STAFFORDSHIRE UNIVERSITY

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# Current Account Sustainability: the case of Bosnia and Herzegovina

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## Abstract

This research investigates whether the persistent current account deficit in Bosnia and Herzegovina (BH) is sustainable. Initially current account sustainability is investigated by using the concept of a stationary condition and the mean reversion proposition. It is argued that stationarity of the current account presents a minimum requirement for current account sustainability assessment based on less strict intertemporal solvency conditions. It was found that four out of the five Western Balkan countries investigated have a stationary current account to GDP ratio and therefore met this minimum requirement for sustainability. In order to develop an empirical model to assess current account sustainability in BH, next the Fundamental Equilibrium Exchange Rate is estimated. The conclusion drawn from this analysis was that BH's high and persistent current account deficit was not caused by exchange rate misalignment, thus there is no need to adjust the peg. The main reason behind the BH current account deficit is its trade deficit. In the absence of previous analyses of trade deficit sustainability in the WB the next question assessed was whether forming an free trade agreement is a helpful policy for BH utilising an ex post empirical analysis. The analysis of the new Central European Free Trade Agreement concentrates upon three effects: on trade flows using gravity equations; on Bosnia and Herzegovina's trade potential and on future deficit sustainability in BH. It was found that although BH trade flows were affected by the CEFTA agreement, the net effect was to contribute to a further widening of the trade deficit in BH. Given the finding that BH's current account deficit cannot be attributed to (real) exchange rate misalignment the main conclusion is that current account sustainability analysis must be based on understanding the reasons why BH has a persistent trade deficit. The main reason behind BH current account deficit is its trade deficit. The main factor underlying trade deficit in BH is strong demand for imported goods and also BH's supply side weaknesses. Policy-makers need to create an environment for the private sector to develop. Hence both micro and macroeconomic conditions would have to be considered by BH policy-makers in order for this country to improve its export competitiveness and its trade position, which could reduce high BH current account deficit.

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| | | |
|---|---|---|
| ADF | – | Augmented Dickey-Fuller |
| AR | – | Autoregressive Structure |
| ARIMA | – | Autoregressive Integrated Moving Average |
| BH | – | Bosnia and Herzegovina |
| BEER | – | Behavioural Equilibrium Exchange Rate |
| BIS | – | Bank for International Settlements |
| B-N | – | Beveridge-Nelson |
| CA | – | Current Account |
| CBA | – | Currency Board Arrangement |
| CBBH | – | Central Bank of Bosnia and Herzegovina |
| CEFTA | – | Central European Free Trade Agreement |
| CEEC | – | Central Eastern European Countries |
| CFA | – | Countries with Franc Zone |
| CFR | – | Common Factor Restrictions |
| CHF | – | Switzerland, Franc |
| CNY | – | China, Yuan Renminbi |
| CPI | – | Consumer Price Index |
| CU | – | Custom Unions |
| DEER | – | Desired Equilibrium Exchange Rate |
| DF | – | Dickey- Fuller |
| EBRD | – | European Bank for Reconstruction and Development |
| EC | – | European Commission |
| ECB | – | European Central Bank |
| ECM | – | Error Correction Mechanism |
| EEC | – | European Economic Community |
| EER | – | Equilibrium Exchange Rate |
| EFTA | – | European Free Trade Agreement |

| | | |
|---|---|---|
| EMU | – | European Monetary Union |
| ER | – | Exchange Rate |
| ERER | – | Equilibrium Real Exchange Rate |
| EU | – | European Union |
| EUR | – | Euro |
| FBH | – | Federation of Bosnia and Herzegovina |
| FDI | – | Foreign Direct Investment |
| FE | – | Fixed Effects |
| FED | – | Federal Reserve Board |
| FEER | – | Fundamental Equilibrium Exchange Rate |
| FEVD | – | Fixed Effect Vector Decomposition |
| FEVDA | – | Fixed Effect Vector Decomposition Augmented |
| FIPA | - | Foreign Investment Promotion Agency |
| FTA | – | Free Trade Agreement |
| GBP | – | United Kingdom, Pound |
| GDP | – | Gross Domestic Product |
| GMM | – | General Methods of Moments |
| HIPC | – | Heavily Indebted Poor Countries |
| HR | – | High Risk |
| HRK | – | Croatia, Kuna |
| HS | – | Harmonised System of Codes |
| HS2 | – | Harmonised Commodity Two Digit Code |
| HS4 | – | Harmonised Commodity Four Digit Code |
| HS6 | – | Harmonised Commodity Six Digit Code |
| HS10 | – | Harmonised Commodity Ten Digit Code |
| ICRGM | – | International Country Risk Guide Methodology |
| IID | – | Independent and Identically Distributed |
| IMF | – | International Monetary Fund |
| IPA | – | Instrument for Pre-Accession Assistance |
| ITA | – | Indirect Taxation Office |
| KM | – | Convertible Mark, Bosnia and Herzegovina Domestic Currency |

| | | |
|---|---|---|
| LM | – | Low Risk |
| M2 | – | Broad Money |
| MKD | – | Macedonia, Denars |
| MR | – | Moderate Risk |
| NAIRU | – | Non Accelerating Inflation Rate of Unemployment |
| NEER | – | Nominal Effective Exchange Rate |
| NTS | – | National Trade Strategy |
| OECD | – | Organisation for Economic Co-operation and Development |
| OHR | – | Office of the Higher Representative |
| OLS | – | Ordinary Least Squares |
| PP | – | Phillips-Peron |
| PPP | – | Purchasing Power Parity |
| PRS | – | Policy Risk Service |
| RE | – | Random Effects |
| REER | – | Real Effective Exchange Rate |
| RER | – | Real Exchange Rate |
| ROL | – | Romania, Lei |
| RPI | – | Retail Price Index |
| RS | – | Republika Srpska |
| RUR | – | Russia, Rubles |
| SAA | – | Stabilization and Association Agreement |
| SFRJ | – | Socialist Federal Republic of Yugoslavia |
| SICE | – | State's Foreign Trade Information System |
| SITC | – | Standard International Trade Classification |
| SMK | – | Serbia Montenegro Kosovo |
| SRD | – | Serbia, Dinars |
| TCI | – | Trade Condition Indicator |
| TRL | – | Turkey, Lira |
| USAID | – | United States Agency for International Development |
| USD | – | United States, Dollars |
| VAT | – | Value Added Tax |

| | | |
|---|---|---|
| VAR | – | Vector Autoregression |
| VHR | – | Very High Risk |
| VLR | – | Very Low Risk |
| WB | – | Western Balkan |

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# Chapter 1: Macroeconomic trends in Bosnia and Herzegovina with a focus on trade



## 1.1 Introduction

The aim of this research is to investigate if the persistent current account deficit in Bosnia and Herzegovina (BH) is sustainable. The starting point is to assess if a current account deficit really matters. To analyse if a current account deficit matters for the sustainability of a BH economy, this chapter will examine its institutional arrangements and critically evaluate its recent macroeconomic trends.

Section 1.2 provides an introduction to the institutional arrangements in BH. Section 1.3 then analyses the BH's main macroeconomic trends, with a particular emphasis upon international trade. In this section an assessment of BH's main economic indicators will be conducted and its performance will be compared with its main trading partners from the region. BH's large current account deficit will be established as one of the main macro-economic problems facing the country on its road toward EU accession and fulfilment of the convergence criteria. As the current account deficit is a result of the high trade deficit, the particular focus of this chapter will be on providing a preliminary analysis of BH's international trade. In Section 1.4 the main importing and exporting commodity groups will be identified and analysed by extracting data from the BH customs data-base. Then BH will be compared with other Western Balkan countries in order to identify its main trading partners and their contribution to its main export and imports. This chapter concludes with section 1.5 which is devoted to an explanation of the content and role of the following chapters. This section also explains the main objectives of this research programme, which are to:

- refine the concept of sustainable current account deficits in the context of the development of operational indicators of sustainability for the transition economies of the Western Balkans;
- introduce an empirical analysis of the sustainability of the persistent trade deficits in Bosnia and Herzegovina; and
- critically evaluate the policy implications of the findings for Bosnia and Herzegovina.

## 1.2 Institutional Arrangements

Bosnia and Herzegovina is probably most well-known for its sad recent history, the war of 1992-1995. This war resulted in much suffering and a largely destroyed and distorted economy. Bosnia and Herzegovina gained its independence in 1992, previously being one of the six Socialist Republics of Socialist Federal Republic of Yugoslavia (SFRJ). Yugoslavia was composed of six socialist republics: Bosnia and Herzegovina, Croatia, Macedonia, Montenegro, Serbia, and Slovenia. Serbia, in addition, included two autonomous provinces of Vojvodina, and Kosovo and Metohia. The conflict in the early 1990s between Croatia, BH and Serbia has resulted in complicated relations between these countries and with the other ex-Yugoslavian Republics. This issue is further discussed in Chapter 5 since the complicated relations between these countries are a potential obstacle to the future integration of these countries with EU.

Peace in BH was formalised by the Dayton Peace Agreement[1], signed in Paris on December 14, 1995 and this agreement is also BH's current constitution. With the signing of the Dayton Peace Agreement, a new structure of the state was introduced; a

[1] Dayton Peace Agreement can be seen at http://www.ohr.int

structure with two entities: the Federation of Bosnia and Herzegovina (FBH) and the Republika Srpska (RS), where the territorial organisation of each entity is regulated by its own Constitution.

BH's government structure is a parliamentary democracy with a bicameral parliament consisting of the House of Representatives and the House of Peoples, a three member rotating presidency, a Council of Ministers and a Constitutional Court. The House of Representatives have 42 seats where 28 are allocated to the FBH and 14 to RS. Elected members serve four year terms. The House of Peoples has 15 seats where 5 are allocated to Bosniak, 5 to Serb and 5 to Croat, where Bosniak and Croat members are elected by the Bosniak/Croat Federation's House of Representatives and Serb members by the RS National Assembly members, and all serve four year terms.

Local self-government is one of the basic principles of the RS constitutional arrangements. In the RS there is only one level of self-government: the municipality, conversely, however in the FBH there are ten Cantons. Their number and boundaries were agreed in February 1994 in the context of the Washington Agreement[2]. Based on the Washington Agreement, each Canton has its own Constitution with legislative and taxing powers. Responsibilities between Federation and the Cantons are divided leaving most responsibilities to the Cantons. A Canton may delegate its responsibilities to a municipality or a city. There are 80 municipalities in ten Cantons of the FBiH and 63 municipalities in the RS. There is one additional municipality whose territory belongs to both Entities, this municipality has a status of Special District so called "Brcko District" with direct international supervision by a deputy High Representative. In both Entities, cities are local government unions that are formed by two or more municipalities which are territorially and economically linked. The city level is weak since it is not financially independent, depending on transfers from the Cantons. Both Entities before January 2006 were contributing to the financing of the State level on the basis of 2/3 from the FBH and 1/3 from the RS. Since 2006, State level financing is based on the revenues collected

[2] The whole text of the Agreement is available at:
http://www.usip.org/library/pa/bosnia/washagree_03011994.html

from Value Added Tax (VAT) and other sources of revenues. Nonetheless, FBH and RS still have two different financial, tax and economic systems.

The economy of BH is probably considerably smaller than before war. However the improved capture of the informal economy through tighter tax enforcement suggests that progress is being made towards restoring economic activity to pre-war levels. BH's B2 government rating and Ba3 foreign-currency country ceiling (Moody's, 2009) indicates the degree of creditworthiness of a complex nation still in progress of establishing its institutions and rebuilding its economy after the conflict. For comparison both Croatia's and Serbia's ratings are more favourable. Croatia's is Baa3 as assessed by Moody's, in 2010 (National Bank of Croatia, 2010) and Serbia's BB- as assessed by Standard&Poor, in 2007, (National Bank of Serbia, 2007). Their higher ratings reflect greater confidence in the economic and political stability of these two countries and growing integration of their countries with the European Union (EU). The EU has been actively involved in BH's post-war stabilisation and restructuring. The BH authorities in 2006 started discussions with the EU on a Stabilization and Association Agreement (SAA) and also completed technical negotiations. Still, difficult compromises, between the multiple layers of government created by the 1995 peace treaty, remain to be addressed.

Overall, in order to achieve stronger economic development, BH will need to work more toward single economic space development throughout the country (IMF 2007, Article IV Consultations). Openness to EU and world trade require credible institutional commitments in place, thus BH is faced with a strong challenge to work more on its internal integration strengthening as well as on intra-regional trade integration in order to accomplish its future EU convergence aspirations. There are many other issues on which transition economies need to work in order to achieve stability and sustainable economic growth and to join the EU. The Maastricht criteria with their focus on nominal and macroeconomic convergence are important conditions that countries will have to accomplish. Persistent current account deficits in Western Balkans raise questions about external sustainability, international competitiveness and the consistency of their policies with these convergence objectives. Some transition economies are progressing faster on their road toward EU membership, while countries like BH are lagging behind.

Associated with this relatively slow development is BH's large current account deficit. Persistent current account deficits above 5% of GDP have generally been considered unsustainable in the long run (Milesi-Ferretti and Razin 1996, Roubini and Wachtel 1998, Carranza 2002). In BH the current account deficit has persisted for several years reaching 15% in 2008 (Central Bank of BH, 2008). In 2009 the current account deficit improved to 8% of GDP. One reason for this reduction was the overall slowdown in economic activity in BH, which was a consequence of the current financial crisis.

The critical questions that have to be raised in a country with such a high current account deficit concern how the deficit is financed and whether the deficit is sustainable (IMF 1998). One often hears these questions, but answers based on in-depth analysis are missing for BH. The current account deficit in BH is mainly driven by a trade deficit (Central Bank of BH, 2009), thus it is sensible to compare BH with its main trading partner countries (CEFTA). Hence the next section will first provide an overview of the recent macroeconomic developments in BH and then the analysis will focus more on an international trade, since a trade deficit presents a significant contribution to BH current account deficit widening (Central Bank of BH, 2007).

Since large current account deficits raise questions about external sustainability (IMF, 1998), the assessment of sustainable position of BH current account deficit seems to be very important in order to ensure a sustainable path for BH on its road toward EU accession and fulfilment of convergence criteria. Thus, at the end of Chapter 1 the organization of the remainder of this thesis is explained, providing an overview of the research programme aiming to close this gap in the analysis of BH's current account sustainability.

### 1.3 Macroeconomic trends in Bosnia and Herzegovina

Bosnia and Herzegovina is a small open economy[3] (Central Bank of Bosnia and Herzegovina, 2008) located in Europe, it is not a member of the EMU nor of the EU, but it does have a currency board with the EURO (previously DM) as its anchor currency. At the end of 1997 the first major structural reform was conducted in BH by the introduction of the Currency Board Arrangement (CBA) and establishment of an independent Central Bank of BH (CBBH). The CBBH operates its monetary policy through a strict CBA, this means that a fixed exchange rate is specified in the law governing the CBBH and that full foreign backing (for all KM liabilities) and convertibility (of the CBBH's liabilities into the anchor currency) is guaranteed. The only monetary instrument that the CBBH currently has is a reserve requirement that applies to commercial bank deposits. The CBBH cannot act as a lender of last resort and cannot finance the BH government. In the case of domestic or international economic shocks, the exchange rate cannot therefore be used as an instrument for adjustment. The CBBH's main goal is to maintain monetary stability by issuing domestic currency (KM – convertible mark) in accordance with the CBA, with full coverage in freely convertible foreign exchange funds under a fixed exchange rate of 1 KM: 0.51129 EURO. In the following table the main economic indicators for BH (Table1.1) are presented to provide an overview of recent macroeconomic developments.

In Table 1.1 the main macroeconomic indicators are presented, where applicable as a percentage of nominal GDP. In BH GDP at constant prices is still only an experimental estimate (BH Agency for Statistics, 2009). It is available from 2006 through 2009 by the production approach and from 2006 through 2008 by the expenditure approach. These two approaches produced different real and nominal GDP amounts, hence their deflators differ. Since BH GDP at constant prices remains an experimental method it was decided to report only GDP at current prices which is calculated based on the production approach by the BH's Agency for Statistics.

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[3] By definition a small economy is an economy that takes economic activities in the rest of the world as given; i.e. it cannot influence them.

Table 1.1: Main Economic Indicators

| Main Economic Indicators | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Nominal GDP[1] BiH, (in millions of EURO) current prices** | 5,976 | 6,424 | 7,067 | 7,417 | 8,071 | 8,757 | 9,843 | 11,125 | 12,637 | 12,245 |
| **Real GDP growth rate in %[1]** | 5.5 | 4.5 | 4.9 | 3.8 | 6.3[2] | 3.9 | 6.1 | 6.2 | 5.7 | -2.9 |
| **Retail prices growth rate in BH[3]** | 4.8 | 3.1 | 0.4 | 0.6 | 0.4 | 3.7 | 7.4 | 1.8 | n/a | n/a |
| **CPI annual growth rate in %** | n/a | n/a | n/a | n/a | n/a | n/a | 6.1 | 1.5 | 7.4 | -0.4 |
| **Unemployment rate in BH[4] (%)** | 39.7 | 40.3 | 40.9 | 42.0 | 43.1 | 44.7 | 31.1 | 29.0 | 23.4 | 24.1 |
| **General Government budget[5]** | | | | | | | | | | |
| Revenue % GDP | 50.4 | 46.9 | 37.1 | 41.5 | 40.4 | 41.6 | 44.6 | 45.2 | 44.1 | 43.1 |
| Expenditure % GDP [6] | 56.9 | 50.2 | 37.2 | 40.8 | 38.8 | 39.2 | 41.7 | 43.9 | 46.1 | 47.5 |
| Overall balance | -6.5 | -3.3 | -0.1 | 0.7 | 1.6 | 2.4 | 2.9 | 1.3 | -2.0 | -4.4 |
| **Money and Credit** | | | | | | | | | | |
| Broad Money (M2) % GDP | 23.0 | 40.3 | 36.7 | 37.9 | 43.3 | 47.1 | 52.1 | 56.1 | 51.4 | 54.3 |
| Credit to Non-Government Sector % GDP | 27.8 | 28.5 | 30.5 | 35.0 | 37.3 | 43.8 | 48.0 | 54.3 | 57.8 | 57.4 |
| Gross Official Reserves | | | | | | | | | | |
| In Months of Imports of goods and services | 1.5 | 3.6 | 3.2 | 3.4 | 4.0 | 4.3 | 5.5 | 5.7 | 4.6 | 6.0 |
| **Balance of Payments** | | | | | | | | | | |
| Current Account Balance % GDP | -7.2 | -13.0 | -17.7 | -19.4 | -16.3 | -17.1 | -7.8 | -10.4 | -15.1 | -7.5 |
| Trade balance % GDP | -50.2 | -51.5 | -49.9 | -49.5 | -45.6 | -45.2 | -34.6 | -37.2 | -38.2 | -27.8 |
| External Debt of Govermment Sector % GDP | 34.7 | 35.2 | 31.1 | 27.7 | 25.5 | 25.3 | 21.1 | 18.2 | 17.2 | 21.8 |
| **External Debt Servicing [7]** | | | | | | | | | | |
| As a percentage of exports of goods and services | 5.9 | 5.0 | 7.0 | 6.7 | 4.9 | 4.1 | 3.8 | 2.9 | 2.5 | 3.2 |

Notes:

1 Source: Bosnia and Herzegovina Agency for statistics.
2 Estimates of BH Central Bank.
3 Weights used represent FBiH and RS shares in BH GDP, not available as of 2008
4 Source: Labour and Employment Agency of BH
5 Source: BH Central Bank, until 2002 IMF estimates.
6 Expenditure also includes net acquisition of fixed assets.
7 Source: BH Ministry for Finance and Treasury.

### 1.3.1 Economic growth

Based on the available data it can be concluded that nominal GDP has doubled since 2000, and definitely more than doubled since 1998, when BH started to work seriously on its economic progress. BH’s economy managed to grow at a rate of 5.7%[4] in 2008, and this could be assessed as doing relatively well, as concluded in the EBRD’s Transition Report 2009. However, recently the political situation in the region and the shocks to the world market, including a rapid growth of oil prices and financial losses as a result of undergoing financial crisis, have had an effect on BH's economic performance with a negative real growth rate of 2.9% in 2009.

In recent years BH has maintained a low inflation rate, well below the other ex-Yugoslavian countries over the last five years, except in 2006 when VAT was introduced at a single rate of 17%. Compared to the other neighbouring countries BH was one of the last countries from the group of ex-Yugoslavia countries to implement a VAT (January 1, 2006): Croatia implemented VAT on January 1, 1998, Macedonia on April 1, 2004, and Serbia on January 1, 2005. Looking at the unemployment rate, it is very high in Bosnia and Herzegovina and in 2009 it reached 24% according to official statistics of the Labor and Employment Agency of BH. The Agency was established in 2003 and it performs a coordinating function between the Federation Employment Service, the Employment Service of Republika Srpska and the Employment Service of the Brčko District of BH. The major fall from the earlier years is a result of improved statistics based on annual Labour Force Surveys which started in 2006 based on ILO and EUROSTAT standards. Few years before the Agency was established USAID together with US Treasury assistance worked on the tax system modernisation project (USAID, 2006). With an updated register of taxpayer’s the Employment Agency of BH was able to obtain access to more accurate data and produce a more reliable rate of BH unemployment. However, the estimating the unemployment rate is further complicated by last available population survey in BH being conducted in 1991 and hence the total population of working age is just an approximation based on that survey. In addition, the high rate of unemployment is

[4] CBBH Estimate

thought to coexist with the strong presence of a grey economy in BH, suggesting the necessity of reforms to improve employment creation in BH, which could foster higher economic growth. According to Schneider et al. (2010) the grey or shadow economy in Bosnia and Herzegovina accounted for around 35% of official GDP over the period 1999 to 2007.

The data in Table 1.1 indicate that BH's government has managed to end most recent fiscal years without a budget deficit, except for 2008 and 2009. The budget deficit in 2009 was 4.4% of GDP. The IMF (2008a.) in its public information notice for BH argues that there was excessive spending by the Federation of BH in 2007 which questions the sustainability of debt financing. Heller (2002) argues that an unsustainable fiscal position exposes a country to risks of default. The IMF (2007) stresses that though the BH government sees the budget mainly as an instrument for pursuing its social goals it is also the key macroeconomic policy tool. The IMF (2008a.) suggests that the BH's general government should maintain a balance over the medium-term. What the IMF's analysis suggests is the possibility that the recent high spending of BH government is actually a procyclical phenomenon, consistent with increased government spending in the "good times". Reinhart and Reinhart (2008) found that in developing countries the fiscal policy stance was often extremely procyclical during a capital inflow bonanza. This means that temporary "good times" are usually treated as permanent from the fiscal point of view and, hence, the fiscal surplus that is evident in recent years; the decrease in the current account deficit; as well as surge in privatization receipts could give a signal of a "good times" to BH government. Though this hypothesis is difficult to confirm for BH due to the small sample of data.

Based on the IMF's descriptive analysis is difficult to claim that BH will have liquidity problems in the short term, for example so far its external debt is being serviced in a timely manner. Based on external debt service indicator (Table 1.1) BH seems to be a moderately indebted country. Other ex-Yugoslavian countries have a higher external debt burden than BH's. Croatia with 85.4% of external debt to GDP seems to be the highest debtor in the region (Table 1.2).

In Table 1.2 selected economic indicators for the Western Balkan countries (in percent of GDP) are provided for both 2006 and 2009. These two particular years are selected in order to compare the pre-crisis period, (i.e., in so called "good times") and the most recent data available. Roubini and Wachtel (1998) stress that transition economy's data are hard to interpret due to the very rapidly involving macroeconomic situation. The same difficulty is found in assessing BH data, since as can be seen in Table 1.2, the economic situation can change very quickly and relying solely on descriptive analysis for a specific time period could lead to wrong conclusions of a stable macroeconomic outlook.

Table 1.2: Selected economic indicators as % GDP in 2006 and 2009

| Country | Growth rate annual % change | | Consumer price index annual % change | | Broad money % change | | External debt in % GDP | | Reserves in months of imports | | Current account deficit as % GDP | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2006 | 2009 | 2006 | 2009 | 2006 | 2009 | 2006 | 2009 | 2006 | 2009 | 2006 | 2009 |
| Bosnia and Herzegovina | 6.2 | -3.4 | 6.1 | -0.4 | 24.7 | 0.6 | 21.3 | 21.8 | 5.5 | 6.0 | -7.8 | -7.5 |
| Croatia | 4.7 | -3.5 | 3.2 | 2.5 | 18.0 | n/a | 74.9 | 85.4 | 4.9 | 5.1 | -6.9 | -5.2 |
| Serbia | 5.2 | -2.9 | 12.7 | 8.1 | 38.4 | 10.7 | 63.3 | 76.0 | 6.6 | 9.7 | -10.1 | -5.7 |
| FYR Macedonia | 4.0 | -1.3 | 1.8 | -1.7 | 24.5 | 2.0 | 44.9 | 56.4 | 4.1 | 3.8 | -3.8 | -9.5 |

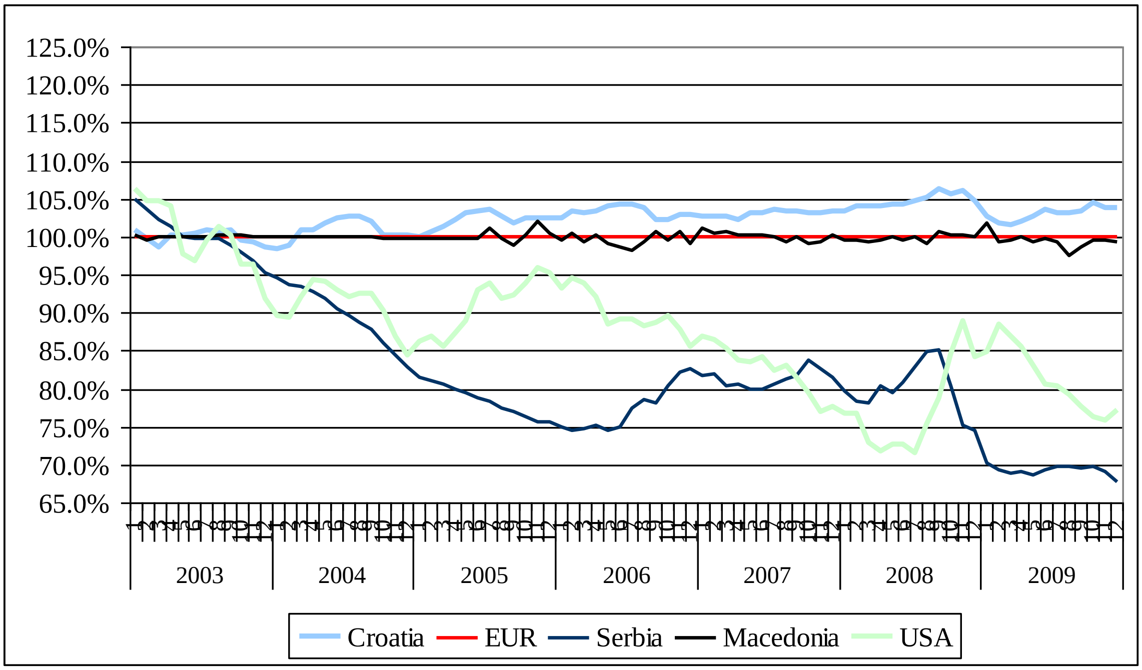
Source: IMF Public Information Notice, Central Banks of selected countries

Overall a slowdown in economic activity can be noticed in all these countries, with external debt increasing and a persistent current account deficit in % GDP. The data in Table 1.2 also indicate that all these countries but Macedonia are building their foreign reserves, with the reported indicator being well above the recommended minimum of three months of imports (IMF recommendation). The data in Table 1.2 also indicate that foreign exchange reserves remained stable in 2009 while broad money growth rate has fallen. According to IMF (2010) foreign-owned banks have broadly maintained their exposure in BH. The banking sector seems to be the sector in which all countries have achieved faster progress with reforms. Depositors, until the financial crises, were increasingly keeping their savings in the banks rather than at home in foreign cash, which was a signal of increasing confidence in the banking sector. Bank lending had also been increasing (EBRD, 2006) in the Western Balkan countries and increasing competition in the banking sector has been evident with the arrival and growth of foreign banks. Further indicators of the BH banking sector's development were: reform of the payments system; establishment of minimum capital requirements; introduction of deposit insurance; sovereign credit rating; and development of the domestic stock exchange.

Analysing bilateral exchange rates, the KM is stable against the EURO because of the currency board arrangement, and the KM has appreciated against the currencies of all of its geographically nearest trading partners, except Croatia, as can be seen from Graph 1.1[5]. The fluctuations recorded with Croatia are mostly seasonal due to the instruments that the Croatian National Bank uses (foreign exchange interventions and reserve requirement) to benefit from their strongest exporting commodity: tourism. The only monetary instrument that the CBBH currently has is a reserve requirement that applies to commercial bank deposits. A reserve requirement has been in place since the CBBH commenced its operations in 1997. The reserve requirement was originally applied only to KM deposits, but now it applies to all deposits, thus more than doubling the base money. Previously banks could meet their reserve requirement either by holding KM banknotes in their vaults or by having KM deposits at the CBBH. Now reserve requirement can only be met by deposits at the CBBH. Previously, banks' excess deposits at the CBBH were not remunerated, now the CBBH pays an overnight interest rate on these deposits.

[5] The base year is set to be 100 in April 2002, even though consensus about the appropriate base year has still not been decided in BH.

Graph 1.1: KM appreciation (2003=100)




Source: CBBH and author's own calculation

Overall it can be concluded that in recent years BH and its neighbours recorded a slowdown in their growth rates and in 2009 even negative growth.

Dailami and Haque (1998) argue that "sound policy" is to be judged by its efficiency in fulfilling the economic objectives of steady growth, full employment, price stability and a balanced external position. The persistent current account deficits in the Western Balkans raise questions about external sustainability, competitiveness and the consistency of their policies. Hence the next section will extend the focus to embrace international trade analysis, since a trade deficit is the main cause of BH's persistent current account deficit.

## 1.4 Analysis of Bosnia and Hercegovina's Current Account Deficit

The previous sections identified that the large current account deficit was one of the main macro-economic problems facing Bosnia and Herzegovina. The focus of this section will be on its composition and changes in BH's trade structure.

### 1.4.1 Composition of Bosnia and Hercegovina's Current Account

The two countries with the highest current account deficit in the Western Balkans in 2009 were Macedonia with one equivalent to 9.5% of GDP and Bosnia and Herzegovina with one of 7.5% GDP. Since all Western Balkan countries have high current account deficits a first important question is: how is the deficit financed? Since the balance of payments is a "balance", a deficit of one component has to be financed by a surplus of some other component(s). In Table 1.3 BH's balance of payments data are presented.

Table 1.3: Bosnia and Herzegovina balance of payments (in millions KM)

| **Year:** | **2005** | **2006** | **2007** | **2008** | **2009** |
|---|---|---|---|---|---|
| **I - Current Account (1+2+3+4)** | **-2,933.1** | **-1,505.3** | **-2,261.3** | **-3,733.8** | **-1,807.1** |
| 1. Goods | -7,748.7 | -6,661.2 | -8,101.1 | -9,432.2 | -6,662.4 |
| Exports | 4,028.4 | 5,255.8 | 6,046.5 | 6,888.4 | 5,711.5 |
| Imports | -11,777.1 | -11,916.9 | -14,147.7 | -16,320.7 | -12,373.9 |
| 2. Services | 872.5 | 1,034.2 | 1,252.7 | 1,252.1 | 1,048.9 |
| 3. Income | 736.6 | 649.3 | 721.9 | 671.2 | 509.3 |
| 4. Current Transfers | 3,206.5 | 3,472.5 | 3,865.3 | 3,775.1 | 3,297.0 |
| **II - Capital and Financial Account (1+2)** | **2,640.7** | **1,244.8** | **2,378.4** | **3,906.8** | **1,781.1** |
| 1. Capital Account | 443.4 | 457.2 | 433.9 | 393.6 | 347.0 |
| 2. Financial Account | 2,197.3 | 787.5 | 1,944.5 | 3,513.2 | 1,434.1 |
| 2.1. Direct investment | 963.7 | 1,113.3 | 2,927.5 | 1,402.0 | 699.3 |
| 2.2. Portfolio investment | 4.2 | -0.7 | -1.1 | -11.8 | -37.7 |
| 2.3. Other investment | 1,974.9 | 902.2 | 264.9 | 1,720.1 | 690.2 |
| 2.4. Reserve assets | -745.5 | -1,227.2 | -1,246.8 | 402.8 | 82.4 |
| **III - Net errors and omissions** | **292.4** | **260.5** | **-117.1** | **-173.0** | **26.0** |

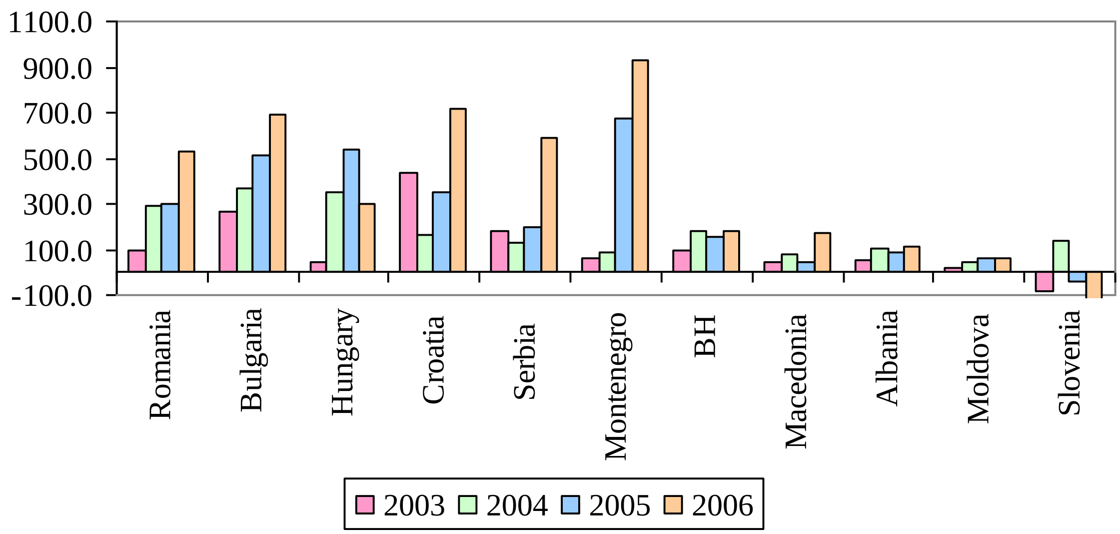
Source: Central Bank of Bosnia and Herzegovina, Yearly Report 2009

The current account represents the sum of goods and services, income and current transfers of a country with the rest of the world (IMF, 1996). Therefore, the balance of the current account can be positive or negative. Looking at the Table 1.3 it can be noticed that BH had a negative current account balance during the whole observed time period. The sum of BH main current account items, hence net exports, net foreign income and current transfers in BH is negative. A negative balance in the current account means that the country's imports have exceeded its exports and its net inwards transfers. In BH imports are 2.5 times higher then exports. Transfers are generally a small fraction of the total flows, but in BH they do present an important part of the current account. The current transfers are generally composed of the government and other sectors transfers (i.e. remittances and pensions). As can be seen from Table 1.3 current transfers at the end of 2009 were approximately KM 3.30 billion and were down by 12.7% compared to 2008. According to CBBH (2009) the main cause of this reduction was in net inflows which occurred due to reduction of revenues from other sectors, particularly remittances and pensions. Looking at Table 1.3 current transfers account for significant part of the BH trade deficit, i.e. around 50% in 2009. The main item that dominates BH's balance of payments is its very large trade deficit in goods, hence this is the focus of the research programme reported in this thesis.

BH's trade deficit in goods is currently financed by: current transfers 49% (workers remittances 30%), services 16% and income 8% (compensation of employees and investment income). The remaining portion of the current account deficit (27%) is financed by the capital and financial account (FDI inflow and other investments). Since large current account deficits raise questions about external sustainability (IMF, 1998), an assessment of how sustainable is the position of BH's current account deficit seems to be very important. The high and persistent trade deficit questions current account sustainability and whether countries with persistent and high deficits can acquire sufficient funds to finance their deficits. It is very difficult to believe that the BH economy in the future can rely on transfers (repatriations) to the current extent. The item that has the most potential to change rapidly is foreign private investment, but for BH to attract more foreign private investment policy-makers need to create an environment to attract additional investment inflows. What determines a high inflow of FDI is still a matter of debate. Empirical studies seems to validate the hypothesis that foreign direct investments disproportionately go to higher income developing countries (Alesina and Dollar, 1998) and countries that are open to world trade (Shatz and Venables, 2000). According to IMF (2010) key factors impeding FDI in BH include: political instability, complicated and expensive bureaucracy, lack of clear strategy for economic development, corruption and weak legislative framework, and inadequate monitoring and enforcement of trading standards.

BH's FDI[6] inflow in 2006 was about KM 1.1 billion, while in 2009 it is estimated at around KM 699.3 millions (CBBH, 2009). The largest capital inflow in both years was from Austria. In 2006 it was around 45%, and in 2008 around 30%, of total FDI. The highest investments were recorded in both periods in the financial intermediation (excluding insurance and pension funding) When compared to the region and given the size of BH economy, it can be seen from Graph 1.2 that BH received a relatively moderate inflow of FDI compared to other Balkan countries, though this was still sufficient to finance a major part of the current account deficit. The question that remains unanswered is whether this is sustainable? According to CBBH estimates and based on the above figures, FDI for 2009 is half of what BH recorded in 2006, and this amount of FDI inflow financed 40% of BH current account deficit (CBBH, 2009) in 2009.

Graph 1.2: Foreign Direct Investment per capita in USD




Source: EBRD Transition Report 2005, 2006, CBBH and author's own calculation

Looking at data from 2004 to 2007 on gross capital formation (BH Agency for Statistics, 2008) a slowdown in investment can be noticed only in 2006. In all other years a positive trend in investment growth is recorded. This latter would appear to suggest some optimism in expected profitability of these investments. However the global financial

[6] The CBBH Governor in his speech on FDI inflow at the investment conference in Sarajevo in March 2007 suggested that political stability, economic progress, as well as a country's image, represent the key elements determining FDI inflow into an economy.

crisis caused that optimism to be ill-founded and the current deterioration in capital inflows raises once more the issue of the sustainability.

It seems that the main reason for the high current account deficit in Western Balkans countries is their trade deficit. In BH four commodity groups: mineral products; machinery; transportation equipment; and consumer goods are responsible both for the persistent trade deficit and for recent increases in that deficit. BH's main trading commodities are presented in Tables 1.4 and 1.5.

Table 1.4: BH's main commodity groups of exports from 2007 to 2009

| Export commodity groups | EURO mil.in 2007 | EURO mil.in 2008 | EURO mil.in 2009 | Total export share 2007 | Total export share 2008 | Total export share 2009 |
|---|---|---|---|---|---|---|
| Aluminium alloys | 252.8 | 243.7 | 135.3 | 8.2% | 7.0% | 4.7% |
| Parts for engines | 165.3 | 120.6 | 67.4 | 5.4% | 3.5% | 2.3% |
| Bars & rods, iron | 131.2 | 147.0 | 70.7 | 4.3% | 4.2% | 2.5% |
| Electrical energy | 209.9 | 302.7 | 295.1 | 6.8% | 8.7% | 10.2% |
| Seats and parts | 122.6 | 152.8 | 169.8 | 4.0% | 4.4% | 5.9% |
| Of beech | 102.8 | 97.9 | 84.6 | 3.3% | 2.8% | 2.9% |
| Parts of footwear | 57.1 | 59.1 | 74.6 | 1.9% | 1.7% | 2.6% |
| Aluminum oxide | 68.2 | 72.8 | 34.8 | 2.2% | 7.0% | 1.2% |
| Tungsten Ores and Concentrates | 52.6 | 30.7 | 13.4 | 1.7% | 0.9% | 0.5% |

Source: Bosnia and Herzegovina Indirect Taxation Agency and author's own calculation

Table 1.5: BH's main commodity groups of imports from 2007 to 2009

| Import commodity groups | EURO mil in 2007 | EURO mil in 2008 | EURO mil in 2009 | Total imports share 2007 | Total imports share 2008 | Total imports share 2009 |
|---|---|---|---|---|---|---|
| Petroleum Oils | 893.8 | 1202.4 | 559.4 | 28.0% | 30.3% | 18.8% |
| Natural gas | 94.0 | 81.6 | 3.3 | 2.9% | 2.1% | 0.1% |
| Motor cars | 134.5 | 143.8 | 83.7 | 4.2% | 3.6% | 2.8% |
| Parts for engines | 82.5 | 70.5 | 21.9 | 2.6% | 1.8% | 0.7% |
| Aluminum oxide | 71.6 | 68.3 | 33.7 | 2.2% | 1.7% | 1.1% |
| Medicaments nesoi | 70.1 | 87.1 | 91.4 | 2.2% | 2.2% | 3.1% |
| Beer made from malt | 63.7 | 67.9 | 67.6 | 2.0% | 1.7% | 2.3% |
| Wheat and meslin | 70.3 | 70.4 | 42.4 | 2.2% | 1.8% | 1.4% |
| Aluminium alloys | 47.9 | 53.3 | 41.9 | 1.5% | 1.3% | 1.4% |

Source: Bosnia and Herzegovina Indirect Taxation Agency and author's own calculation

The economic consequences of importing consumer goods or industrial raw materials and machinery are very different. If the country had adopted an export-led growth solution to address its persistent trade deficit then the initial expectation would be a worsening of the trade deficit, as more raw materials and machinery are imported. If on the other hand a country lacks a clear strategy then a persistent trade deficit based largely on imported consumer goods is likely to be unsustainable in the long-run. According to the World Bank Doing Business Report (2009), Bosnia and Herzegovina's ranking in terms of the ease of starting a business was 162 out of 183 economies, which is not very encouraging for a country that aims to attract higher inflows of foreign capital.

As can be seen from Tables 1.4 and 1.5, mineral fuels and industrial raw materials constitute a high proportion of BH's imports. These goods cannot be easily substituted by other goods and have a price inelastic demand. However given the data available it is not possible to provide accurate estimates of the price elasticity of BH's main imports and exports.

Table 1.6: Bosnia and Herzegovina exports, imports and trade deficit (in EURO millions) and annual growth rates

| Year | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|
| BH Trade, current prices: | | | | | |
| Export (in millions of EURO) | 2,059.70 | 2,687.22 | 3,091.54 | 3,522.00 | 2,920.24 |
| Import (in millions of EURO) | -6,021.54 | -6,093.03 | -7,233.58 | -8,344.63 | -6,326.66 |
| Trade deficit (in millions of EURO) | -3,961.84 | -3,405.81 | -4,142.05 | -4,822.63 | -3,406.42 |
| BH Trade, constant prices: | | | | | |
| Export (in millions of EURO) | 2,059.70 | 2,509.08 | 2,964.08 | 3,282.38 | 2,919.07 |
| Import (in millions of EURO) | -6,021.54 | -5,689.10 | -6,935.36 | -7,776.91 | -6,324.13 |
| Trade deficit (in millions of EURO) | -3,961.84 | -3,180.02 | -3,971.28 | -4,494.53 | -3,405.06 |
| BH Trade, growth rates: | | | | | |
| Export annual growth in nominal terms | n/a | 30.5% | 15.0% | 13.9% | -17.1% |
| Export annual growth in real terms | n/a | 21.8% | 10.3% | 6.2% | -17.1% |
| Import annual growth in nominal terms | n/a | 1.2% | 18.7% | 15.4% | -24.2% |
| Import annual growth in real terms | n/a | -5.5% | 13.8% | 7.5% | -24.2% |
| Trade deficit annual growth in nominal terms | n/a | -14.0% | 21.6% | 16.4% | -29.4% |
| Trade deficit annual growth in real terms | n/a | -19.7% | 16.6% | 8.5% | -29.4% |

Source: CBBH and author's own calculation

In BH the volume of trade has been rising, as shown in Table 1.6, except in 2009 due to overall a slowdown in economic activity. One of the areas in which deficit reduction could be achieved in Bosnia and Herzegovina is through development of its energy sector. Significant reforms have been undertaken in BH's energy sector. The Entity's Action Plans for the Energy Sector Restructuring have been ratified by both RS and FBH Parliaments. Basically as of 2006 the reform process of the energy sector was intensified, though to the knowledge of the author no National Energy Strategy has yet been developed and the organisation of the energy sector development is still lacking a systematic approach. In BH there are three regulatory commissions instead of one, with the State only having a coordinating role. According to Jenko (2007) the main barrier to a single internal energy market in BH is the lack of integration of a State-driven action plan. The additional difficulty is that there is no systematic collection of energy statistics. Hence, it is a difficult to calculate whether BH is an efficient user of energy. Jenko (2007) suggests based on international data sources that BH seems to be a very inefficient user of energy. If BH is an inefficient user of energy then promoting increased efficiency can be a part of energy sector strategy, releasing additional capacity for exports.

The natural energy sources of BH are coal and hydro power, which are mainly used for electricity generation. Jenko (2007) suggests that production of coal is only about 40% of pre-war levels and that coal reserves are considerable and provide a significant long-term source of energy. Looking at the data provided above it can be seen that electricity is one of the main exports of BH. If the energy sector is stimulated by an economic strategy of encouraging exports for which it has a comparative advantage, then the beginnings of an export-led growth strategy for BH are there. Export-led growth in combination with import substitution can result in lower energy prices for domestic producers. This would create more opportunities to identify energy-intensive products to promote as exports and in which to develop import substitutes. Also, by becoming more energy efficient, very large energy consumers may gain a competitive advantage and increase their share of domestic and foreign markets. A national energy strategy should aim to identify clear priorities based upon competitive advantage and on those activities which may attract additional FDI. According to a recent press statement (October 18, 2010) by the Director of Foreign Direct Investment Promotion Agency (FIPA) in BH there is a potential for FDI inflows of 10 billion EURO just in BH's energy sector, a figure which represents about 82% of nominal GDP in 2009. Though which specific areas would attract such inflows are not identified.

In order to know whether there is any significant change to the pattern of trade in terms of specific groups of goods, the extent of changes in BH's trade structure are next calculated.

### 1.4.2 The churning of trade in Bosnia and Herzegovina

Trade structure 'churning' is used as an indicator for changes in trade composition. The later may be an important indicator of longer term trends which may have significant implications for the sustainability of deficit. A low level of churning may indicate inertia and a failure to restructure in line with the demands of international competitiveness. In contrast, a high level of export churning may signal that Bosnian exports are increasingly targeting markets of high income elasticity of demand and higher value added. Developing countries exports frequently depend on a high content of intermediate products. Hence churning on the exports side will also tend to lead to churning on the imports side and in sum this is likely to be necessary to turn to higher growth markets and higher value added markets which seem to be an important pre-condition to improve BH's balance of trade. A measure of 'churning' can be calculated following Jiandog and Shang-Jin's (2007) approach, modified in order to utilise available data on BH's trade. The modification is basically in the number of periods used. Jiandog and Shang-Jin's (2007) used five time periods and here only two are used due to data availability. First churning of trade is calculated using 2007 and 2008 data based on the HS2[7], HS4 and HS6 classifications and then churning of trade is calculated again for BH's using 2007 and 2009 for the most diversified HS6 classification.

Hence, BH's churning is calculated as:

$$\text{BH Churning} = \frac{1}{T}\sum_{t=1}^{T}\left[\left|BHX(h,t) - BHX(h,t_{t-1})\right| + \left|BHM(h,t) - BHM(h,t_{t-1})\right|\right] \qquad (1.1)$$

This measure of the churning of trade is bound between 0 (no change) and 2 (maximum possible change), where,

BHX (h, t) = the share of product h in country's exports in year t,

BHM (h, t) = the share of product h in country's imports in year t.

h = country's products according to HS coding system

t = 2007, 2008 and hence T=2,

the results using equation (1.1) are presented in Tables 1.7, 1.8 and 1.9:

Table 1.7: Churning of trade based on harmonized commodity two digit code HS2

| Time | Number of periods T | export churning | import churning | Trade churning | w/o Ch 1-29 |
|---|---|---|---|---|---|
| 2007/2008 | 2.0 | 0.072 | 0.054 | 0.126 | 0.084 |

Source: CBBH and author's own calculation

[7] The Harmonized Commodity Description and Coding System, or HS, is a multipurpose goods nomenclature used as the basis for customs tariffs and for the compilation of trade statistics all over the world. The HS was developed by the World Customs Organization and was implemented on 1 January 1988 by an international convention that came into force on 1 January 1988. HS2 is two digit code; HS4 is four digit code and HS6 is six digit code.

Table 1.8: Churning of trade based on four digit code HS4

| Time | Number of periods T | export | import | Churning | w/o Ch 1-29 |
|---|---|---|---|---|---|
| 2007/2008 | 2.0 | 0.127 | 0.106 | 0.233 | 0.116 |

Source: CBBH and author's own calculation

Table 1.9: Churning of trade based on six digit code HS6

| Time | Number of periods T | export | import | Churning | w/o Ch 1-29 |
|---|---|---|---|---|---|
| 2007/2008 | 2.0 | 0.177 | 0.268 | 0.445 | 0.305 |

Source: CBBH and author's own calculation

It was found that BH Churning of trade based on HS2 classification it is 0.126 (Table 1.7), while based on HS4 classification is 0.233 and based on HS6 classification is 0.445. This is an indication that BH change in trade composition compared to different HS classifications (see Tables: 1.7, 1.8 and 1.9) vary. This also suggests that the more disaggregated commodities groups are (i.e. HS6), the higher the churning of trade, hence the focus will be on the HS6 classification. This finding is also in accordance with Jiandog and Shang-Jin's (2007) suggestion that the more disaggregated commodities groups are the higher the churning. However, they did not report less disaggregated calculations from HS commodities only those for HS6. Jiandog and Shang-Jin's calculated churning indices for fifty four countries using five time periods (1996, 1998, 2000, 2002 and 2004). Out of fifty four different countries only one country can be identified with the almost the same churning of trade as BH. That country is Pakistan and its churning of trade is 0.40. Bosnia and Herzegovina churning of trade is 0.45. All the other 43 countries had higher churning than Bosnia and Herzegovina. Since churning of trade is bound between 0 and 2, where 0 is relatively low, the obtained result on the churning of BH's trade is relatively low and indicates a unusually stable pattern of trade. This suggests that current trade imbalances are unlikely to be reversed in the short to medium term.

Jiandog and Shang-Jin's calculate churning of trade without chapters 1 to 29, meaning excluding agriculture, dairy, fishery and related sectors, arguing that these chapters are generally difficult to switch in and out of. Following this suggestion, trade structure churning is calculated for BH without CH 1-29 and it is found to be around 0.31, again similar to Jiandog and Shang-Jin's (2007) finding for Pakistan (0.30) However it cannot be overlooked that there is a difference between these two calculations and it refers to the time periods used in calculation. The above calculations are applied to only two time periods while Jiandog and Shang-Jin's (2007) use five time periods. This analysis suggests that if more time periods were available for BH its trade structure churning would probably be considerably higher. Since additional data are not available the time period is changed and instead of calculating churning between years 2007 and 2008, churning is calculated between years 2007 and 2009. Next in Table 1.10 results are presented using equation (1.1).

Table 1.10: Churning of trade based on six digit code HS6

| Time | Number of periods T | export | import | Churning | w/o Ch 1-29 |
|---|---|---|---|---|---|
| 2007/2009 | 2.0 | 0.204 | 0.320 | 0.524 | 0.330 |

Source: CBBH and author's own calculation

It was found that BH Churning of trade is 0.524 based on HS6 classification (table 1.10). It can be seen that BH Churning of trade is higher than that from Table 1.9 based on the same HS6 classification.

It is also interesting to see how changes in export and imports are contributing to overall churning of trade, so those are calculated separately. Again more disaggregated commodities groups offer different results for trade structure churning (see tables above on export and import churning). Comparing those calculations it was found that HS6 is offering different findings regarding the contribution from exports and imports to overall change in a trade structure. According to the later calculation BH imports contribute more to overall churning (Table 1.9), while looking at Tables 1.7 and 1.8, it is noticeable that exports have a higher contribution to overall churning. These findings suggest using the most disaggregated data available in order to find from where these changes in trade change are coming.

Based on BH data, trade structure churning is coming from both exports and imports, but imports have a higher weight in the most disaggregated classification. In order to see where these changes are coming from further improvements have been undertaken with regards to the chapters selected for calculation. Trade structure churning was calculated separately for chapters 1-25, 26-29 and 30-98. These findings are reported next.

Table 1.11: Churning of trade for different chapter selection based on HS6 classification

| Chapters | Year 2007/2008 | | Year 2007/2009 | |
|---|---|---|---|---|
| | export | import | export | import |
| Contribution of first 25 chapters | 0.013 | 0.017 | 0.020 | 0.032 |
| Contribution of chapters 26 through 29 | 0.018 | 0.092 | 0.042 | 0.101 |
| Contribution of chapters 30 through 98 | 0.146 | 0.159 | 0.142 | 0.188 |
| All chapters (1 through 98) | 0.177 | 0.268 | 0.204 | 0.320 |

Source: CBBH and author's own calculation

Based on Table 1.11 it is noticeable that even when churning of trade is calculated within different groups of chapters the contribution of the first 25 chapters is almost identical and very small. Hence the first 25 chapters do not make a big difference, while the next group of chapters - 26 to 29 - do. The group of chapters 30 through 98 had the highest observed contribution but this group also contains the highest number of chapters. The highest observed weighted contribution is therefore from chapters 26 through 29 and it is coming from the import side. These chapters refer to: Ores, slag and ash; Mineral fuels; Inorganic chemicals and Organic chemicals. These commodity groups are difficult to switch in and out off, but it is important that these be identified as the main contributors to churning of BH trade composition. In the previous section tables 1.4 and 1.5 suggested that mineral products is the one of the commodity groups that contributes the most to the trade deficit widening, hence it is not surprising to find chapter 27 to be among those which contribute the most to churning of BH trade composition.

Looking at more aggregated data, it was found that out of 1254 subheadings (HS4 classification) just 14 subheadings (commodity groups) explained 45.1% of overall BH exports in 2008 and 29 subheadings explained 40.2% of its overall imports in 2008. While in 2009, only 9 subheadings explained 34.5% of overall BH exports and 15 subheadings explained 27.8% of overall BH imports. The main selection criteria for the analysis were subheading value (export or import) that was higher then 50 million of EUROS (or 1/10 of average monthly imports).

Next the focus is on commodities that BH traded the most by running an initial analysis of its international trade based on trade data availability. The initial analysis of international trade has been conducted based on trade data which covers the period from 2006 to 2009. This particular time-frame is due to data availability for commodity groups based on detailed HS statistics. In this analysis 4,500 commodity groups were assessed based on the monthly data statistics obtained from the Indirect Tax Agency data base. Trade analysis refers to the commodities that BH traded the most and the key finding is that fifteen commodity groups largely determine the behaviour of the trade deficit.

### 1.4.3 Bosnia and Herzegovina's Exports

The export analysis for 2009 was based on the selection of the top fifteen commodity groups based on ten-digit HS statistics. It was found that the export value of each selected commodity was more than KM 26 million (Table 1.12) in 2009, while in 2006 it was more than KM 52 million per commodity group (Table A1.1, Appendix 1.1) and more than KM 58 million per commodity group in 2007 (Table A1.2, Appendix 1.1). Those fifteen commodities explain 38% of total exports during 2009; 36% during 2008; 40% during 2007 and 43% during 2006. This suggests a low diversification of BH exports. The analysis showed that out of 38% of total exports in 2009, BH exports to its twenty main trade partners 31% of its goods. Compared to 2008, there was an overall decrease of 11.2% in the value of the exports of the top 15 commodity groups.

In 2009 in the face of the global financial crisis, exports recorded a negative growth rate of about -18%. In the majority of the fifteen selected commodity groups (Table 1.12) five countries account for more than 81% of total BH exports in 2009, these five countries are geographically the nearest to BH. It was also noticed that the majority of selected commodity groups are inputs intended for industrial production. Overall, the low diversification of BH exports and the lack of any systematic analysis of the potential for further export specialisation and likely destination markets remain obstacles to the future growth of BH's exports.

## Table 1.12: Structure of BH commodity export with main trading partners in 2009

| HS code | Commodity | Total value of export | Top five BH export destinations | | | | | | | | | | Coverage of top five export countries | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Exports HS10 | | all countries | 1 | | 2 | | 3 | | 4 | | 5 | | 2009 | 2008 | 2007 | 2006 |
| 7601201000 | Aluminum Alloys | 264,611,302.32 | Croatia | 39.7% | Austria | 18.5% | Italy | 14.2% | Hungary | 8.0% | Frnace | 6.0% | 86.5% | 99.9% | 96.6% | 92.8% |
| 2716000000 | Electrical Energy | 456,366,528.95 | Croatia | 34.8% | Switzerland | 16.5% | Monte Negro | 10.0% | Czech. R. | 4.6% | Hungary | 3.1% | 68.9% | 94.0% | 80.7% | 99.2% |
| 8409990000 | Parts of Compression-ignition Internal Combustion Piston Engines | 131,848,110.88 | Slovenia | 69.2% | Germany | 22.5% | Croatia | 7.6% | Serbia | 0.3% | Monte Negro | 0.1% | 99.6% | 99.7% | 99.8% | 99.7% |
| 2704001900 | Coke, Semi-coke of Coal, of Lignite, of Peat; Retort Carbon | 120,856,487.88 | Serbia | 56.5% | Turkey | 3.1% | Italy | 1.0% | UK | 0.8% | Croatia | 0.5% | 61.9% | 92.5% | 72.5% | 71.4% |
| 9401908000 | Parts of Seats Other than Dentists' | 231,564,059.00 | Germany | 82.6% | Czech. R. | 1.5% | Hungary | 0.8% | Italy | 0.5% | Slovenia | 0.4% | 85.7% | 81.0% | 72.6% | 70.6% |
| 7214200000 | Concrete reinforcing bars and rods, Hot-rolled, Hot-drawn, Hot-extruded | 67,624,879.19 | Croatia | 33.6% | Serbia | 31.5% | Slovenia | 14.8% | Kosovo | 9.4% | Macedonia | 6.3% | 95.6% | 94.4% | 82.2% | 99.5% |
| 2818200000 | Other Aluminium Oxide | 68,059,138.16 | Monte Negro | 36.6% | Italy | 35.5% | Hungary | 4.3% | Poland | 2.9% | USA | 2.1% | 81.4% | 97.7% | 100.0% | 99.6% |
| 7213911000 | Bars and Rods Of circular cross section measuring less than 14 mm (0.55 inch) in diameter | 70,653,329.23 | Serbia | 56.4% | Kosovo | 18.4% | Monte Negro | 8.9% | Croatia | 6.8% | Macedonia | 3.8% | 94.3% | 96.7% | 90.8% | 95.8% |
| 7308909900 | Other Structures and Parts of Structures, of Iron or Steel | 85,421,246.93 | Croatia | 23.6% | Germany | 16.8% | Serbia | 9.0% | Monte Negro | 8.9% | Slovenia | 4.0% | 62.3% | 63.0% | 77.0% | 84.3% |
| 4407920000 | Of beech (Fagus spp) | 77,726,696.91 | Germany | 28.1% | Croatia | 24.5% | Italy | 13.0% | Slovenia | 8.4% | Austria | 5.6% | 79.5% | 80.5% | 68.9% | 75.6% |
| 9401610000 | Seats, With Wooden Frames, Upholstered | 100,543,131.61 | Austria | 39.6% | France | 17.8% | Serbia | 7.4% | Croatia | 6.8% | Germany | 5.4% | 77.0% | 81.4% | 75.2% | 87.0% |
| 4407109800 | Coniferous | 87,767,381.84 | Serbia | 34.5% | Croatia | 19.3% | Kosovo | 7.7% | Italy | 1.9% | Macedonia | 1.9% | 65.3% | 95.0% | 93.4% | 65.1% |
| 6406101100 | Uppers and Parts Thereof, Other than Stiffeners | 79,437,883.44 | Italy | 50.8% | Germany | 24.3% | Slovenia | 13.9% | Austria | 8.5% | Croatia | 0.9% | 98.3% | 97.8% | 97.7% | 96.1% |
| 2601110000 | Iron Ores and Concentrates (Non-agglomerated) | 26,160,102.16 | Czech. R | 48.9% | Poland | 32.7% | Romenia | 18.4% | France | 0.0% | Germany | 0.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 9403601000 | Other Wooden Furniture | 72,932,548.49 | Germany | 29.3% | Croatia | 22.0% | France | 9.9% | Serbia | 8.5% | Monte Negro | 3.9% | 73.6% | 75.4% | 74.0% | 85.0% |

Source: Bosnia and Herzegovina Indirect Taxation Agency and author’s own calculation

### 1.4.4 Bosnia and Herzegovina's Imports

The import analysis refers to the commodities that BH imports the most and that also contribute to the trade deficit widening. The import analysis for 2009 (Table 1.13) was based on the selection of fifteen commodities based on six-digits HS statistic. It was found that each of these commodity groups, participated in the import value with more than KM 64 million per commodity group in 2009 (Table 1.13) and more than KM 94 million per commodity group in 2007 (Table A1.4, Appendix 1.1). Those fifteen commodities explain 21% of total imports during 2009 and 23% of total BH imports during 2007, this low percentage coverage suggests that BH's import are much more diversified than its exports. In 2009 a significant decrease in the total value of the top 15 imported commodities can be noticed, which resulted in a decrease in total imports of KM 755 million. Out of these fifteen commodity groups, only in two did BH have a surplus, while in the other thirteen BH recorded a deficit. The surplus commodity groups are electric energy and "other products" as a component of the "compression-ignition internal combustion piston engines" group.

## Table 1.13: Structure of Bosnia and Herzegovina's commodity imports from its main trading partners in 2009

| HS code Imports HS06 | Commodity | Total value of imports | Top five BH import countries | | | | | | | | | | Coverage of top five import countries | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1 | | 2 | | 3 | | 4 | | 5 | | 2009 | 2008 | 2007 | 2006 |
| 271019 | Other oils | 819,429,068.53 | Croatia | 59.6% | Slovenia | 15.6% | Hungary | 7.1% | Austira | 6.1% | Serbia | 5.3% | 93.7% | 89.7% | 92.3% | 93.7% |
| 271011 | Petroleum Oils, Oils Obtained from Bituminous Minerals | 287,924,748.32 | Croatia | 64.6% | Slovenia | 14.9% | Hungary | 10.9% | Serbia | 4.9% | Italy | 1.2% | 96.4% | 99.6% | 99.2% | 98.6% |
| 870332 | Other Vehicles, Spark-ignition Engine Of a cylinder capacity exceeding 1,500 cc but not exceeding 2,500 cc | 172,137,206.25 | Germany | 40.2% | Czech. R | 16.2% | Italy | 7.9% | Slovenia | 4.9% | Austira | 4.3% | 73.4% | 71.0% | 72.0% | 69.7% |
| 271600 | Electrical Energy | 96,029,481.29 | Croatia | 74.2% | Serbia | 20.3% | Switzerlan | 1.6% | Czech. R | 0.4% | Slovenia | 0.1% | 96.5% | 75.6% | 73.1% | 99.7% |
| 270112 | Bituminous Coal | 107,333,086.76 | Czech. R | 44.1% | UK | 31.6% | USA | 21.1% | Croatia | 0.4% | 0.00 | n/a | 97.2% | 60.6% | 98.4% | 97.6% |
| 840999 | Parts of Compression-ignition Internal Combustion Piston Engines | 186,605,998.55 | Germany | 97.6% | Serbia | 0.6% | Croatia | 0.4% | Italy | 0.3% | Switzerland | 0.3% | 99.2% | 97.9% | 98.5% | 99.0% |
| 281820 | Other Aluminium Oxide | 121,038,639.26 | Switzerland | 99.6% | Germany | 0.4% | Italy | 0.0% | Slovenia | 0.0% | Holland | 0.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 100190 | Seed, White, Other | 82,866,088.71 | Hungary | 62.8% | Croatia | 26.1% | Serbia | 10.8% | Switzerland | 0.2% | n/a | 0.0% | 99.9% | 99.2% | 99.5% | 99.9% |
| 300490 | Other Medicaments | 128,778,712.76 | Slovenia | 21.3% | Croatia | 17.0% | Serbia | 16.8% | Switzerland | 6.3% | Germany | 5.2% | 66.6% | 79.0% | 76.6% | 68.5% |
| 271121 | Natural Gas | 129,999,527.56 | Russia | 100.0% | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | 100.0% | 100.0% | 100.0% | 100.0% |
| 720449 | Other Ferrous Waste and Scrap | 63,839,010.41 | Serbia | 29.4% | Croatia | 26.1% | Romania | 12.9% | Germany | 8.3% | Macedonia | 7.9% | 84.5% | 99.5% | 90.4% | 96.6% |
| 240220 | Cigarettes (Containing Tobacco) | 105,345,930.99 | Croatia | 65.3% | Switzerlan | 13.6% | Germany | 7.8% | Austira | 5.1% | Macedonia | 3.1% | 95.0% | 93.2% | 94.8% | 95.3% |
| 220300 | Beer Made from Malt | 100,551,016.65 | Serbia | 50.3% | Croatia | 42.7% | Slovenia | 6.8% | Austira | 0.1% | Holland | 0.1% | 99.9% | 99.9% | 98.4% | 99.7% |
| 841490 | Parts of Air or Vacuum Pumps | 79,146,326.06 | Austira | 45.3% | Germany | 23.8% | Slovenia | 11.9% | Hungary | 2.7% | Croatia | 1.6% | 85.3% | 79.6% | 87.4% | 95.8% |
| 210690 | Other Food Preparations | 69,279,249.81 | Slovenia | 27.9% | Croatia | 26.9% | Germany | 6.8% | Hungary | 5.5% | Italy | 5.2% | 72.3% | 77.3% | 76.1% | 72.0% |

Source: Bosnia and Herzegovina Indirect Taxation Agency and author's own calculation

### 1.4.5 Bosnia and Herzegovina's export and import trade partners and commodity groups

Looking at BH's main import and exports, the main trading partners are the geographically nearest countries: Croatia, Serbia, Italy and Slovenia (Table 1.14 and Table 1.15).

Table 1.14: Bosnia and Herzegovina's exports: main trading partners

| Partner countries: | 2003_export | 2004_export | 2005_export | 2006_export | 2007_export | 2008_export | 2009_export |
|---|---|---|---|---|---|---|---|
| Croatia | 3.8% | 5.0% | 5.2% | 5.8% | 5.5% | 5.0% | 5.3% |
| Serbia and MN | 3.6% | 3.7% | 3.9% | 4.1% | 4.7% | 4.1% | 4.1% |
| Germany | 2.7% | 2.2% | 2.9% | 4.0% | 3.8% | 4.0% | 4.5% |
| Italy | 3.2% | 4.1% | 3.3% | 4.3% | 3.9% | 3.7% | 3.9% |
| Slovenia | 2.3% | 2.1% | 2.4% | 3.8% | 3.3% | 2.7% | 2.6% |
| Austria | 0.8% | 1.1% | 1.1% | 1.9% | 1.9% | 1.8% | 1.8% |
| Hungary | 0.1% | 0.2% | 1.0% | 1.0% | 1.1% | 0.9% | 0.5% |
| China | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| Turkey | 0.1% | 0.1% | 0.2% | 0.1% | 0.1% | 0.1% | 0.3% |
| USA | 0.2% | 0.2% | 0.9% | 1.1% | 0.8% | 0.6% | 0.1% |
| Russian Federation | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.1% | 0.1% |
| France | 0.2% | 0.4% | 0.4% | 0.5% | 0.5% | 0.4% | 0.6% |
| Romania | 0.0% | 0.0% | 0.3% | 0.4% | 0.3% | 0.4% | 0.3% |
| Poland | 0.1% | 0.1% | 0.4% | 0.6% | 0.3% | 0.3% | 0.3% |
| Czech Rep. | 0.1% | 0.1% | 0.2% | 0.3% | 0.3% | 0.3% | 0.4% |
| Switzerland | 2.1% | 0.9% | 0.3% | 0.6% | 0.6% | 0.8% | 0.6% |
| Holland | 0.1% | 0.2% | 0.2% | 0.3% | 0.3% | 0.3% | 0.3% |
| UK | 0.7% | 0.3% | 0.5% | 0.1% | 0.1% | 0.3% | 0.2% |
| Macedonia | 0.2% | 0.2% | 0.2% | 0.2% | 0.2% | 0.3% | 0.3% |
| Lithuania | 0.1% | 0.9% | 0.4% | 0.0% | 0.0% | 0.0% | 0.1% |

Source: Bosnia and Herzegovina Agency for Statistics and author's own calculation

Table 1.15: Bosnia and Herzegovina's imports: main trading partners

| Partner countries: | 2003_import | 2004_import | 2005_import | 2006_import | 2007_import | 2008_import | 2009_import |
|---|---|---|---|---|---|---|---|
| Croatia | 13.6% | 13.5% | 12.6% | 11.8% | 12.3% | 12.1% | 10.4% |
| Serbia and MN | 6.2% | 7.8% | 7.6% | 6.7% | 7.2% | 7.5% | 7.2% |
| Germany | 9.5% | 9.1% | 10.7% | 8.6% | 8.8% | 8.3% | 7.8% |
| Italy | 8.0% | 7.0% | 6.7% | 6.2% | 6.3% | 6.6% | 6.9% |
| Slovenia | 7.3% | 5.9% | 5.2% | 5.2% | 4.5% | 4.2% | 4.2% |
| Austria | 3.4% | 3.3% | 3.3% | 2.8% | 2.7% | 2.6% | 2.5% |
| Hungary | 4.8% | 3.4% | 2.7% | 2.4% | 2.4% | 3.1% | 2.2% |
| China | 1.2% | 1.8% | 2.5% | 2.4% | 3.0% | 3.3% | 3.1% |
| Turkey | 1.6% | 1.7% | 2.1% | 1.9% | 4.1% | 3.8% | 2.1% |
| USA | 1.0% | 1.0% | 1.4% | 1.3% | 1.5% | 2.3% | 1.8% |
| Russian Federation | 1.1% | 1.8% | 2.2% | 1.5% | 1.4% | 1.5% | 4.8% |
| France | 1.5% | 1.5% | 1.7% | 1.3% | 1.5% | 1.5% | 1.4% |
| Romania | 0.5% | 0.6% | 1.6% | 2.1% | 0.6% | 0.6% | 0.6% |
| Poland | 1.8% | 1.4% | 1.5% | 0.8% | 0.9% | 0.9% | 1.4% |
| Czech Rep. | 1.7% | 1.6% | 1.5% | 1.9% | 1.5% | 1.3% | 1.4% |
| Switzerland | 1.3% | 1.3% | 1.2% | 1.6% | 1.5% | 0.9% | 0.5% |
| Holland | 0.9% | 0.9% | 0.8% | 0.7% | 0.7% | 0.8% | 0.7% |
| UK | 0.5% | 0.5% | 0.5% | 0.4% | 0.4% | 0.5% | 0.5% |
| Macedonia | 0.4% | 0.5% | 0.6% | 0.7% | 0.7% | 0.7% | 0.7% |
| Lithuania | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |

Source: Bosnia and Herzegovina Agency for Statistics and author's own calculation

BH's export/import coverage index is presented in Table 1.16, this expresses the trade balance in terms of a ratio of its components rather than a difference, by eliminating the units of measurement it makes comparisons across countries easier. In Table 1.16 the overall coverage is increasing, though some deterioration of coverage is present in 2007 and 2008. A significant trade deficit can be noticed with China, Turkey, the Czech Republic and the Russian Federation, while Romania, and Switzerland, are countries where the attainment of an export/import balance has achieved the greatest progress in recent years (Table 1.16).

Table 1.16: Export/Import coverage index

| Trade partners | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|
| Croatia | 28.08% | 37.33% | 41.10% | 49.58% | 44.51% | 41.61% | 50.94% |
| Serbia and MN | 58.22% | 47.11% | 51.80% | 61.08% | 64.47% | 54.58% | 57.82% |
| Germany | 28.71% | 24.37% | 26.72% | 47.19% | 43.73% | 47.71% | 58.30% |
| Italy | 39.99% | 57.90% | 49.60% | 69.91% | 62.03% | 55.43% | 56.55% |
| Slovenia | 32.25% | 36.02% | 46.82% | 73.15% | 72.96% | 63.83% | 61.03% |
| Austria | 22.74% | 34.32% | 33.48% | 68.79% | 68.96% | 68.49% | 71.60% |
| Hungary | 2.32% | 5.52% | 34.82% | 41.83% | 45.81% | 28.33% | 22.86% |
| China | 0.17% | 0.04% | 0.48% | 0.05% | 0.11% | 0.30% | 0.74% |
| Turkey | 7.05% | 8.36% | 7.48% | 3.62% | 3.11% | 2.38% | 14.14% |
| USA | 16.11% | 21.51% | 60.91% | 83.89% | 50.62% | 27.59% | 6.67% |
| Russian Federation | 1.00% | 0.42% | 1.52% | 2.90% | 2.73% | 4.35% | 2.97% |
| France | 15.05% | 27.43% | 25.31% | 40.94% | 31.77% | 28.38% | 43.38% |
| Romania | 1.20% | 6.19% | 19.17% | 19.25% | 47.23% | 63.59% | 52.30% |
| Poland | 4.69% | 6.53% | 27.69% | 65.50% | 40.97% | 28.91% | 20.22% |
| Czech Rep. | 4.67% | 4.33% | 15.94% | 18.71% | 19.73% | 25.29% | 28.95% |
| Switzerland | 164.50% | 65.67% | 27.48% | 35.31% | 37.53% | 90.84% | 123.36% |
| Holland | 12.59% | 18.76% | 28.45% | 37.94% | 40.10% | 41.72% | 46.33% |
| UK | 133.83% | 58.65% | 87.58% | 23.60% | 26.36% | 59.46% | 31.09% |
| Macedonia | 45.63% | 46.33% | 38.46% | 36.49% | 35.15% | 43.77% | 47.72% |
| Lithuania | 228.68% | 3775.45% | 3389.10% | 236.68% | 293.15% | 72.39% | 1155.59% |
| Total exchange: | 86.70% | 86.13% | 90.59% | 89.50% | 89.82% | 88.35% | 87.16% |
| Export: | 21.83% | 23.25% | 25.29% | 31.20% | 29.93% | 29.18% | 30.93% |
| Import: | 78.17% | 76.75% | 74.71% | 68.80% | 70.07% | 70.82% | 69.07% |
| Coverage | 27.92% | 30.29% | 33.84% | 45.35% | 42.71% | 41.19% | 44.79% |

Source: CBBH customs data and author's own calculation

Furthermore, analysis has permitted the identification of a few commodity groups that caused the trade deficit to shrink in 2009: mineral products (mainly other oils), machinery and mechanical appliances and means of transportation (vehicles not railway or tramway), which are exactly the same commodity groups as in 2008, except that in 2008 these commodity groups contribute to a widening of the BH trade deficit. It is interesting to notice that the same commodity groups in all years prior to 2009 also caused the trade deficit to widen but its significant reduction has been achieved only in 2009 as a result of activation of a domestic production of oil in Bosanski Brod and at the same time it could also reflect the denomination of oil prices in US dollars and slowdown of overall economic activity in BH. With further assessment of the less detailed analytical structure of HS2[8] statistics during 2009 it can be noticed (Table 1.17 and Table 1.18) that the main import commodities are also the main contributors to the trade deficit in 2009.

Table 1.17: Total exports and exports commodity contribution to export growth

| **HS commodity group (in 000 KM)** | **2005** | **2006** | **2007** | **2008** | **2009** |
|---|---|---|---|---|---|
| **Total** | **3,783.3** | **5,164.3** | **5,936.6** | **6,711.7** | **5,530.4** |
| Animals & animal products | 35.4 | 43.4 | 57.3 | 77.5 | 90.8 |
| Vegetable products | 43.3 | 49.7 | 57.3 | 64.9 | 83.7 |
| Animal or vegetable fats | 24.3 | 22.6 | 37.2 | 47.5 | 44.3 |
| Prepared foodstuff | 120.2 | 143.0 | 173.1 | 220.1 | 233.9 |
| Mineral products | 503.1 | 607.2 | 658.3 | 808.5 | 861.7 |
| Chemical products | 286.5 | 345.2 | 324.1 | 429.7 | 333.5 |
| Plastic and rubber | 61.9 | 104.8 | 137.7 | 138.6 | 116.3 |
| Hides & skins | 69.6 | 112.3 | 114.6 | 114.2 | 66.2 |
| Wood & wood products | 376.6 | 462.5 | 527.4 | 495.0 | 393.6 |
| Wood & pulp products | 78.2 | 94.2 | 113.8 | 144.0 | 156.8 |
| Textile & textile articles | 157.6 | 254.7 | 281.3 | 332.0 | 323.5 |
| Footwear, headwear | 119.9 | 299.0 | 349.5 | 369.0 | 345.9 |
| Articles of stone, plaster, cement, asbestos | 30.7 | 46.7 | 73.9 | 74.3 | 73.0 |
| Pearls, precious metals and articles thereof, prec. or semi-prec. stones | 0.5 | 1.7 | 2.5 | 1.1 | 1.8 |
| Base metals & articles thereof | 947.0 | 1,389.1 | 1,643.4 | 1,798.6 | 1,047.2 |
| Machinery & mechanical appliances | 544.0 | 643.2 | 763.1 | 793.5 | 618.8 |
| Transportation equipment | 92.6 | 99.2 | 108.8 | 208.7 | 139.9 |
| Instruments   measuring, musical | 18.7 | 15.4 | 16.9 | 21.6 | 21.9 |
| Arms and ammunition; parts and accessories thereof | 35.6 | 28.1 | 37.1 | 42.0 | 40.5 |
| Miscellaneous | 231.4 | 400.5 | 458.2 | 530.1 | 536.8 |
| Works of art, collectors' pieces and antiques | 1.5 | 0.9 | 0.9 | 0.1 | 0.2 |
| Unclassified | 4.7 | 0.8 | 0.2 | 0.4 | 0.0 |
| **HS commodity group (% contribution to growth in exports)** | | **2006** | **2007** | **2008** | **2009** |
| **Total** | | **36.5%** | **15.0%** | **13.1%** | **-17.6%** |
| Animals & animal products | | 0% | 0% | 0% | 0% |
| Vegetable products | | 0% | 0% | 0% | 0% |
| Animal or vegetable fats | | 0% | 0% | 0% | 0% |
| Prepared foodstuff | | 1% | 1% | 1% | 0% |

[8] Data available since 2003

| | | | | |
|---|---|---|---|---|
| Mineral products | 3% | 1% | 3% | 1% |
| Chemical products | 2% | 0% | 2% | -1% |
| Plastic and rubber | 1% | 1% | 0% | 0% |
| Hides & skins | 1% | 0% | 0% | -1% |
| Wood & wood products | 2% | 1% | -1% | -2% |
| Wood & pulp products | 0% | 0% | 1% | 0% |
| Textile & textile articles | 3% | 1% | 1% | 0% |
| Footwear, headwear | 5% | 1% | 0% | 0% |
| Articles of stone, plaster, cement, asbestos | 0% | 1% | 0% | 0% |
| Pearls, precious metals and articles thereof, prec. or semi-prec. stones | 0% | 0% | 0% | 0% |
| Base metals & articles thereof | 12% | 5% | 3% | -11% |
| Machinery & mechanical appliances | 3% | 2% | 1% | -3% |
| Transportation equipment | 0% | 0% | 2% | -1% |
| Instruments measuring, musical | 0% | 0% | 0% | 0% |
| Arms and ammunition; parts and accessories thereof | 0% | 0% | 0% | 0% |
| Miscellaneous | 4% | 1% | 1% | 0% |
| Works of art, collectors' pieces and antiques | 0% | 0% | 0% | 0% |
| Unclassified | 0% | 0% | 0% | 0% |

Source: Bosnia and Herzegovina Agency for Statistics and author’s own calculation

Table 1.18: Total imports and imports commodity contribution to import growth

| HS commodity group (in 000 KM) | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|
| **Total** | **11,178.5** | **11,388.8** | **13,898.2** | **16,292.5** | **12,348.5** |
| Animals & animal products | 300.4 | 236.2 | 266.4 | 378.4 | 375.4 |
| Vegetable products | 490.0 | 468.5 | 606.2 | 704.2 | 526.0 |
| Animal or vegetable fats | 96.8 | 91.1 | 97.1 | 126.4 | 111.3 |
| Prepared foodstuff | 1,094.5 | 1,149.2 | 1,269.4 | 1,411.1 | 1,376.4 |
| Mineral products | 1,585.5 | 1,882.1 | 2,072.6 | 2,836.9 | 1,997.2 |
| Chemical products | 1,037.5 | 1,062.6 | 1,241.9 | 1,395.2 | 1,260.7 |
| Plastic and rubber | 518.3 | 539.3 | 682.8 | 777.8 | 648.1 |
| Hides & skins | 147.9 | 241.3 | 235.6 | 240.2 | 199.7 |
| Wood & wood products | 124.5 | 121.5 | 175.7 | 209.9 | 150.4 |
| Wood & pulp products | 321.8 | 319.3 | 359.2 | 387.5 | 355.9 |
| Textile & textile articles | 574.6 | 604.3 | 681.3 | 737.7 | 664.6 |
| Footwear, headwear | 178.6 | 189.7 | 221.3 | 235.4 | 212.7 |
| Articles of stone, plaster, cement, asbestos | 319.2 | 290.4 | 373.5 | 379.4 | 285.1 |
| Pearls, precious metals and articles thereof, prec. or semi-prec. stones | 6.2 | 7.9 | 11.6 | 13.9 | 11.1 |
| Base metals & articles thereof | 1,068.8 | 1,187.3 | 1,694.8 | 1,974.4 | 1,074.8 |
| Machinery & mechanical appliances | 1,980.8 | 1,816.4 | 2,345.4 | 2,610.8 | 1,838.3 |
| Transportation equipment | 911.4 | 801.4 | 1,055.4 | 1,275.6 | 804.4 |
| Instruments measuring, musical | 157.1 | 139.1 | 178.2 | 237.1 | 182.3 |

| | | | | | |
|---|---|---|---|---|---|
| Arms and ammunition; parts and accessories thereof | 6.4 | 4.3 | 5.7 | 7.3 | 5.3 |
| Miscellaneous | 236.0 | 234.2 | 322.0 | 351.6 | 268.1 |
| Works of art, collectors' pieces and antiques | 0.8 | 0.4 | 1.1 | 0.9 | 0.4 |
| Unclassified | 21.5 | 2.6 | 1.2 | 0.5 | 0.2 |
| **HS commodity group (% contribution to growth in imports)** | | **2006** | **2007** | **2008** | **2009** |
| **Total** | | **1.9%** | **22.0%** | **17.2%** | **-24.2%** |
| Animals & animal products | | -1% | 0% | 1% | 0% |
| Vegetable products | | 0% | 1% | 1% | -1% |
| Animal or vegetable fats | | 0% | 0% | 0% | 0% |
| Prepared foodstuff | | 0% | 1% | 1% | 0% |
| Mineral products | | 3% | 2% | 5% | -5% |
| Chemical products | | 0% | 2% | 1% | -1% |
| Plastic and rubber | | 0% | 1% | 1% | -1% |
| Hides & skins | | 1% | 0% | 0% | 0% |
| Wood & wood products | | 0% | 0% | 0% | 0% |
| Wood & pulp products | | 0% | 0% | 0% | 0% |
| Textile & textile articles | | 0% | 1% | 0% | 0% |
| Footwear, headwear | | 0% | 0% | 0% | 0% |
| Articles of stone, plaster, cement, asbestos | | 0% | 1% | 0% | -1% |
| Pearls, precious metals and articles thereof, prec. or semi-prec. stones | | 0% | 0% | 0% | 0% |
| Base metals & articles thereof | | 1% | 4% | 2% | -6% |
| Machinery & mechanical appliances | | -1% | 5% | 2% | -5% |
| Transportation equipment | | -1% | 2% | 2% | -3% |
| Instruments measuring, musical | | 0% | 0% | 0% | 0% |
| Arms and ammunition; parts and accessories thereof | | 0% | 0% | 0% | 0% |
| Miscellaneous | | 0% | 1% | 0% | -1% |
| Works of art, collectors' pieces and antiques | | 0% | 0% | 0% | 0% |
| Unclassified | | 0% | 0% | 0% | 0% |

Source: Bosnia and Herzegovina Agency for Statistics and author’s own calculation

Out of twenty two classification groups available in the HS2 statistics (looking at the difference between these classifications groups in Tables 1.17 and 1.18) there are only four commodity groups where a trade surplus was achieved in 2009. Those groups are: wood and wood products (KM243 million); footwear (KM 133 million); arms and ammunition (KM 35 million); and miscellaneous products (KM 269 million).

It seems that one of the main problems for Bosnia and Herzegovina's trade competitiveness arises from its low diversity of export goods, which are composed mostly of raw materials like wood and mineral products. In these commodities it is not apparent that BH has a clear competitive advantage. Although the current income elasticity for demand of these products maybe relatively high it would be unwise to base a policy for the current account sustainability on the further expansion of these commodities. More generally there has been no systematic analysis of the prospects for future export growth in the BH. What is needed is a detailed product analysis based upon ECB (2005) which assesses the export specialisation of a country in terms of its destination markets. It assesses whether it is directed towards increasing penetration in rapidly growing exports market destinations. The general idea behind this product and market effect analysis is that the product and geographical structure of a country's exports can affect its total export growth. The absence of BH trade competitiveness analysis actually could be an additional obstacle for BH trade improvement and also a barrier to BH trade deficit reduction. Moreover the World Bank (2002) has shown that the quality of domestic institutions is positively correlated with export diversification, yet it can be argued that the decision to diversify is actually made by the private sector individual firms. Intuitively the reason why BH has a low diversification of export could be in weak institutions.

### 1.5 The organization of the remainder of the thesis

Significant overall economic progress is evident in BH, but a full analysis of current account sustainability is still missing. Currently the CBBH conducts a current account analysis in its regular Yearly Report, but only in the form of current account deficit financing. This is not sufficient in order for BH to know whether there is a threat to its external sustainability and to assess whether its policy is consistent with the EU convergence criteria. Thus, a framework for medium-term analysis is currently missing for BH. Moody's (2008) stress that large current account deficits have seriously raised macroeconomic stress across emerging European economies. Hence the large current account deficit could be an important economic problem that Bosnia and Herzegovina is facing. An analysis of the current account is necessary to see if the country is likely to be able to handle the external and internal shocks that could arise, including reduced capital inflows. In addition, the current account deficit can suddenly change.

This research will: refine the concept of sustainable current account deficits particularly in demonstrating that a stationary condition could be used to check if a current account can be considered as sustainable; provide an empirical analysis of the sustainability of the persistent trade deficits in Bosnia and Herzegovina; and derive policy proposals to promote the achievement of internal and external balance whilst enabling rapid economic development in the Western Balkans. It is now explained how the following chapters are organised to achieve these objectives.

The analysis presented in Chapter 2 critically reviews the economic theory of current account sustainability. This chapter develops the theoretical framework for this research programme. This chapter will explain why defining sustainability is important and what sustainability of current account deficit means for BH in the context of its development and accession to the EU. The concept of sustainability will be related to the long-run external equilibrium position of a country.

Chapter 3 provides a discussion of current account sustainability in the context of transition. This chapter will establish the importance of analysing whether a current account deficit matters for the sustainability of an economy. The Maastricht criteria will be presented within this chapter and the importance of achieving nominal and macroeconomic convergence with the EU will be discussed. Furthermore the common structural factors are evaluated to determine the ability to sustain current account deficits (i.e. economic growth, openness, financial structure, political stability etc.), and to assess the external sector vulnerability indicators of the IMF. This analysis is then extended through estimation of the current account convergence to a long-run steady state,

In Chapter 4 an empirical model of BH's current account sustainability is developed. This chapter will examine recent fundamental changes in the BH economy. Whether these changes pose a threat to BH's current account sustainability will be examined by applying a fundamental equilibrium exchange rate framework. The long-run external equilibrium position of a country will be affected by real exchange rate changes, as opposed to changes in the nominal exchange rate (Edwards, 1989). When the equilibrium value of the real exchange rate is derived it is possible to determine if the actual real exchange rate is overvalued or undervalued. This chapter will explore this approach by estimating the equilibrium exchange rate for Bosnia and Herzegovina and assessing whether changes in the equilibrium exchange rate are affecting the current account in BH by calculating real exchange rate misalignment.

Chapter 5 examines the trade deficit issue in Bosnia and Herzegovina through focusing on trade connections within Central European Free Trade Agreement countries. The theoretical foundations of economic integration through free trade agreements will be evaluated. Free trade zones like CEFTA are becoming a potentially important stage for Western Balkan preparation for EU integration, thus the relevance of regional trade integration and its importance is critically assessed for the Balkans' future economic development. In terms of deficit sustainability in Western Balkan countries, free trade agreements may be an important part of achieving a smooth transition to the EU. The impact of intra-European trade agreements on the Western Balkans are of particular importance for regional trade integration. Trade agreements typically have a positive effect on trade growth (Herderschee et al., 2007) and hence affect the nature and sustainability of current account deficits in the Western Balkans. Thus Chapter 5 will also provide an investigation of previous findings on the impact of trade agreements on trade flows. Then, in Chapter 6, an empirical analysis for BH's trade potential will be carried out.

Chapter 6, will develop an approach to gravity modelling to best estimate the effect of the new CEFTA on Bosnia and Herzegovina's trade flows and to calculate the trade potential of Bosnia and Herzegovina. Some modification to the work of Bussiere et al. (2005) and Caporale et al. (2008) is undertaken to make this model more relevant for Western Balkan countries. The intention is to develop three key areas in this chapter. The first is the estimation of the effects of the CEFTA using gravity equations; the second is calculation of Bosnia and Herzegovina's trade potential; and the third is a discussion of the effects of CEFTA on trade deficit sustainability in BH.

In Chapter 7 based upon the findings of the previous analyses policy proposals for Bosnia and Herzegovina will be developed. To anticipate, a policy of export-led growth could be particularly relevant for BH, given BH's opening of the traded goods sectors with the intention of boosting regional integration and developing productive capacity to enhance economic growth.

In summary, this thesis will introduce, apply and, wherever possible, quantitatively assess the concepts of sustainability, nominal and macroeconomic convergence, competitiveness, internal and external balance, free trade agreements, export-led growth and, based on the above findings, develop policy proposal for BH.

# Chapter 2: Economic theory and current account sustainability



## 2.1 Introduction

The discussion in Chapter 1 was organised around an examination of macroeconomic trends in BH. This led into a more detailed analysis of BH's macroeconomic imbalances. The trade imbalance was identified as being relatively high throughout the whole observed period, and in 2008 the trade deficit was around 35% of GDP. High and persistent trade deficits are seen as a possible threat to the country's current account sustainability. In this chapter the theoretical issue of the meaning of the term "sustainability" is discussed and, in particular, the concept of "current account sustainability". The importance of knowing what sustainable means is discussed throughout the chapter in order to develop an operational definition of sustainable current account.

Section 2.2 starts with a discussion of the meaning of sustainability and stresses the importance of defining what sustainability means in order to practice it. Section 2.3 discusses in more detail the connection between sustainability and the current account.

Here, a current account definition is provided and the intertemporal approach introduced as the dominant approach in the literature that examines whether a current account deficit is sustainable. This section will also introduce the role of the current account as an important measure of macroeconomic performance. Furthermore, the importance of assessing the sustainability of the current account is discussed with respect to a persistent current account deficit, excessive imbalances and countries' solvency.

In the final section of this chapter, 2.4, this research further extends the analysis of current account sustainability by investigating the connection between current account sustainability and the exchange rate, since much research has substantiated that real exchange rate shifts are responsible for changes in the current account. Here the concept of the fundamental equilibrium exchange rate is introduced, an approach well-known in the literature that examines exchange rate misalignment. Since this research interest is focussed on the connection between current account sustainability and the exchange rate, this chapter further extends the analysis of the fundamental equilibrium exchange rate in the context of the relationship between the balance of payments and the exchange rate. This chapter ends with a proposal for an operational definition of current account sustainability and section 2.5 provides a brief concluding section.

## 2.2 The meaning of sustainability

A concern for the future is a factor that motivates many who make frequent use of the word "sustainable" (Bartlett 1998:3). Another aspect of sustainability is the ability to adjust to shocks. Sustainability and words like sustainable development, sustainable current account, sustainable agriculture or sustainable industry are very often used by different institutions and in many economic articles, papers or books (UN, 1987; Isard et al., 2001; FED, 2005). During the 1980s sustainability was primarily utilised as an ecologically based-concept in the World Conservation Strategy, with the aim to ensure the sustainable utilisation of species and ecosystems, but it was very quickly transformed into a more comprehensive socio-economic approach (Lutteken and Hagedorn, 1998).

Sustainability as a concept seems to be very broad and it lacks a uniform definition. Bartlett (1998) argues that the concept should cover an unspecified long period of time, for him sustainability provides comfort and reassurance. In contrast, Schaller (1993) argues that: "As a destination, sustainability is like truth and justice – concepts not readily captured in concise definitions." Whereas Kidd (1992) argues that there cannot be a single definition of sustainability since why should any single definition be more logical and productive compared to any other definitions. Though, it can be argued that one might be more useful than another. Hence, there is disagreement in the meaning and understanding of the term sustainability. It can be argued that this uncertainty over the meaning of sustainability has not reduced the popularity of the concept. The resulting flexibility of the concept may be even self-reinforcing.

In recent work there is frequent reference to two types of sustainability, strong and weak, and they depend upon the costs incurred in attaining them (Common and Perrings, 1992; Rennings and Wiggering, 1997). Strong sustainability equates to what some call ecological sustainability with the focus primarily on the environment, while weak sustainability equates to a sort of economic sustainability with the emphasis on allocation of resources and levels of consumption. Thus, ecologists and economists have a different focus with respect to the meaning of sustainability. Most ecologists have a passion for the natural world, where limits to growth are apparent and exceeding those limits has its consequences (Holdren et al., 1995). While economics, in the context of sustainability, is more about the material goods and services used in daily lives, which can replace or duplicate natural capital, starting from basic necessities to the luxury goods that make life more enjoyable.

Hence sustainability seems to be a very broad concept that concerns the economy, environment and society, where for example: the economy refers to jobs and wealth; the environment refers to nature's resources; and society to health, education and freedom. Therefore it is not surprising that an agreed definition of sustainability is still missing. After all, defining sustainability is not an easy task and it seems to be usually author's own vision of what sustainable means. In the literature the most often cited definition of sustainability (Turner, 1997; Abrahamson, 1997; Lutteken and Hagedorn, 1998; Bartlett, 1998; Plowright and Marshall, 2004; Kemp and Martens, 2007) is the one created by the UN's Brundtland Commission Report in 1987[9] that refers to sustainable development[10]. It can be argued that this definition of sustainability introduces the concept of sustainability and increases the importance of focussing on improvement. Abrahamson (1997) argues that the idea of sustainable development is to have a qualitative concept that will incorporate ideas about improvement and progress that will incorporate cultural, social and economic dimensions. Moreover, Bartlett (1998) is expanding the interpretation of sustainable development further by arguing that it represents the ability for future improvement where demographic developments need to be in harmony with the changing productive potential of the economic system.

Furthermore, Carranza (2002) stresses that sustainability depends on the macroeconomic environment. Hence it can be argued that in order to achieve this harmony between demographic developments and changing productive potential of the economy, there is a need to take into consideration the macroeconomic policy stance (monetary and exchange rate policy, fiscal policy). Hence in the attempt to define sustainability, the macroeconomic policy stance should be also incorporated. The question of whether sustainability can be achieved or not can be answered only if there is an agreement what the term means. If it cannot be defined what sustainable means, then how to know what to try to get and how? Thus it is important to define what sustainable is or might be, in order to practice it, after all how can something be targeted unless it is not known what it means?

Since this research is concerned with a sustainable current account, the focus is on interpreting sustainability in terms of the current account. However, assessment of the sustainable current account first requires arriving at an appropriate working definition of

[9] One of the main reasons why the Commission was established was to produce a report on the environment to the year 2000 and beyond, including proposed strategies for sustainable development. "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development 1987:54).

[10] The idea of sustainable development or sustainability was an attempt to link the environment with development and the Report indicated that sustainability cannot be achieved if the problem of poverty is not successfully addressed globally.

sustainability. Roubini and Wachtel (1998) developed an operational definition of sustainability, arguing that if there are no exogenous shocks, and the macroeconomic conditions are unchanged, then it can be argued that current account deficit is sustainable as long as no external sector crises occurs (i.e. an exchange-rate crises or a foreign-debt crises). This interpretation of current account sustainability seems to lack a time profile of the current account position and therefore is difficult to make operational. This definition indicates that the issue of the current account sustainability can only be assessed after a crisis has happened. However, what needs also to be understood are the conditions that may trigger crises, so there is a need to define the term ‘crisis’ and how changes in the current account either attenuate or amplify the probability of a crisis. Within this framework a large empirical literature (Krugman, 1979; Kaminski, Lizondo and Rinhart, 1997; IMF, 1998b) has been devoted to identify the policy variables that are highly correlated with external crises. Since the focus is on the transition economies of the Western Balkans, and particularly Bosnia and Herzegovina, an assessment of the behaviour of structural factors, like external, monetary and financial indicators, could provide a good leading indicator of the possibility of future crises occurring.

Furthermore in evaluating macroeconomic imbalances in transition economies, current account deficits are particularly important since large current account deficits can bring sudden reversals in capital inflows and sharp changes in exchange rates (IMF, 1998b). Notwithstanding the movements to more flexible exchange rates and increased capital mobility, orthodox economic textbooks frequently still present the current account of the balance of payment as an important variable for policymakers and a tool for future external imbalances risk assessment (IMF, 2002). Traditional analysis therefore suggests that the existence of a current account deficit means that whether an economy’s performance and/or current policy mix are potentially unsustainable should be investigated. It is necessary that both the meaning and quantitative assessment of current account sustainability should be explored and in the next section the connection between sustainability and the current account will be investigated further.

### 2.3 Sustainability and the current account

The current account definition is discussed first. In the IMF's balance of payments textbook the current account represents the sum of goods and services, income and current transfers of a country with the rest of the world (IMF, 1996). Therefore, the balance of the current account can be positive or negative. A nation has a current account deficit if the sum of its net exports, net foreign income and current transfers is negative (Kaupartisas, 2005). A negative balance in the current account means that the country's imports have exceeded its exports and its net inwards transfers. Transfers are generally a small fraction of the total flows, but they present an important part of the current account in the Western Balkan economies. A current account deficit means that a country is buying from foreigners more than it sells to them and this difference has to be financed somehow. So asking if current account deficits are sustainable is the same question as asking whether or not the actual and potential sources of finance are sustainable. This is where the notion of sustainability enters into the analysis in the form of the ability to pay. Financing is thus usually obtained by borrowing, and therefore foreign debt increasing, or by running down its previously accumulated foreign wealth, which are all reflected in the capital account balance. The capital account balance has two main accounts: capital and financial. The capital account is related to the purchase and sale of assets, and the financial account to making and repaying loans and changes in currency holdings. These changes are all reflected in the financial account items of: net foreign direct investments; portfolio investments; and other investments (i.e. bank loans, bank deposits); as well as in international reserves for the transactions that involve a government entity (IMF, 1996). Therefore, the balance in the capital account can also be positive or negative, where positive is an indication of a capital account surplus and negative of a deficit.

Generally in macroeconomic textbooks, the difference between national income and domestic residents spending[11] is identified as equal to the current account (Krugman and Obstfeld, 2003). According to this framework, a current account deficit reflects the situation where a country uses more output then it currently produces. The Federal

[11] Domestic residents' spending is the sum of consumption, investment and government spending and this sum is often referred as domestic 'absorption'.

Reserve Bank of Chicago (2005) indicates that the size of a current account deficit reflects the amount by which a country's gross domestic expenditure exceeds its income from all sources, domestic and foreign. While Millesi-Ferretti and Razin (1996) stress that a current account deficit represents a positive increment to the stock of the external liabilities of the economy. Hence, special attention should therefore be dedicated to the analysis of persistent current account deficits, excessive imbalances and a country's solvency. These issues are discussed in the following sections.

### 2.3.1 Persistent current account deficits

Persistent current account deficits above 5% of GDP have generally been considered unsustainable in the long run, especially when the deficit is financed with short-term debt and decreases in foreign reserves (Milesi-Ferretti and Razin, 1996, Carranza 2002). To illustrate the context the data provided in Table 2.1 show recent current account deficits as a percentage of GDP for a group of advanced economies and in Table 2.2 for the Western Balkans.

Table 2.1: Current account as percentage of GDP for selected advanced economies

| Year | Australia | Austria | Greece | Italy | Japan | Spain | United Kingdom | United States |
|---|---|---|---|---|---|---|---|---|
| 1980 | -2.82 | -5.15 | -4.12 | -3.68 | -1.00 | -2.36 | 0.75 | 0.08 |
| 1981 | -4.52 | -3.81 | -4.87 | -3.69 | 0.40 | -2.57 | 1.89 | 0.16 |
| 1982 | -4.56 | 0.82 | -3.66 | -2.48 | 0.62 | -2.45 | 0.80 | -0.17 |
| 1983 | -3.56 | 0.17 | -4.02 | 0.32 | 1.73 | -1.46 | 0.41 | -1.09 |
| 1984 | -4.58 | -0.36 | -4.69 | -0.95 | 2.75 | 1.24 | -0.39 | -2.40 |
| 1985 | -5.32 | -0.22 | -7.26 | -1.27 | 3.75 | 1.18 | -0.16 | -2.80 |
| 1986 | -5.52 | -0.03 | -3.16 | 0.45 | 4.26 | 1.50 | -0.93 | -3.30 |
| 1987 | -3.77 | n/a | -1.98 | -0.37 | 3.45 | -0.01 | -1.73 | -3.39 |
| 1988 | -4.24 | -0.18 | -1.33 | -0.94 | 2.67 | -1.01 | -4.12 | -2.38 |
| 1989 | -5.92 | 0.19 | -3.44 | -1.68 | 2.13 | -2.87 | -4.86 | -1.82 |
| 1990 | -5.10 | 0.71 | -3.84 | -1.91 | 1.44 | -3.47 | -3.78 | -1.36 |
| 1991 | -3.41 | 0.04 | -1.58 | -2.50 | 1.96 | -3.58 | -1.77 | 0.05 |
| 1992 | -3.51 | -0.35 | -1.95 | -2.68 | 2.96 | -3.49 | -2.09 | -0.79 |
| 1993 | -3.12 | -0.76 | -0.73 | 1.16 | 3.03 | -1.07 | -1.91 | -1.27 |
| 1994 | -4.82 | -1.63 | -0.13 | 1.32 | 2.73 | -1.24 | -0.98 | -1.72 |
| 1995 | -5.19 | -2.86 | -2.22 | 2.06 | 2.12 | -0.31 | -1.24 | -1.53 |
| 1996 | -3.70 | -2.84 | -3.34 | 3.19 | 1.42 | -0.23 | -0.81 | -1.59 |
| 1997 | -2.86 | -2.43 | -3.65 | 2.83 | 2.27 | -0.09 | -0.12 | -1.69 |
| 1998 | -4.78 | -1.60 | -2.75 | 1.62 | 3.09 | -1.18 | -0.36 | -2.43 |
| 1999 | -5.33 | -1.63 | -5.29 | 0.68 | 2.62 | -2.93 | -2.35 | -3.21 |
| 2000 | -3.81 | -0.74 | -7.70 | -0.53 | 2.56 | -3.96 | -2.64 | -4.20 |
| 2001 | -1.96 | -0.82 | -7.17 | -0.06 | 2.14 | -3.94 | -2.07 | -3.87 |
| 2002 | -3.74 | 2.68 | -6.48 | -0.78 | 2.87 | -3.26 | -1.74 | -4.31 |
| 2003 | -5.35 | 1.70 | -6.61 | -1.30 | 3.22 | -3.51 | -1.61 | -4.68 |
| 2004 | -6.07 | 2.08 | -5.83 | -0.94 | 3.74 | -5.25 | -2.07 | -5.32 |
| 2005 | -5.77 | 2.02 | -7.26 | -1.65 | 3.64 | -7.36 | -2.62 | -5.92 |
| 2006 | -5.32 | 2.83 | -11.10 | -2.59 | 3.91 | -8.97 | -3.31 | -6.00 |
| 2007 | -6.30 | 3.11 | -14.20 | -2.42 | 4.82 | -10.01 | -2.70 | -5.16 |
| 2008 | -4.60 | 3.48 | -14.42 | -3.41 | 3.20 | -9.59 | -1.73 | -4.89 |
| 2009 | -3.25 | 2.11 | -9.98 | -2.51 | 1.92 | -6.03 | -2.04 | -2.59 |

Source: International Monetary Fund, *World Economic Outlook Database*, October 2009

From Table 2.1 it can be noticed that a majority of advanced economies run a persistent current account deficit, with the typical size of these deficits in the 80s and 90s being up to 5% of GDP, except for Australia, which recorded a larger deficit. After 2000 it can be seen that some countries, like Australia, Greece, Spain and USA started to register higher current account deficits. A somewhat different trend can be noticed by looking at the Table 2.2. First of all it can be seen that a lot of data is not available for the Western Balkan countries in the 80s and 90s. Second even in the 90s, for those countries for which data is available, the current account was generally well above 5% of GDP.

Table 2.2: Current account as percentage of GDP for Western Balkan Economies

| Year | Albania | BH | Croatia | Macedonia | Moldova | Serbia |
|---|---|---|---|---|---|---|
| 1980 | 0.06 | n/a | n/a | n/a | n/a | n/a |
| 1981 | -0.48 | n/a | n/a | n/a | n/a | n/a |
| 1982 | -2.40 | n/a | n/a | n/a | n/a | n/a |
| 1983 | -1.68 | n/a | n/a | n/a | n/a | n/a |
| 1984 | -1.40 | n/a | n/a | n/a | n/a | n/a |
| 1985 | -1.23 | n/a | n/a | n/a | n/a | n/a |
| 1986 | 0.06 | n/a | n/a | n/a | n/a | n/a |
| 1987 | 0.28 | n/a | n/a | n/a | n/a | n/a |
| 1988 | -1.05 | n/a | n/a | n/a | n/a | n/a |
| 1989 | -2.86 | n/a | n/a | n/a | n/a | n/a |
| 1990 | -4.58 | n/a | n/a | n/a | n/a | n/a |
| 1991 | -13.13 | n/a | n/a | 6.29 | n/a | n/a |
| 1992 | -8.69 | n/a | 2.62 | -0.40 | -4.51 | n/a |
| 1993 | 1.78 | n/a | 4.71 | -4.29 | -16.28 | n/a |
| 1994 | -3.94 | n/a | 4.07 | -9.01 | -8.43 | n/a |
| 1995 | -2.09 | n/a | -6.47 | -6.33 | -5.88 | n/a |
| 1996 | -5.68 | n/a | -4.22 | -7.50 | -11.32 | n/a |
| 1997 | -10.06 | n/a | -10.70 | -7.96 | -14.24 | n/a |
| 1998 | -3.26 | -5.74 | -5.83 | -8.67 | -19.74 | n/a |
| 1999 | 2.23 | -7.64 | -6.66 | -2.65 | -5.82 | n/a |
| 2000 | -3.68 | -6.95 | -2.50 | -1.88 | -8.41 | -1.77 |
| 2001 | -3.07 | -12.47 | -3.19 | -7.22 | -2.50 | -2.49 |
| 2002 | -7.15 | -17.77 | -7.28 | -9.43 | -1.52 | -8.26 |
| 2003 | -5.02 | -19.40 | -5.42 | -4.10 | -6.58 | -7.22 |
| 2004 | -3.99 | -16.34 | -4.61 | -8.39 | -1.81 | -12.11 |
| 2005 | -6.08 | -17.97 | -5.75 | -2.60 | -8.29 | -8.67 |
| 2006 | -5.58 | -8.35 | -6.70 | -0.88 | -11.28 | -10.09 |
| 2007 | -9.15 | -12.66 | -7.58 | -7.16 | -17.01 | -15.55 |
| 2008 | -14.06 | -14.68 | -9.37 | -13.09 | -17.72 | -17.27 |
| 2009 | -11.53 | -8.76 | -6.13 | -10.64 | -11.82 | -9.09 |

Source: International Monetary Fund, *World Economic Outlook Database*, October 2009

A starting point for the analysis of sustainability is to assess if a current account deficit really matters. “Deficits can be too small as well as too large, and you cannot even begin to tell what they are until you measure them right” (Eisner, 1992: 295). A current account deficit is not necessarily a harmful occurrence; some countries may want to run a current account deficit in order to generate surpluses in the future. Those countries may wish to borrow at the present time in order to develop their productive capacity to enhance future growth. It can be argued that current account deficit may not reflect the underlying strength of a developing economy, since a rapidly industrialising economy may temporarily suck in more imports of capital and technology. However, Roubini and

Wachtel (1998) argue that a current account deficit can reflect an unsustainable imbalance between national savings and domestic investment, as well as debt accumulation that cannot be serviced, or it can simply reflect a low level of national savings compared to the investment. It was argued that in Western Balkan economies there might be more investment opportunities than those countries can afford to undertake on their own, due to their low domestic savings, so their current account deficits are not surprising, though if persistent then they could affect sustainability. Based on the above it is also not easy to distinguish whether persistent current account deficits are a consequence of growth-inducing capital inflows, or a result of debt accumulation that cannot be sustained. Current account deficits may reflect the success of structural changes that have resulted in capital inflows and rapid economic growth, but also they could be a reflection of a transition process, which is not well managed (Roubini and Wachtel, 1998; Carranza, 2002). Therefore in the section 2.3.2 the issue of current account sustainability in transition economies is addressed.

### 2.3.2 Current account sustainability in transition economies

Roubini and Wachtel (1998) found that most of the transition economies experienced large current account deficits after the collapse of the Soviet planning system. They classify those deficits as temporary, since they were a result of a decline in domestic output, and were largely financed by international assistance and borrowing. The question of sustainability seems to have become important during the later stage of these countries transition in the later 1990s. At the beginning of transition, current account imbalances were associated with structural changes (i.e. reform policies that aim for positive real growth rates) and generally considered, since these effects were seen as temporary, as not worrying. Roubini and Wachtel (1998) stress that there is no simple rule that can determine whether a current account deficit is sustainable. However, they identified four issues that should cause concern in assessing current account imbalances in transition economies: an increasing size of the deficit relative to GDP; consumption booms and low national savings; significant real appreciation and a loss of competitiveness; and weak domestic banking and financial systems. These features are more fully discussed in Chapter 3.

### 2.3.3 The issue of current account sustainability and the intertemporal approach

To analyse if a current account deficit matters for the sustainability of an individual economy, it is important to examine a wide range of macroeconomic factors that may indicate whether the current account imbalances are sustainable. The dominant approach in the literature to this issue is the intertemporal approach (Sachs 1981; Obsfeld and Rogoff 1994; Milesi-Ferretti and Razin 1996; Carranza 2002) and it provides an important foundation for the analysis of current account sustainability. The intertemporal analysis of the current account is based on the proposition that current account balance is a consequence of forward-looking dynamic saving and investment decisions (Brissimis et al., 2010). Edwards (2004) argues that the intertemporal models of the current account incorporate domestic economic agents' efforts to smooth consumption over time. Therefore, the sustainable level of the current account depends on portfolio decisions of domestic and foreign investors. Intertemporal trade takes place when a country lends capital (runs a current account surplus) to another country in one period and then collects the capital back with interest (or runs a current account deficit) in a future period (Jiandog Ju and Shang-Jin Wei, 2007).

The intertemporal approach was developed in the early 1980s with the aim of incorporating all the relevant elements of a country's current account, particularly elements that influence saving and investment balances (Obsfeld and Rogoff, 1994). The important theoretical motivation for the development of the intertemporal approach was the Lucas critique (1976) based upon forward-looking decisions of economic agents. The Lucas critique led economists to incorporate into their models the assumption that people's decision rules change when there is a change in the way policy is conducted (Chari and Kehoe, 2006). Another very influential study was by Sachs (1981) who investigated the factors that determined the size and direction of the current account imbalances in the 1970s. He investigated connections between oil price increases and current account imbalances by identifying permanent and temporary shocks and characterised the optimal response to those shocks. Sachs explained that if a shock is permanent, oil-importing countries will face large relative price changes, corresponding changes in the terms of trade, and more borrowing and a higher current account deficit. Hence, such countries will explore alternative sources of energy and export potential in order to reduce the need for deficit financing. Thus, deficit will cause a reduction in countries' income and also their consumption.

### 2.3.4 The issue of a country's solvency and current account sustainability

An extension of the Sachs (1981) approach concentrates on intertemporal solvency (Milesi-Ferretti and Razin, 1996; IMF, 1998b; Carranza 2002). Sustainability is ensured if the resulting path of the trade balance is consistent with intertemporal solvency (IMF, 1998b). This approach is focused mainly on the determinants of a country's solvency in order to explain whether at some point in time the country's future surpluses will be greater than or equal to a country's current external indebtedness. It appears that the theoretical criteria for current account sustainability according to the intertemporal solvency condition is not particularly strict, since the intertemporal budget constraint of a country typically imposes only mild restrictions on the evolution of a countries current account deficit and foreign debt. Based on the above, a country is considered to be solvent as long as it does not increase its foreign debt at a rate faster than the real interest rate on that debt. Moreover, "a country could run a very large current account deficit for a long time and remain solvent as long as there are surpluses at some time in the future" (Roubini and Wachtel, 1998:4).

Carranza (2002) argues that the concept of current account sustainability can be made operational by assessing strict and less strict solvency conditions[12], where both conditions imply that the external debt must be repaid fully. The less strict solvency condition implies a constant debt to GDP ratio, where the growth rate of GDP has to be greater than real interest rate. A strict solvency condition implies that the higher the growth rate is in

[12] The derivation of the strict and less strict solvency condition can be found in Carranza (2002).

relation to the real interest rate, the smaller the primary surpluses necessary to repay the debt. Based on the above it was argued that a current account deficit can be seen as sustainable as long as the ratio of foreign debt to GDP is not increasing.

However, Milesi-Ferretti and Razin (1996) claim that the notion of solvency is not always the appropriate yardstick for evaluating the sustainability of external imbalances, arguing that willingness to pay and willingness to lend provides a better framework for understanding the variety of country experiences with protracted current account imbalances. This follows since governments can renegotiate debt contracts, debt forgiveness can occur (i.e. HIPC relief through the Paris Club), and the current account deficit can change. By arguing that "willingness to pay and willingness to lend" provides a better framework for evaluating the sustainability, Milesi-Ferretti and Razin (1996) actually question the sustainability of a country's current set of policies. "A policy reversal is needed when the continuation of the current policy stance violates the intertemporal solvency condition" (Carranza, 2002: 108). If an unchanged policy stance is going to lead to a shift that will reverse the trade balance position or cause a balance of payment crises i.e. an exchange rate collapse, then the current account position is assumed to be unsustainable (IMF 1998b). An evaluation of the current operational indicators[13] of sustainability will indicate if, and when, a policy change is needed. Carranza argues that: "Policy reversal can take the form of a sudden currency devaluation, or the tightening of monetary or fiscal policies or a combination of these, leading to a drastic contraction of domestic absorption and a sudden shift in the current account" (Carranza, 2002:109).

### 2.3.5 Defining sustainability

In an attempt to come closer to specifying an operational definition of sustainability, it was argued that the current account deficit can be seen as sustainable as long as there is

[13] Milesi-Ferretti and Razin (1996) developed a set of operational indicators of sustainability from a comprehensive analysis of the factors affecting current account sustainability like size of the export sector, debt service, level of savings, etc.

no adverse shock, either domestic or foreign, that will cause macroeconomic policy reversal over time. However, economies with under-developed financial sectors are more vulnerable to shocks that may require policy reversals (Prasad, 2007; Erasmus et al., 2009). In the light of recent events in global financial markets, financial crises can intensify the impact of shocks and lead economies with under-developed financial sectors, as well as those with developed financial markets, into recession. Thus investigation of financial sources of shocks could be an important part of assessing the sustainability of the current account.

In the 1990s several emerging economies were troubled by currency crises. In response, the IMF launched a major effort to improve its ability to assess how vulnerable countries are to financial crises. Emerging market economies are especially vulnerable to reversals in investors' sentiment (IMF, 2008b). Therefore vulnerability indicators (IMF, 2000; Kaminski, 2003), and their consistency with the operational indicators of sustainability should be investigated. Vulnerability indicators cover the government, household and corporate sectors and results from surveys of these sectors present an important element in balance of payments forecasts. This means that there are a number of different sources of information to be used in order to assess the future behaviour of the current account. Incorporating vulnerability and operational indicators could result in a set of structural factors that are important for an assessment of current account sustainability. Therefore to analyse if a current account deficit matters for sustainability of a particular economy, it should be important to examine whether a current account deficit is sustainable, given the structural factors (i.e. economic growth, openness, financial structure, political stability, etc.) of a specific economy and its current macroeconomic policy stance (i.e. its monetary and fiscal policies).

Governments use economic policies to respond to changes and also to promote changes in the economy. The IMF (1998b) argues that a current account imbalance could have implications for the exchange rate and that an inconsistent policy mix can also be a good indicator of the probability of an external crisis. It is often argued that excessively expansionary fiscal and monetary policy could lead to the loss of foreign reserves and force the authorities to abandon the current parity (Krugman, 1979). In fixed exchange rate regimes, if the resulting appreciation of the real exchange rate is a consequence of inconsistent monetary and fiscal policy, then the continuation of these policies will cause the current account deficit to persist. This may suggest that if this inconsistency continues over time the current account deficit will become unsustainable, either because the country has run down its foreign reserves or external borrowing is no longer available (Krugman, 1979; Kaminsky, Lizondo and Reinhart, 1997). Changes in the real exchange rate should be interpreted in the light of their fundamental causes. This suggests that policymakers concerned with designing the appropriate macroeconomic policy mix will have to be careful when dealing with exchange rate related problems. The real exchange rate is also an indicator which is mostly used to determine if there is a need for the exchange rate adjustment. Kaminsky, Lizondo and Reinhart (1997) found that most signals[14] of unsustainable current account imbalance occurred when the real exchange rate deviated from its trend. Carranza (2002:113) argues that "the choice of nominal anchor is critical to determining the ability of an economy to sustain current account deficits". Hence the level of the real exchange rate could be another important indicator of sustainability and examination of current account imbalance and the real exchange rate should be closely related. Therefore the next section investigates the connection between current account sustainability and the exchange rate in order to develop an operational definition of current account sustainability.

## 2.4 Current account sustainability and the exchange rate

The long-run external equilibrium position of a country (current account) will be affected by changes in the real exchange rate, as opposed to movements in the nominal exchange rate (Edwards, 1989). Many studies suggest that shifts in the real exchange rate are a source of changes in the current account (Dornbush, 1975; Edwards, 1989; IMF, 1998b;

[14] Kaminsky, Lizondo and Reinhart (1997) propose a specific early warning system that involves monitoring the evolution of several indicators that tend to exhibit unusual behaviour prior to a crisis. The variables that have the best track record in crisis anticipation in the context of a signal approach include: output; exports; deviation of real exchange rate from its trend; equity prices; and the ratio of broad money (M2) to foreign reserves.

Roudet et al., 2007; Abdih and Tsangarides, 2010). Montiel (2002) argues that the real exchange rate is an important part of the macroeconomic adjustment mechanism and when the economy is subjected to shocks, the real exchange rate will tend to change. Hence, the persistence of real exchange rate misalignment seems to put into question the sustainability of current account deficit. When the equilibrium value of the real exchange rate is derived it is possible to determine whether the actual current real exchange rate is overvalued or undervalued. Montiel (2002) stresses the importance of distinguishing between short-run and long-run equilibrium, since the difference between these two is often referred as exchange rate misalignment. The starting point therefore should be in determining whether the real exchange rate is misaligned. In the literature there is a consensus that persistent misalignments of the real exchange rate imply serious macroeconomic imbalances.

### 2.4.1 Exchange rate misalignment and equilibrium exchange rate

The idea of exchange rate misalignment is directly related to the concept of the equilibrium exchange rate. In order to assess whether the currency is misaligned, there is a need to have some equilibrium exchange rate with which to compare the actual rate. Montiel (2002) stresses that the nature of the equilibrium rate is not a trivial issue since any particular equilibrium may not necessarily be desirable. For him the real exchange rate is in equilibrium if there is no tendency for it to change given that fundamentals remain the same (Montiel, 2002). This may suggest that the equilibrium condition will have to depend on sustainable values of different policy variables that are changing gradually through time.

Many different approaches to calculating equilibrium exchange rates exist. Some of the most often applied approaches are: purchasing power parity[15] (PPP); the behavioural equilibrium exchange rate approach (BEER); and the external-internal balance approach (Rogoff, 1996; MacDonald, 2000; Akram et al., 2003; Abdih and Tsangarides, 2010). The choice among the different approaches depends on the specific question of interest,

[15] The name was coined in 1918 by the Swedish economist Gustav Cassel.

the definition of the exchange rate (i.e. nominal vs. real; bilateral vs. effective), modelling options and time horizon (i.e. short-run, medium-run to long-run). Purchasing power parity (PPP) is based on the proposition that domestic goods will generally cost the same as foreign goods if measured in a common currency and adjusted for international trade costs (Akram et al., 2003:32). This suggests that the terms of trade measured in terms of the real exchange rate will be in equilibrium at a certain level. Hence, along the lines of PPP theory, the real equilibrium exchange rate should be constant and equal to unity (Abdih and Tsangarides, 2010). Empirical work on testing PPP is generally not very supportive of the theory (e.g. Rogoff, 1996; MacDonald, 2000). These results are conventionally interpreted as reflecting the unrealistic assumptions of PPP, such as the law of one price holding for each good or factor price equalisation. There are several reasons why the price level may deviate from PPP, given transportation costs and trade barriers as well as the consumption basket differences across countries. This suggests that an alternative approach is needed.

The behavioural equilibrium exchange rate approach is based on underlying interest rate parity. In this approach the observed real exchange rate can be presented as a function of expected values of the real exchange rate and the current real interest rate differential. This approach captures movements in the real exchange rate, in the medium or long-run, by taking into account those macroeconomic variables that generate trend movements and long swings in the real exchange rate (Akram et al., 2003; Abdih and Tsangarides, 2010). Hence this approach produces estimates that incorporate both the long-run economic fundamentals and the short-run interest rate differential[16].

### 2.4.2 Fundamental Equilibrium Exchange Rate as the equilibrium exchange rate approach

The approach that defines the equilibrium real exchange rate as the simultaneous attainment of both internal and external balance is called the fundamental equilibrium

[16] This approach would be difficult to apply with Bosnia and Herzegovina data, due to limited availability of time-series data and especially those for interest rates (see: CBBH, Yearly Report 2007 for data availability).

exchange rate (FEER) approach (Williamson, 1994; Kemme and Roy, 2006; Roudet et al., 2007; Abdih and Tsangarides, 2010). The simultaneous attainment of external and internal equilibrium (Meade, 1951; Swan, 1963; Krueger, 1969; Edwards, 1989; Akram et al., 2003) is the most common used methods for the analysis of the relationship between the balance of payments and the exchange rate. According to Egert et al. (2006) internal equilibrium is typically defined as when an economy functions at full capacity output accompanied by low inflation, while external equilibrium is defined as when the balance of payments is in a sustainable position over the medium-term horizon. There is a need to acknowledge that there is some circularity in this approach. Wong (2002) argue that the real exchange rate reflects its underlying economic condition and macroeconomic policies. Based on our discussion in section 2.3, the current account also reflects the underlying economic condition and macroeconomic policies. Still the economic literature suggests that a current account deficit occurs if RER is overly appreciated. Hence, it can be argued that RER is determined by much the same list of "structural" determinants. In other words, not because the CA and RER influence each other but, rather, that both of them are jointly determined by the same (or, at least, similar) influences. Wong (2002) also argues that any excess in real domestic demand also affects internal and external balance. Hence an appropriate combination of RER and real domestic demand can ensure internal and external balance simultaneously. Hence in these simultaneous attainment models the internal balance is defined as full employment and external balance refers to a situation in which current account deficit is equal to the value of the sustainable capital inflow (Montiel, 2002). Based on discussion in sections 2.3.3 and 2.3.4 the problem is that there is no consensus on how to measure this. Section 2.3.4 provides a discussion on a less strict solvency condition, based on the proposition that the sustainable level of capital flows would be that which requires countries to maintain a constant debt to GDP ratio. This is estimated in Chapter 3. Wu (2000) and Lau and Baharumshah (2005) suggest that a stationary current account to GDP ratio is consistent with a finite external debt to GDP ratio and finding the ratio of current account to GDP to be stationary is consistent with less strict solvency condition. Kemme and Roy (2006) suggest that the long-run real equilibrium exchange rate may be specified as a function of the sustainable values of the macroeconomic fundamentals under condition of internal and external balance, which is based on the approach utilised by Edwards (1989, 1994). The difference is that this approach recognises that it is not possible to define external sustainability separate from achievement of internal sustainability. Thus, the equilibrium level of the real effective exchange rate can be measured as dependent on the sustainable values of a set of real exogenous and policy variables that affect real exchange rate directly or indirectly through so called long-run fundamentals (Montiel, 2002). The process of estimation of the equilibrium exchange rate has to involve a clear theoretical framework, some judgment and an appropriate empirical specification. The alternative internal-external balance approach is the desired equilibrium exchange rate approach (Driver and Westaway, 2004), which has the same theoretical assumption and time horizon as the fundamental equilibrium exchange rate, but an assumption of portfolio balance is added.

Measuring the real equilibrium exchange rate is difficult, because it is unobservable. The main advantages of the FEER approach are that it does not require too much data, the estimate can be easily computed and it is frequently applied in practice. The fundamental equilibrium exchange rate (FEER) approach is particularly appropriate in assessing whether a movement in the real effective exchange rate represents a misalignment or whether the equilibrium real effective exchange rate (EREER) itself has shifted because of changes in the economic fundamentals (Abdih and Tsangarides, 2010). To make this assessment, it is important to identify the fundamentals that are affecting the real exchange rate misalignments and to analyse them in order to see whether the real exchange rate is at its equilibrium level. To identify the fundamentals that are affecting macroeconomic imbalances is not an easy task. Egert et al. (2006) argue that researchers' use of different fundamentals may be a result of different theoretical frameworks or may simply reflect ad hoc choices. Williamson (1994) makes a comparison of the alternative approaches and concludes that the common fundamentals for equilibrium exchange rate estimation are terms of trade, tariffs and trade restrictions. In the light of the more recent work, additional common fundamentals for equilibrium exchange rate estimation are government consumption and foreign direct investments (Egert et al., 2006; Roudet et.al., 2007; Abdih and Tsangarides, 2010). Inclusion of these different fundamentals[17] means that long-term relationship between the real exchange rate and its fundamentals can in principle be established.

An influential work in this area is Edwards (1989). He developed a fully optimising model of the equilibrium real exchange rate in two periods (present and future) with perfect foresight in a three-good economy: exportables; importables; and nontradables. The three-good model is usually applied in order to assess the effects of terms of trade changes and trade policies on the internal real exchange rates for exportable and importable goods. In the model of Edwards (1989) the equilibrium real exchange rate (ERER) is a result of the simultaneous attainment of internal and external equilibrium. The model of Edwards is further discussed in Chapter 4.

The more recent model of Abdih and Tsangarides (2010) applies the fundamental equilibrium exchange rate by following Edwards (1989). The main reason why Abdih and Tsangarides (2010) applied their model is in order to assess whether changes in the fundamentals impact real effective exchange rates of the two CFA franc zone (Central and West Africa) countries with a fixed exchange rate regimes. They used their model to describe nominal misalignment by separating the factors that can permanently affect the long-run equilibrium real exchange rate and the short-run misalignment of the nominal exchange rate that result from policy variables. The model results in a long-run behaviour of equilibrium exchange rate that can be explained by fluctuations in terms of trade; government consumption; investment; openness and productivity; hence, the model fundamentals. The real effective exchange rate is found, for the period investigated, to be in line with the equilibrium exchange rate, thus misalignment seems to be statistically insignificant for both regions.

In order to employ the fundamental equilibrium exchange rate, two key issues have to be addressed. The first is what determines the potential output growth associated with low inflation and the second is the sustainability of the current account. In order to address the

[17] Egert et al. (2006: 302) survey the wide range of fundamentals used in this research.

first issues, Edwards (1989) suggests that the implicit idea of internal equilibrium is unemployment at its natural level (or NAIRU). From orthodox economic theory it is known that the natural level of unemployment is the rate at which inflation is stable. This suggests that the fundamental equilibrium exchange rate approach might not be entirely appropriate for a transition economy. Many transition economies are characterised by high unemployment, like Croatia and Poland, though for both countries the fundamental equilibrium exchange rate has been estimated. For example; Gattin-Turkalj (2005) estimate the fundamental equilibrium exchange rate for Croatia even though a high unemployment rate is evident in Croatia (National Bank of Croatia, Bulletin 2003). Gattin-Turkalj (2005) discuss various approaches to equilibrium exchange rate estimation (EER), but they do not provide any argument as to why FEER is the appropriate approach for the Croatian economy. This also raises the question of whether there is an appropriate equilibrium exchange rate approach for a transition economy? As Montiel (2002) stresses there is no widely agreed, reliable method for estimating the value of equilibrium exchange rate, but what is needed is to find a way how to make this concept operational for a transition economy in order to address real exchange rate misalignment. So an adequate balance has to be achieved through judgment while continuing to be guided by theory.

As indicated in the paragraph above, two key issues have to be addressed in order to employ the fundamental equilibrium exchange rate. The first is what determines the potential output growth associated with low inflation. With regards to potential output growth it can be argued that in the Western Balkans actual output might be close to potential output given transition induced obsolescence, hence a capital shortage may exist in that there is insufficient capital to employ the available labour force. Much of the capital that continues to exist physically cannot, to a greater or lesser extent, be used profitably at existing wage rates. Meaning that if a large part of the capital stock in transitional economies is obsolete, then there may not be sufficient capital stock to support additional profitable production at existing wage rates even after the initial transition recession. Here diminishing marginal returns to labour is assumed: if additional labour is added to the existing, then productivity is likely to fall below the prevailing wage rate. However, real wages are not falling to clear the labour market in these economies, because of the strong presence of the informal economy, which is setting the floor for wages in the formal economy. Thus the gap between actual and potential output in the transition economies of the WB could be very small, even if the economy registers high rates of unemployment. Hence, it can be hypothesised that without additional useful capital, an addition of one unit of labour may even lower productivity. Hence REER depreciates and the expected sign is negative. This possibility will be investigated in Chapter 4.

The second issue in implementing the fundamental equilibrium exchange rate is what determines current account sustainability. Below current account sustainability is addressed via the approach of intertemporal solvency (section 2.3.4)[18]. This requires that long-run capital flows be reliable. Hence by applying strict and less strict solvency conditions, a current account deficit can be seen as sustainable as long as the ratio of foreign debt to GDP is not increasing. Chapter 3 investigates further whether a current account deficit can be seen as sustainable through estimation of the current account convergence speed.

### 2.4.3 Empirical approaches to Fundamental Equlibrium Exchange Rate

There are some differences between the empirical approaches to fundamental equilibrium exchange rate that are important to address. The main difference is whether models utilise single equation or structural internal and external balance equations. Single equation models are usually employed when estimating equilibrium exchange rates for developing and transition economies. The advantage of this approach is that it overcomes the limited availability of time-series data which constrains the use of the Williamson (1994) methodology, based on large structural macro-econometric models. Structural equations are quite difficult to estimate for most transition economies due to limited availability of time-series data, as well as frequent structural breaks, which present an obstacle to constructing large macro-econometric models.

[18] Discussion on current account sustainability is provided in Section 2.2.

### 2.4.4 Equilibrium exchange rate and transition economies

From the theoretical point of view, equilibrium exchange rate analysis in the transition economies is problematic since equilibrium period identification is not an easy task (i.e. base year identification), and frequent productivity and other transition related shocks have an influence on the equilibrium real exchange rate. Also to measure the real equilibrium exchange rate is difficult, because it is not directly observable. As discussed earlier, shifts in the real exchange rate are considered important for changes in the current account. The starting point therefore should be to calculate and assess the real exchange rate.

First the concept of internal real exchange rate should be discussed, since it is used to assess the exchange rate within an economy (Gattin-Turkalj, 2005) and therefore is important for a country's development prospects. Kemmer and Roy (2006) define the internal exchange rate as the internal relative prices of producing and consuming traded goods at the cost of non-traded goods. Liargovas (1999) indicates that massive capital inflows and high inflation rates in transition economies could cause the real exchange rate to appreciate. He also argues that the growth of the traded goods sector compared to the non-traded goods sector is important for countries' economic development. Moreover, Kemmer and Roy (2006) signify the importance of the growth in the traded sector for the transition economies. Transition economies are opening their markets to the world's economies and thus experiencing a significant growth in the traded sector (Liargovas, 1999). Therefore, an analysis of the effects of fundamentals on the change in the real exchange rate in terms of traded and non-traded goods is recommended. For developing economies that aim to grow their traded goods sector relative to their non-traded goods sector, measurement of the real exchange rate is important, since irrespective of the nominal exchange rate regime, the real exchange rates always float, because they adjust through relative price changes (Gylfason, 2002). A major problem in the empirical utilisation of the internal real exchange rate is data availability, mainly on tradable and non-tradable goods. Since utilisation of the internal real exchange rate is problematic for

WB countries due to data availability, for many countries the domestic and foreign CPIs[19] will have to be used to estimate the real exchange rate. This causes a problem if the selection of the base year[20] for the real exchange rate calculation is not appropriate, meaning that in the selected base year the exchange rate was out of equilibrium.

Thus, when examining the determinants of the real exchange rate a starting point should be in the calculation of the real effective exchange rate (REER). When calculating the REER it is important to select the appropriate trading partners, calculate their participation in country foreign trade and to select an appropriate base year (BIS, 1993), and then a model based on the macroeconomic fundamental variables can be established. This approach is undertaken in Chapter 4.

Finally, in the process of establishing the fundamental equilibrium exchange rate the procedure will have to involve the process of identification of the fundamentals that are influencing changes in the real exchange rate. Therefore in order to operationalise the concept of current account sustainability, it is defined as the fundamental consistency of the identified structural factor fundamentals with the REER in a given time period. Structural factors are usually discussed in the context of their effect on the current account by applying descriptive analysis. According to the fundamental view a worsening of the current account is usually a response to underlying structural weaknesses and fundamental changes in the economy. The research reviewed in section 2.4 suggested that shifts in the real exchange rate are a source of changes in the current account. Hence based on the above it can be argued that if REER is in equilibrium and not changing, then the current account can be seen as sustainable. This means that REER is first defined and then calculated; then core fundamentals that could affect changes in the REER identified and then FEER (fundamental consistency of REER with its equilibrium level) is estimated. All this is necessary in order to assess whether, and if so how, changes in the

[19] The conventional definition of the real exchange rate is RER=ER*(CPI*/CPI), where CPI* stands for foreign consumer price index. ER is nominal exchange rate if expressed through direct quote where ER will be measured as KM/EURO and if expressed through indirect quote ER will be measured as EURO/KM. In this form RER is an index of price competitiveness.

[20] "In the base year the currency might have been undervalued, so that the subsequent real appreciation was to a certain extent a correction towards a less undervalued currency", (Liargoves, 1999:305).

fundamentals impact on the real effective exchange rate of BH. In estimating the FEER, the focus is to test whether a movement in the real exchange rate represents a misalignment or whether the equilibrium real exchange rate itself has shifted because of changes in the economic fundamentals. Detailed analysis of structural factors and macroeconomic policies will be critical in determining the ability of an economy to sustain current account deficits and to identify the fundamentals which is the focus of the analysis in the following chapters.

## 2.5 Conclusions

Chapter 2 provided a discussion on the theoretical issue of the meaning of the term "sustainability" and the concept of "current account sustainability". The literature suggests that a current account deficit can be sustained if the economy receives sufficient capital inflows. The review of the economic literature also led us to the conclusion that in order to determine the ability of an economy to sustain current account deficits it is important to identify the underlying structural factors causing the deficit. Several studies suggest that a change in the real exchange rate is an important indicator of sustainability. The long-run equilibrium position of a country's current account will be affected by changes in the real exchange rate. Hence in order to operationalise the concept of the current account sustainability, current account sustainability is defined as the fundamental consistency of the identified structural factor fundamentals with the REER in a given time period. A detailed analysis of structural factors and macroeconomic policies seems to be critical in determining the ability of a transition economy to sustain current account deficits and this analysis will be provided in Chapter 3.

# Chapter 3: Assessment of current account sustainability in the light of Western Balkans' EU accession with a focus on Bosnia and Herzegovina



## 3.1. Introduction

Chapter 2 explained how a current account deficit could become unsustainable. Section 3.2 investigates further whether a persistent current account imbalance could be seen as a threat to the economic integration of Bosnia and Hezegovina, and other Western Balkans countries, with the EU. EU membership can be seen from the perspective of the Western Balkans as a means towards greater political and economic stability. In turn, macroeconomic stability is a key matter of common concern for the EU member states, especially with respect to: price stability; sustainable balance of payments; sound fiscal policy (ECB, 2007). It can be argued that, based on the data presented in section 1.2, the Western Balkan countries will have to reach higher levels of nominal and real convergence before they can become EU member countries. The Maastricht criteria with their focus on nominal and macroeconomic convergence are important conditions that these countries will have to accomplish, but persistent current account deficits in Western Balkans raise questions about their external sustainability and competitiveness and, hence, the consistency of their policies with these convergence objectives. Chapter 2 assessed the economic theory of current account sustainability and concluded that in order to determine the ability of an economy to sustain current account deficits it is important to identify the underlying structural factors causing the deficit. Only then can it be assessed how these structural factors affect the REER. An analysis of these underlying structural factors will indicate whether REER and CA can be considered as jointly determined by similar influences. A detailed analysis of structural factors and macroeconomic policies seems to be critical in determining the ability of a transition economy to sustain current account deficits: such an analysis provides the focus of this chapter. Following this analysis in Chapter 4 a fundamental equilibrium exchange rate approach is applied. This will relate structural fundamentals to the REER in order to investigate whether fundamental changes in BH's economy could be seen as potential threats to its current account sustainability.

This chapter is organised as follows: section 3.2 starts with an examination of the Maastricht criteria; here is stressed the importance of nominal and macroeconomic convergence on the EU's levels for Bosnia and Herzegovina on its road toward membership. Section 3.3 evaluates the common structural factors determining the ability to sustain current account deficits (i.e. economic growth, openness, financial structure, political stability etc.), together with the external sector vulnerability indicators of the IMF. In the next section, the 3.4 analysis is extended through estimating current account convergence to a long-run steady state for: Bosnia and Herzegovina; for each of the other Western Balkan countries; and for the Western Balkan countries as a group. In estimating this the restriction that the current account deficit should be set at maximum of 5% of GDP, generally considered in the empirical literature to be the criteria for it to be sustainable, is not imposed. The conclusions of this chapter are presented in section 3.5

## 3.2 The Maastricht criteria as guidelines and constraints on macroeconomic policy in Bosnia and Herzegovina

The nominal and macroeconomic convergence of Western Balkan economies with the European Member States should lead the former countries toward economic and monetary integration with the European Union (EU). It can be argued that Bosnia and

Herzegovina's integration toward the EU began in June 1998, when the European Council approved the Declaration of Special Relations with Bosnia and Herzegovina and then, in May 1999, a Stabilisation and Association Process was initiated by the European Council (BH's Directorate for European Integration, 2007).

### 3.2.1 Nominal and macroeconomic convergence in Bosnia and Herzegovina

The path toward EU membership is composed of different stages, with progress to the next stage depending on the degree of convergence previously achieved. Anderton et al. (1991) defines convergence as the narrowing of international differences in the development of certain economic variables. He argues that a distinction between nominal and real convergence must be made, since nominal convergence refers to costs and prices, while real convergence refers to working conditions and living standards. It can be argued that the convergence progress of a transition economy towards full integration into the EU is evaluated by the European Commission based on a country's ability to achieve their nominal and real convergence goals.

There are several stages toward EU accession which can be identified: Feasibility study; Stabilisation and Association Agreement; Application for Membership; and Accession itself (Sorsa, 2006). By investigating the progress of countries based on the recent European Commission Quarterly Report (EC, 2010), it can be argued that countries from the Western Balkan group have achieved different degrees of progress. They have all finished the first stage and most are currently between the second and the third stage. The exception is Croatia which has almost finished its negotiations with the EU. Croatia is currently working toward closing all of the Chapters of the Acquis Communautaire[21] before it can end the negotiations and start the Accession itself.

Each country in the Western Balkans has a permanent, independent and professional body[22] with responsibility to harmonise activities and to oversee the implementation of

[21] The accumulated EU laws.

[22] In Bosnia and Herzegovina that professional body is called the "Directorate for European Integration" (DEI).

the decisions of its government to bring the country further along the EU integration process. At the Thessaloniki Summit in March 2004 the EC approved a Decision (EC No. 533/2004) on the establishment of a European Partnership in the framework of the Stabilisation and Association process for all the Western Balkan countries. It can be interpreted that the main role of the European partnership[23] is to identify the key priorities that each country has to implement (i.e. through reforms).

The convergence progress of a country also depends on its ability to implement political, legislative and economic reforms. Reforms are part of a contractual relation, the so called "Stabilisation and Association Agreement" (SAA)[24], which provides a country with potential candidate status (BH's Directorate for European Integration, 2007). The actual signing of the SAA therefore depends on the progress of a country. After the SAA is signed, the negotiation of the Acquis Communautaire Chapters starts. After all chapters are negotiated and closed, the final stage of accession starts.

Sorsa (2006) argues that in all the stages of EU accession macroeconomic stability seems to be a key criterion. According to her, during the early stages of the process the benchmarks are looser than those of the Maastricht criteria. This was evident from the previous experiences of Romania, Bulgaria and, currently, Croatia. Romania still has high rates of inflation and a current account imbalance, Bulgaria also has a current account imbalance, while Croatia has both a current account imbalance and a large fiscal deficit (actually the largest of all Western Balkan economies[25]). All three countries need to identify which specific policies they will implement in order to meet their nominal and macroeconomic convergence targets to accomplish the Maastricht criteria.

### 3.2.2 The Maastricht criteria and convergence

Based on the available data for Romania, Bulgaria and Croatia it seems that the accession process to the EU can start, and even end, when macroeconomic convergence has not

[23] Full text available on www.dei.gov.ba
[24] The second stage of accession toward EU membership.
[25] Data presented in section 1.2

been completely accomplished. This may be reasonable, since it takes time to implement the standards that the EU requires in the accession process and for the results of the implementation to be apparent. It can be argued that their favourable initial conditions made some Western Balkan economies achieve nominal and macroeconomic convergence with the EU more rapidly than other countries from the group. Bosnia and Herzegovina for example has made slow progress toward EU accession (Sorsa, 2006). This is not surprising since this country has the additional burden of a very complicated administrative organisation involving several layers of government (section 1.1, Chapter 1). This country has also recently experienced several transition phases (i.e. socialist country; war-peace and the restructuring of the economy).

As learned in Chapter 1, although the Western Balkan economies have made significant progress in recent years, establishing a policy framework that will foster sustained growth still requires more time and effort. Sorsa (2006) emphasises that the EU accession criteria are assumed to foster growth and income convergence largely by focusing on the establishment of a market economy. A concern is whether the pressure from the accession process to implement various reforms, with strong focus on the fiscal side, will result in "too early" an accession for Western Balkan countries, with some basic structural reforms remaining unfinished[26]. This could cause the Western Balkan countries problems in accomplishing the Maastricht criteria targets. However, Frankel and Rose (1998) and Warin, Wunnava and Janicki (2008) suggest that the optimum currency area criteria may be endogenous. They argue that adoption of a common currency will force these economies to become an optimum currency area through tighter international trade linkages with the other members of the Union and the adoption of a common monetary policy. Warin, Wunnava and Janicki (2008) suggest that a better allocation of capital would result from the use of the common currency. They use FDI flows as a proxy for the allocation of the capital and find that FDI flows double when countries join the EMU.

Meeting the Maastricht criteria with their focus on nominal and macroeconomic convergence is an important condition that countries will have to accomplish, but

[26] For example, a Fiscal Council was only established in BH in the second half of 2008.

persistent current account deficits in the Western Balkans raise questions about external sustainability, sustained competitiveness and the consistency of their policies with these convergence objectives. Misalignment of a real exchange rate with too high current account deficits in Western Balkan countries could cause an inability to meet these criteria. According to the fundamental view, as defined by Roubini and Wachtel (1998), a worsening of the current account is usually a response to underlying structural weaknesses and fundamental changes in the economy.

The Maastricht criteria rules are composed of *five* criteria (Anderton et al., 1991; Ancans, 2005; Sorsa, 2006; EC, 2007). The criteria rules are set as preconditions that have to be fulfilled for the two years period before a country's readiness to adopt the euro can be assessed. Hence the fulfilment of Maastricht criteria rules represents the final stage of EU accession. Yet those criteria can be interpreted based on the work of Buiter et al. (1992), Ancans (2005), Sorsa (2006) and European Commission (2007). One criterion is related to *inflation*, stating that inflation should not be more than 1.5 percentage points higher than the rate in the lowest three EU member states. The next two criteria are related to *fiscal issues:* requiring that the fiscal deficit should not exceed 3% of GDP and public debt should not exceed 60% of GDP. There is also one criterion that is related to the *interest rate*, stressing that the nominal long-term interest rate should be below the average rate of the three countries with the lowest inflation plus 2%. The final Maastricht criterion is related to the *exchange rate*, which states that countries should join the ERM2 and maintain stability over the central rate for two consecutive years under the European Monetary System band of +/- 15 percent.

The fundamental concern of the Maastricht criteria is with price stability. Given price stability the other monetary conditions are likely to be fulfilled: interest rate convergence via the uncovered interest parity condition; and exchange rate stability via the relative PPP relation. The fiscal criteria are included to support the fundamental aim of price stability by removing the temptation of a government to solve its fiscal problems by an inflation tax (seigniorage). In respect to the Maastricht criteria rules, it can be argued that the stability of the currency board in BH and the low levels of inflation that were evident in recent years (section 1.2), should make it easy for BH to transfer from its currency board arrangement into the ERM2[27], since adopting a peg regime to the euro enhances the credibility of domestic monetary policy and strengthens the links with the EU (Coricelli, 2002; Buiter and Grafe, 2003; Lipinska, 2008).

Afxentiou (2000: 248) argues that the Maastricht criteria are "simple rules" for price and fiscal stability, while Ravenna (2005) argues that the Maastricht criteria can serve as a sort of commitment that improves the credibility of the macroeconomic policies in the accession countries. In the context of the Maastricht criteria and the Western Balkan economies, the word "simple" is not necessarily an appropriate term, since it takes time to accomplish the Maastricht criteria. The criteria emphasise stability, but the achievement of stability is also not "simple" in the Western Balkans. The algorithm to achieve stability is not known. It seems to be a lengthy and on-going process for these countries and it is suggested to rather address the Maastricht criteria as "rules". The achievement of economic stability seems not to be simple, since all Western Balkan economies have persistent current account deficits above 5% of GDP. However, the Maastricht criteria do not explicitly mention any criteria for the current account, though a large and persistent current account imbalance could be seen as a threat to currency stability and, hence, price stability.

The combination of exchange rate targeting and a high degree of euroization in the Western Balkan economies suggest that monetary policy cannot be used as a central bank tool to deal with the external deficit. Given that the financial sector in these economies is not strong, their international reserves are insufficient to sustain the value of domestic currency and fiscal policy is not sound, this can put sustained pressure on the external balance[28]. Therefore, as discussed in Chapter 2, the threat that a current account deficit could become unsustainable exists (Kaminsky, Lizondo and Reinhart, 1997; IMF 1998b;

[27] The ERM2 (exchange rate mechanism) is based on the exchange rate arrangement framework between the Eurosystem and most other EU Member States that have not yet adopted the euro (European Central Bank, 1999).

[28] The on-going process of privatisation (i.e. oil industry and telecommunication) in BH could be seen as an indication that the country has still not finished its basic transition reforms, which could result in potentially volatile capital inflows or even large external shocks (Sorsa, 2006).

Carranza, 2002). The Maastricht criteria do require that inflation rates must be similar in all EU states. So the inability to converge on EU inflation rates might be a problem for the Western Balkans. These countries have inflation rates above the EU states, partly reflecting Balassa-Samuelson processes. Convergence of inflation to the EU's level is faster in the tradable sector than in the non-tradable sector and productivity growth in the tradable sector in transition economies is faster than in the non-tradable sector, though wage rate increases will tend to be the same (Roubini and Wachtel, 1998; Liargoves 1999; Egert et al., 2003; Kemme and Roy, 2006). Even if the candidate country maintains a fixed exchange rate with respect to the Euro, the Balassa-Samuelson process implies a higher inflation rate of non-tradables in transition economies and, hence, overall higher inflation rates (Pelkmans, Gros and Ferrer, 2000). It follows therefore that the adoption of the Maastricht inflation target may require Western Balkan countries to target a higher output gap, than would be the case in the absence of the Balassa-Samuleson effect.

A large and persistent current account imbalance could be seen as a threat to currency stability and, hence, price stability. In order to assess the macroeconomic weaknesses potentially arising from current account deficits in the Western Balkans' in section 3.3 research on external sector imbalances is critically assessed.

## 3.3 Limitations of the current approaches to current account sustainability

Research on external sector imbalances has identified different variables that impact on current account sustainability, like: economic growth; openness; financial structure; political stability, as suggested in Milesi-Ferretti and Razin (1996,1998), Krzak (1998), Roubini and Wachtel (1998), Carranza (2002) and Gutierrez (2006). These structural factors have been found to be important for the assessment of current account sustainability.

The review of the economic literature in Chapter 2 established that no simple theoretical rules exist that can help determine whether a current account is sustainable or not. This also led us to the conclusion that in order to determine the ability of an economy to sustain current account deficits it is important to identify the underlying structural factors causing the deficit (section 2.3.5) and then by applying a FEER approach assess whether CA can be considered as sustainable. Roubini and Wachtel (1998) conducted an analytical overview of recent trends in current account performance in transition economies. Their central question concerns prevailing trends in the current account deficit and if they could lead to currency crises. They argue that structural factor analysis seems to be relevant for transition economies. The discussion in Chapter 2 suggested that incorporating vulnerability and operational indicators could result in a set of structural factors that are important for an assessment of current account sustainability. It is next assessed whether those structural factors can be a cause of possible threats to current account sustainability by briefly introducing each of them.

### 3.3.1 Structural factors

The analysis presented in section 2.3.4 suggested that “willingness to lend and willingness to pay” (Milesi-Ferretti and Razin, 1996) analysis was a better framework for evaluating current account sustainability compared to only assessing a country’s solvency. Based on this framework, Milesi-Ferretti and Razin (1996) divided the external sector indicators into three groups: structural factor indicators; macroeconomic policy and political economy factors. All three groups seem to be important for external imbalances assessment. This section is going to focus on structural factors and how they are related to current account sustainability assessment. According to Milesi-Ferretti and Razin, the structural factor group constitutes: investment/savings; economic growth; openness; composition of external liabilities and financial structure. Carranza (2002) uses this same set of structural factors in order to stress the importance of considering those factors as highly correlated variables with external crises. He also introduces one new group of factors that “seems to be relevant”, the so-called “other factors”, which include: political instability, policy uncertainty, weak credibility and pessimistic market expectations.

Investment/savings

In the system of national accounts a current account deficit is the result of a difference between national savings and domestic investments (section 2.3.1). High levels of investment can be an indicator of countries' capacity building for future higher growth, while engaged in productivity "catch-up", and also an indicator of future increased creditworthiness for foreign investors. This indicator can be considered as a signal that a country is building its capacity for future debt repayments. Assessing saving rates is also important. If for example the saving rate constantly declines and domestic savings are insufficient to finance domestic investment, or are invested in unprofitable projects, then (other things being equal) the current account deficit would widen (Carranza, 2002). Roubini and Wachtel (1998) stress that there is a difference if widening occurs as a consequence of a fall in private saving compared to the fall in public savings. A fall in private savings could be a result of higher permanent income expectations due to higher future GDP growth expectations, in which case the saving rate would recover when future income increases. A fall in public savings is usually the result of a higher budget deficit (Blejer and Skreb, 1999) and high and persistent budget deficits could lead to an unsustainable build-up of foreign debt (Wyplosz, 2005). This would require financing and new borrowing. Therefore it can be argued that changes in the level of savings and investment are potentially important indicators of future changes in the current account deficit.

Economic growth

Krzak (1998) argues that a given current account deficit could be seen as less sustainable if the deficit is large relative to GDP. Ceteris paribus, a given current account deficit could be seen as more sustainable if future economic growth is expected to be high. Roubini and Wachtel (1998) indicate that current account deficits can reflect the success of structural changes that have resulted in net capital inflows and rapid economic growth. A current account deficit can also be a reflection of a transition process which is not well managed. Referring back to the discussion in Chapter 2, it can be argued that a current account deficit can be seen as sustainable as long as the ratio of foreign debt to GDP is not increasing over time.

Openness

Openness in the empirical literature is defined as the ratio of exports and imports to GDP (Kaminski et al., 1997; Krzak, 1998; Roubini and Wachtel, 1998; Carranza, 2002; Gutierrez, 2006). Carranza (2002) argues that this is a "determinant of sustainability". He stresses that more open economies can generally better cope with external shocks, though the size of the export sector may also be particularly relevant. It can be also argued that the degree of openness by itself could give a misleading signal of the extent to which an economy can cope with potential external shocks. What should be looked at is not only imports and exports as a ratio of GDP, but also what is likely to dominate in the future. This indicator could provide us with the opportunity to consider trends and whether external debt servicing is absorbing too large a part of export proceeds.

Composition of external liabilities

Carranza (2002) argues that net external liabilities[29] as a ratio of GDP is a natural indicator of current account sustainability. In assessing the net external liabilities it is important to distinguish which part of the external liabilities is related to debt and which to equity. In the case of a country's default, investors will probably have to cover a part of the foreign equity burden. Therefore everything else will have to be borne by the government. Hence an assessment of a country's debt maturity should be carefully conducted. This could be a signal of a possible threat to current account sustainability, especially if a country is under liquidity pressures. Crises in Thailand and in Mexico (1994-1995) were based on short-term borrowing to finance large current account deficits (IMF, 2002).

Financial structure

Krzak (1998) argues that a lack of confidence in the financial sector can restrain investors' willingness to finance a country's current account deficit. Hence that country's financing could become unsustainable. In assessing the financial structure the banking sector seems to be the focus point for the analysis (Kaminski et al., 1997). The quality

[29] The difference between the total external assets and total external liabilities indicates if a country is a net creditor or net debtor.

and extent of banking supervision seems to be of great importance in determining the degree of confidence in a country's financial structures. Though economists differ in their opinion as to whether this is made better or worse if the central bank can act as a lender of last resort (Milesi-Ferretti and Razin, 1996). Financial systems that have poor supervision and a weak deposit insurance scheme are more vulnerable to external shocks. These uncertainties could lead to a balance of payment crisis (Milesi-Ferretti and Razin, 1996; Kaminski et al., 1997; Krzak, 1998), i.e. through excess credit expansion.

Other factors

Political instability, policy uncertainty and market expectations may all cause uncertainty about the economic environment (Milesi-Ferretti and Razin, 1996; Krzak, 1998; Carranza, 2002). Market participants' behaviour is mainly determined by their anticipation of future events. Both political instability and uncertainty could lead to weak credibility of a government's policy announcements. A political regime which is not committed to sound macroeconomic policy may reduce investor's confidence in its ability to finance future current account deficits (Krzak 1998; Gutierrez, 2006).

Real exchange rate

The real exchange rate is not considered as a structural factor indicator in the studies reviewed above. The reason for its exclusion as a structural factor seems to be that it is determined by much the same list of "structural" determinants, or in other words not because the current account and the real exchange rate influence each other but, rather, that both of them are jointly determined by the same (or, at least, similar) influences. However, several of these studies suggested that a change in the real exchange rate is an important indicator of sustainability. Roubini and Wachtel (1998) introduce two views about the variability of exchange rates: the fundamental and misalignment views. According to the fundamental view, an appreciation of the real exchange rate is not necessarily a signal of misalignment and loss of competitiveness: it may represent an appreciation of the long-run equilibrium real exchange rate (Roubini and Wachtel, 1998). According to this view a worsening of the current account is usually a response to underlying structural weaknesses and fundamental changes in the economy. According to the misalignment view, a real exchange rate appreciation can cause a loss of competitiveness that worsens the current account balance.

This section has briefly assessed suggested structural indicators from previous analyses of current account sustainability in transition economies. They all applied a descriptive approach in their analysis and were unable to derive a clear empirical rationale for why a particular value of a structural indicator would indicate sustainability or not. Section 3.3.2 examines vulnerability indicators since a number of different sources of information seems to be useful in order to assess the future behaviour of the current account.

### 3.3.2 Vulnerability indicators

The IMF (2000) has contributed to the development of different groups of vulnerability indicators. These vulnerability indicators can be classified as: external vulnerability indicators; financial soundness indicators; and corporate sector indicators. The interest is in the external vulnerability indicators, since these have relevance to the assessment of external sector imbalances. This vulnerability indicators group is composed of *external and domestic debt indicators* and *reserve adequacy indicators*. These indicators are chosen as potentially important for assessment of a country's solvency.

The IMF's work on vulnerability indicators was motivated by the currency crisis in the 1990s (IMF, 2002). The research study of Kaminski, Lizondo and Reinhart (1997) on early warning systems can be seen as an early contributor to the establishment of the external vulnerability indicators group. These authors propose a specific early warning system that involves monitoring the evolution of several indicators that tend to exhibit unusual behaviour prior to a crisis. They find several variables that have the best track record in crisis anticipation. These variables are assessed in the context of a signal approach and they include: output; exports; deviation of the real exchange rate from its trend; equity prices; and the ratio of broad money (M2) to foreign reserves. These identified signal variables if combined together with structural factors from section 3.3.1

may be seen as useful for current account sustainability assessment. Yet it can be argued that this approach lacks a formal theoretical model and the choice of indicator seems to depend upon the subjective opinions of individual researchers.

External and domestic debt

The IMF (2000) argues that a large external debt has an impact on external vulnerability through influencing a country's ability to fulfil its debt obligations. The IMF (2000) does not explicitly connect external and domestic debt indicators with the sustainability of the current account deficit. However, the inability of a country to meet its debt obligations may result in solvency problems. Solvency problems are important since they can cause difficulties in financing current account deficits. De Grauwe (1989) provides a direct link between current account deficit and debt analysis. He argues that a current account deficit can be financed by issuing debt. If a debt burden exists then repayment of its principal is an obligation for the country. It can be argued that a country can issue new debt when old debt expires and even before the old debt expires. Therefore if these practices continue a country would eventually be obliged to pay interest indefinitely into the future. In order to secure its interest payments a country will have to run corresponding current account surpluses into the future (Grauwe, 1989; Carranza, 2002).

The question that rises is how much debt a country can issue and how large the surpluses will have to be to finance it in the future? From the discussion presented in Chapter 2 of the solvency conditions it is known that orthodox theory suggests that foreign debt issued today cannot be larger than its present value of all expected future current account surpluses. If debt is too large then foreign creditors would probably doubt a country's ability to service its debt and hence become less willing to hold its debt. This can cause solvency problems.

Moreover the indicators of external debt over exports and external debt over GDP are used by the IMF for an assessment of a country's repayment capacity. A high ratio indicates a greater burden of debt servicing while a growing ratio may suggest that the country is on an unsustainable path. These indicators are relatively easy to consider, since the ratio will indicate whether debt servicing is likely in the future to absorb total export proceeds. However, empirical work on debt indicators is limited. In order to assess the medium- to long-term debt sustainability more information on debt composition and future interest rates would be required. In calculating these indicators data availability on debt and its structure is crucial.

Reserve adequacy

The IMF (2000:6) defines reserves as “external assets readily available to and controlled by monetary authorities for direct financing of external payments imbalances”. The reserve adequacy indicator is another measure that IMF applies in order to assess solvency and therefore current account sustainability. Cruz and Walters (2008) stress that international reserves in developing economies were initially seen as a source of insurance and more recently as a permanent buffer stock against overall vulnerability of the balance of payments. This vulnerability may arise from both the capital and the current account. Accumulation of reserves seems to be of a precautionary nature. Aizenman (2007) suggests that international reserves play a role in the mitigation of terms of trade shocks in developing countries. As an indicator the accumulation of reserves presents a useful approximation of current account sustainability, since it only provides the number of months a country can continue to support its current level of imports. The IMF suggests that the minimum of reserve coverage should be three months, though this indicator is only useful in providing information on a country’s current funding position, not about the adequacy of its reserves for the future (Barnichon, 2009).

Additional indicators of current account sustainability

Roubini and Wachtel (1998) suggest additional indicators of current account sustainability. They classify these indicators as: foreign reserves, foreign debt, openness and country risk. In the above discussion all these indicators were introduced except for country risk.

Country risk assessment

Roubini and Wachtel (1998) considered using a country's risk ranking published by *Euromoney* magazine and an average measure of sovereign ratings from the rating agencies. There is another source available for a country's risk assessment; namely, the international country risk methodology of the PRS Group Inc. This section will critically assess the international country risk guide methodology (ICRGM) of the PRS Group Inc. This methodology applies different statistical ratings of risk categories in order to assess the potential risks of undertaking international business and investments in 140 countries and was developed in the 1980s. The ICRGM methodology provides economic, political and financial risk-rating. Appendix 3.1 provides a detailed explanation of the ICRGM , where the ICRGM is also applied to rate the Western Balkans.

One has to be critical of the procedure undertaken in Appendix 3.1 since the presented methodology is lacking any clear economic rationale. The PRS group does not explain how risk points[30] were decided, or even what estimation procedures was undertaken in order to define those values. It was not possible to discover based on the available methodology what makes these variables selected as risky or even how economic risk or financial risk is defined. There seems to be a weighting scheme between different factors but what is the rationale behind it? To draw any conclusion on the risks assessed requires a clear rationale for the inclusion of each of these factors, as well as, for the overall weighting methodology.

In summary, so far this Chapter has argued that from the Western Balkan perspective, EU membership can be seen as a means toward greater political and economic stability. The Maastricht criteria with their focus on nominal and macroeconomic convergence are important conditions that these countries will have to achieve. The inability of Western Balkan countries to converge on EU inflation rates might be a problem, but stronger warning signals are evident from the persistent current account deficits in the Western Balkans. However, the medium to long-run sustainability of the latter could not be

[30] Each variable has risk points assigned, i.e. current account deficit above 5% of GDP is 13.5 points. Those points are determined by the PRS Group Inc., their methodology is presented in Appendix 3.1.

assessed based on the available descriptive analysis of structural factors and vulnerability indicators.

In this section vulnerability indicators suggested by the IMF (2000) are briefly assessed together with the other proposed indicators of current account sustainability. It is argued that it is difficult to believe that any of these indicators can provide an accurate signal of potential future crises. These indicators were discussed in order to illustrate that assessing the sustainability of the current account imbalance is a complex issue. To assess sustainability by just discussing factors either structural or vulnerability is not enough, and what is to be done if a country does not have long time series data and adequate theoretical framework? As a first step sustainability is assessed next by showing how stationary criteria can be used in this diagnostics.

### 3.4 Current account convergence to the long-run steady state

The previous sections provided an overview of structural factors and vulnerability indicators and it was found that work on transition economies applied only descriptive analysis. This section will show how informative empirical analysis can be undertaken, even for countries with limited time series data like BH.

In the analysis presented in Chapter 2 it was argued that a country's current account deficit can be seen as sustainable as long as the ratio of foreign debt to GDP is not increasing. Wu (2000) and Lau and Baharumshah (2005) suggest that a stationary current account to GDP ratio is consistent with a finite external debt to GDP ratio. Applying a single equation method, Wu (2000) finds a stationary current account to GDP ratio consistent with a finite external debt to GDP ratio for ten OECD countries. Lau and Baharumshah (2005) find a stationary current account to GDP ratio for three out of twelve Asian countries. Finding the ratio of current account to GDP to be either stationary or declining over time is a necessary, but not a sufficient, condition for current account sustainability. It is not sufficient since, as argued above and analysed in the later chapters, many other factors have an effect on current account sustainability. Still finding the ratio of current account to GDP to be stationary is consistent with a less strict intertemporal solvency condition. If this is the case then there is no need for drastic policy changes from the government or future default on its foreign debt. This section will test if the ratio of current account deficit to GDP is stationary for the Western Balkans.

In estimating the rate of current account convergence to a steady state  the work of Jiandog and Shang-Jin (2007) is followed and the recent economic literature on convergence calculation (Ball and Seridan, 2003; Hyvonen 2004). These approaches are based on the mean-reversion proposition. In other words, it is argued that countries with potentially high current account deficits will experience a significant degree of current account decrease just by returning to some underlying long-run cross-country mean rate. These deficits will tend to decrease if their size were a consequence of the country's initial performance because of transitory factors and/or poor policy performance. This convergence may occur as a consequence of the policy to join the EU, since an assumption is that Western Balkan countries are aware that EU accession with high current account deficits is not possible. The current account rate of convergence to its steady state is estimated for BH and each of the other Western Balkan countries. Steady state is defined, based on the mean reversion proposition, as the autonomous growth in current account to GDP ratio divided by the speed of convergence. It is calculated for each WB country and for the region as whole. Individual country steady state estimations will be used as an indication of how far each country is from the region's long-run steady state for current account convergence. This estimation is particularly important for BH due to EC decision no. 533/2004, the "EC confirmed it determination fully and effectively to support the European perspective of the WB countries, affirming that WB will become an integral part of the EU once they meet the established criteria". The European partnership will identify priorities for action that will be adapted to a country's specific needs and respective stage of preparation. Hence the calculated-long run current-account steady state will present an indicator that allows comparisons across the Western Balkan countries. In estimating this the restriction that a country's current account should be zero is not imposed nor the deficit limited to 5% of GDP. Instead it should be region specific, on the basis that these countries are at the similar stage of accession to the EU and therefore face a similar the need to converge on the EU processes and performance. The calculated long-run current account steady state is not necessarily sustainable, but it presents a minimum requirement for current account sustainability in this period based on less strict solvency condition (Chapter 2). Next a short description of the data used is provided and then the estimation procedure is explained.

### 3.4.1 Data

Seasonally unadjusted quarterly data is used and data sources are: from International Financial Statistics (IFS); the National Bank of Serbia; Bank of Albania; Croatian National Statistics Office (Crostat); Statistical Agency for BH and Central Bank of BH (CBBH) for the period 2002 to 2007. An exception is made with regard to Albanian data. Here estimates are made based on yearly data from 1996 to 2007 since the necessary quarterly data on GDP were not available. The main variable is the ratio of the current account deficit to GDP.

Table 3.1 provides yearly data on the current account deficit to GDP ratio. This particular time period is selected since it could be considered as one without sudden reversals in the Western Balkan economies, that is a period associated with sudden stops in capital inflows (Edwards, 2004).

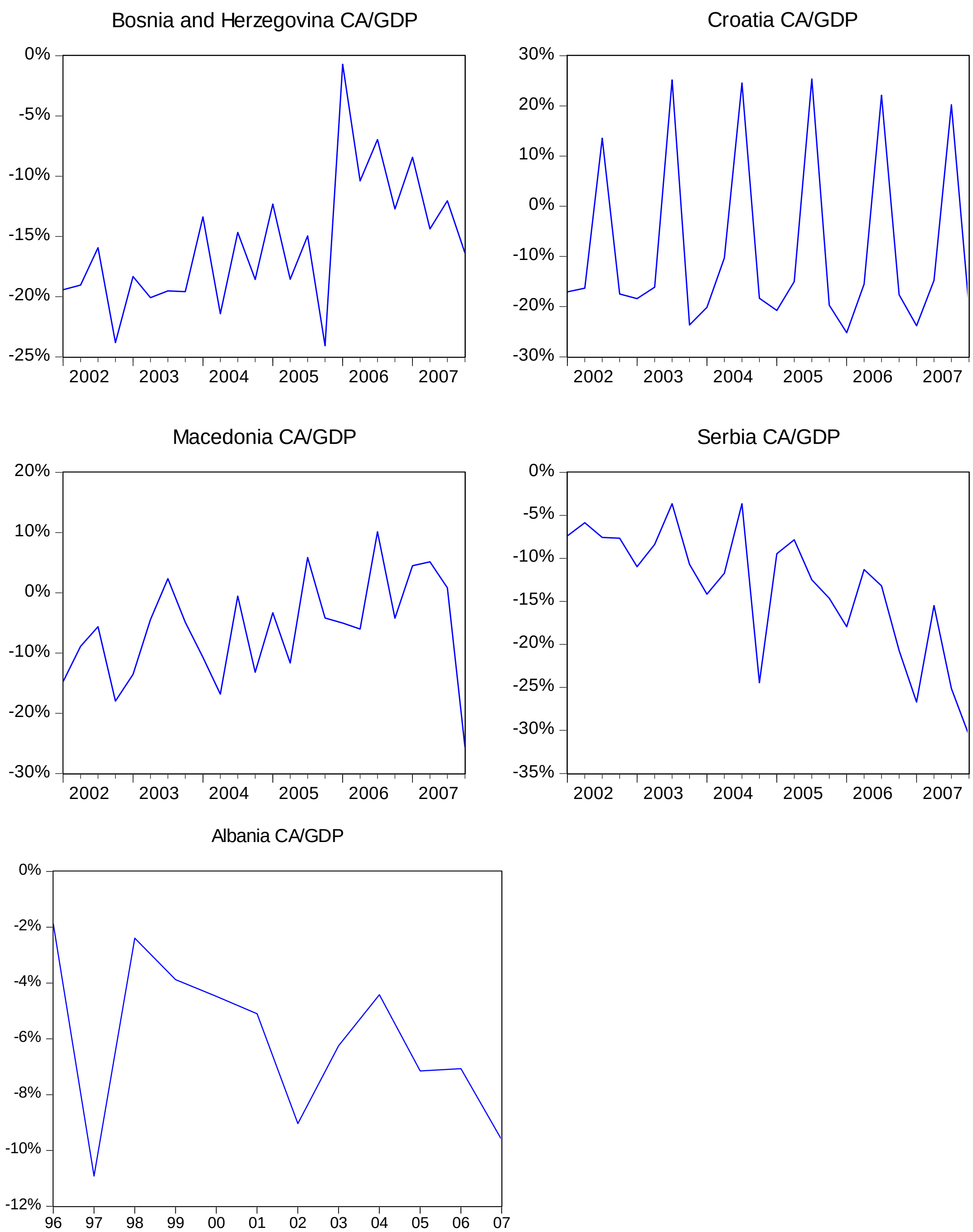
Table 3.1: The current account balance as % gross domestic product for Western Balkan Countries

| year | Bosnia | Croatia | Macedonia | Albania | Serbia |
|---|---|---|---|---|---|
| 2002 | -19.7% | -8.6% | -11.9% | -9.0% | -7.1% |
| 2003 | -19.4% | -7.2% | -5.0% | -6.2% | -8.4% |
| 2004 | -17.2% | -5.0% | -10.3% | -4.4% | -13.7% |
| 2005 | -18.0% | -6.3% | -3.3% | -7.1% | -11.3% |
| 2006 | -8.4% | -7.9% | -1.2% | -7.1% | -16.0% |
| 2007 | -13.1% | -8.6% | -4.3% | -9.6% | -24.6% |

Source: author’s calculation (for data source see section 3.4.1)

Data is presented in Graph 3.1 using different scales in vertical axes in order to observe more clearly any tendency towards convergence.

Graph 3.1: Current account balance as % gross domestic product for Western Balkan countries




Note: CA/GDP is a current account deficit to GDP ratio

In the above graphs, it can be seen a strong seasonality influence in the third quarter of Croatian data, this is most likely due to Croatia's strong orientation to summer tourism. In the BH data there is a structural break evident in the first quarter of 2006. This is the quarter when VAT was introduced in BH. A similar pattern can be noticed in Serbia's data in 2005, which is also when VAT was implemented. Macedonian data are expressing an improving trend in the current account deficit to GDP ratio, though with a sudden rise in imports at the end of 2007, whilst Albanian data show a negative trend in this ratio. The plots in Graph 3.1 suggests that trends are important components of the data and that results of unit root testing are likely to be very sensitive to the beginning and end values of the data.

### 3.4.2 Estimating the speed of current account convergence

To estimate the speed of current account convergence the work of Jiandog and Shang-Jin (2007) was followed. The only deviation from Jiandog and Shang-Jin (2007) is that the speed of current account convergence is not going to be tested with regard to labour market rigidity, terms of trade and exchange rate regime, since the focus is to estimate the speed of current account convergence to its long-run steady state. Two different methods are applied. The first method is ordinary least squares and the second method is panel regression. The first method is applied to each country's data individually. The second is applied to the Western Balkan countries as a group. With regards to sensitivity analysis, it is difficult to compare this findings with those of Jiandog and Shang-Jin (2007), since they did not report estimates of the speed of current account convergence to the steady state. What they report is an explanation of how they dealt with the potential serial correlation in the error term.

The estimation procedure is based on the following steps. The first model estimation procedure is presented initially and then that for the second model.

First model estimation procedure

1. ***First*** calculate $x_t$ which represents each country's current account (*ca*) balance as a share of its GDP (*gdp*) in period (t). $x_t = \frac{ca_t}{gdp_t}$ (3.1)

where t indexes the quarters from 2002 to 2007

2. ***Second*** test if $x_t$ follows a unit root process.

In order to assess whether the ratio of current account balance to GDP is stationary a unit root test is applied. Stationary series tend to return to their mean value and fluctuate around it within a more or less constant range, while in non-stationary time series shocks never die out, hence their mean and variance change with time. The usual methods for eliminating trends are differencing and detrending, where detrending means regressing a variable on time and saving the residuals. If a series contains a unit root it can be made stationary by differencing. If an inappropriate method is used to eliminate a trend a serious problem may be encountered, due to the fact that macroeconomic variables do not grow at a smooth long-run rate and some macroeconomic shocks are of a permanent nature so that the effects of such shocks are never eliminated (Enders, 2004). If the hypothesis of a unit root process is rejected then it can be preceded with Jiandog and Shang-Jin's (2007) estimation. Hence first discuss applying unit root test to the available data and then elaborate further in step 3 the estimation procedure.

$$\Delta x_t = \alpha + \beta \, x_{t-1} + e_t \qquad (3.2)$$

This equation (3.2) is actually the form of the Dickey-Fuller (DF) test for a unit root, because if $\beta = 0$, then there is a unit root and convergence is precluded (by definition). However, if beta is less than 0, then that is consistent with convergence. A word of caution is necessary since a likely weakness of the unit root tests is availability of only 24 quarterly observations. In applied work the main criticism is that the power of the tests is low if the process is stationary but with a root close to the non-stationary boundary and also it is difficult to distinguish between trend and drift, particularly for small samples. Low power basically implies that a series may be stationary but the Dickey-Fuller test suggests a unit root process. One solution to low power is to increase the number of observations, but the possibility needs to be considered that there may be differences in economic structure or policy that is conducted, which all need to be considered in the model. For example in the BH data, as discussed above, the structural break is evident in the first quarter of 2006. This structural break may have changed the behaviour of the current account balance to GDP ratio and if that is not recognised then a unit root may be found where it should not exist. In brief, the main issue is the availability of only a small sample of data, which suggests that the main problem is low power. One solution to low power is to increase the number of observations which is performed by applying the commonly used panel unit root test.

The two most commonly used unit root tests are applied: the Augmented Dickey-Fuller (ADF) and the Phillips-Peron (PP). The ADF test for the unit root is usually applied to long time-series data (Shiller and Perron, 1984; Wu, 2000), since the Dickey-Fuller test (DF) is valid only if residuals are white noise. However the residuals will be autocorrelated if there is autocorrelation in the first difference, so a solution is to "augment" the DF test using p lags of the dependent variable. In order to apply the ADF and PP tests Eviews software was used, where probabilities and critical values are calculated based on 20 observations. A panel unit root test was also applied to address the problem of the low power of standard unit roots tests (Tables 3.2 and 3.3). Table 3.2 presents first the findings from the ADF and PP tests for each country separately.

Table 3.2: Order of integration for the ratio CA/GDP indicated by unit root testing

| Unit root test | Bosnia | Croatia | Macedonia | Serbia | Albania |
|---|---|---|---|---|---|
| ADF (Augmented Dickey-Fuller) | I(1)** | I(1)** | I(0)** | I(1)** | I(0)** |
| PP (Phillips-Peron) | I(0)** | I(0)** | I(0)** | I(1)** | I(0)** |

Note: Computed in Eviews 6.0
** significant at 1% level or better;
* significant at 5% level or better;

The PP unit root test (Table 3.2) suggests that all time-series except Serbia's are integrated I(0) in levels i.e. stationary. The ADF test suggests that only the time series for Macedonia and Albania are integrated I(0) in levels or stationary. The ADF test suggests that time series for Bosnia; Croatia; Serbia are integrated I(1) or stationary in first differences. Jenkins and Snaith (2005) indicate that panel unit root and cointegration tests evolved in order to address the problem of the low power of standard unit roots tests. These tests intend to distinguish between unit roots and near unit roots. The results of panel unit root test is presented in, Tables 3.3 and 3.4. The panel unit root test suggests rejecting the Ho of a common unit root process and individual unit root process.

Table 3.3: Panel unit root test, quarterly data with intercept included

Panel unit root test: Summary
Series: CAGDPWBQ
Sample: 2002Q1 2007Q4
Exogenous variables: Individual effects
User specified lags at: 1
Newey-West bandwidth selection using Bartlett kernel
Balanced observations for each test

| Method | Statistic | Prob.** | Cross-Sections | Obs |
|---|---|---|---|---|
| Null: Unit root (assumes common unit root process) | | | | |
| Levin, Lin & Chu t* | -2.28245 | 0.0112 | 4 | 88 |
| Null: Unit root (assumes individual unit root process) | | | | |
| Im, Pesaran and Shin W-stat | -3.48455 | 0.0002 | 4 | 88 |
| ADF - Fisher Chi-square | 31.4553 | 0.0001 | 4 | 88 |
| PP - Fisher Chi-square | 62.4185 | 0.0000 | 4 | 92 |

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Table 3.4: Panel unit root test, quarterly data without intercept included

Panel unit root test: Summary
Series: CAGDPWBQ
Sample: 2002Q1 2007Q4
Exogenous variables: None
User specified lags at: 1
Newey-West bandwidth selection using Bartlett kernel
Balanced observations for each test

| Method | Statistic | Prob.** | Cross-Sections | Obs |
|---|---|---|---|---|
| Null: Unit root (assumes common unit root process) | | | | |
| Levin, Lin & Chu t* | -1.36440 | 0.0862 | 4 | 88 |
| Null: Unit root (assumes individual unit root process) | | | | |
| ADF - Fisher Chi-square | 25.0880 | 0.0015 | 4 | 88 |

| | | | | |
|---|---|---|---|---|
| PP - Fisher Chi-square | 32.8070 | 0.0001 | 4 | 92 |

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Although evidence is mixed from the ADF and the PP tests, the panel unit root test suggests that the time series are I(0) in levels or stationary. Since the ADF test is generally considered to be less powerful than the PP test (Maddala and Kim 1998, Ferda, 2004), it was concluded that all series except Serbia's are integrated I(0) in levels or stationary. Hence the conclusion is that Serbia's data are not suitable for convergence speed estimation.

However, there is a difference between Jiandog and Shang-Jin's (2007) regression and the estimation 3.3. The difference is in additional a relevant dummy variables included in the estimation 3.3. The dummies are identified through both economic and statistical reasoning. First take into account significant events i.e. the introduction of VAT in Bosnia and Herzegovina; and second analysed outliers that are potentially important for these particular countries based on the data plot examination in section 3.4.1. Hence

$$\Delta x_t = \alpha + \beta\ x_{t-1} + D_t + e_t \qquad (3.3)$$

In Table 3.2 it was found that there is no strong evidence of a unit root process. Based on the finding proceed with step three.

3. ***In step three*** based on the mean reversion proposition of Jiandog and Shang-Jin (2007) the speed of convergence of the current account balance to GDP ratio to its long-run mean is estimated by utilising the above regression (3.3):

$$\Delta x_t = \alpha + \beta\ x_{t-1} + D_t + e_t \qquad (3.4)$$

Where:

$\Delta$ is the first differences of the current account balance to GDP ratio.

$\alpha$ is a constant term that represents autonomous growth in the current account balance to GDP ratio

$\beta$ is a speed of convergence to its long run mean

$e_t$ is the uncorrelated error term

$D_t$ is a country specific dummy variable which reflects the outcome of the data examination in section 3.4.1.

The Jarque-Bera test statistic was used in order to test whether the series are normally distributed (or, equivalently, that the regressions are not unduly influenced by outliers). Under the null hypothesis of a normal distribution, the Jarque-Bera statistic is distributed as $\chi^2$ with 2 degrees of freedom. The reported probability is the probability that a Jarque-Bera statistic exceeds (in absolute value) the observed value under the null hypothesis. A small probability value leads to the rejection of the null hypothesis of a normal distribution. Based on the Jarque-Bera test a normal distribution of errors was found as reported in Appendix 3.2, model 1. This test initially suggested that there are outliers in the residuals, but when the dummy variables were included in the estimated country equations then the normal distribution of the errors suggested an absence of outliers. These dummy variables correspond to the findings already established based on the data plot from section 3.4.1.

*The null hypothesis is* that the current account balance as a share of GDP does not converge, hence, $\beta$ =0, which indicates the presence of a unit root,

*the alternative hypothesis is* that the current account balance as a share of GDP converges to a long-run steady state, where $\beta$ should be negative and smaller than one in absolute terms.

From equation (3.4) it follows:

$$x_t - x_{t-1} = \alpha + \beta x_{t-1} + D_t + e_t \quad (3.5)$$

$$x_t = \alpha + x_{t-1} + \beta x_{t-1} + D_t + e_t \quad (3.6)$$

$$x_t = \alpha + (1+\beta)x_{t-1} + D_t + e_t \qquad (3.7)$$

$$1-\beta < 0 \qquad (3.8)$$

The closer to one is $\beta$ in absolute value, the faster the speed of convergence.

Now if the time subscripts is dropped from $x_t$, then equation (3.5) can be written as:

$$x - x = \alpha + \beta x + D_t + e_t \qquad (3.9)$$

$$-\beta x = \alpha + D_t + e_t \qquad (3.10)$$

$$x = -\frac{\alpha}{\beta} - \frac{D_t}{\beta} - \frac{e_t}{\beta} \qquad (3.11)$$

4. Based on (3.11), ***in step four*** the long-run steady state of the current account balance to GDP ratio is calculated. Jiandog and Shang-Jin's (2007:35) specification does not impose the constraint that the long-run value of the current account to GDP ratio should be zero. Jiandog and Shang-Jin's (2007) propose to calculate the country specific long-run value toward the steady state in the following specification:

$$\text{Long-run steady state} = -\frac{\alpha}{\beta} \qquad (3.12)$$

That is the autonomous growth in current account balance to GDP ratio divided by the speed of convergence. The units used in estimation procedure are percentage points; hence the calculation is coherent and the calculated long-run steady state indicates the percentage point where the current account balance to GDP ratio settles. These values are obtained from the step three (3) estimation.

Second model estimation procedure

This model is applied in order to find the steady state rate of the current account balance to GDP ratio. The steady state is defined, based on the mean reversion proposition, as the autonomous growth in current account balance to GDP ratio divided by the speed of convergence. It is calculated for each WB country and for the region as whole. The individual country steady state estimation is used as an indication of how far each country is from the region's long-run steady state for current account convergence, which is taken to be an indicator of current account sustainability for the Western Balkans as a region.

Here a two-way fixed effects panel data regression model is estimated. This estimation is conducted by pooling time series and cross-section observations. The two-way fixed effects model seems to be appropriate since the focus is on a specific number of countries and the inference is restricted to the behaviour of this set of countries (Baltagi, 2008). A panel regression model is estimated based on quarterly data; hence the Western Balkan group does not include data on Albania[31].

1. ***The first step*** is the same as in the model one. Which is to calculate ($x_{i,t}$) which represents each country's current account balance as a share of its GDP**.**

2. ***Second,*** pool the data ($x_{i,t}$) and organise it as cross-sectional units observed in a period (t). Where:
t stands for the number of periods in quarterly observations, t = 24 and
i refers to the Western Balkan countries (i = 4).

3. ***Third,*** test if ($x_{i,t}$) follows a unit root process. If the hypothesis of a unit root process is rejected then proceed with step 4.
In this data sample the Ho of a unit root process is rejected and results are provided in, Tables 3.3 and 3.4

4. ***In step four*** the speed of convergence of the current account balance to GDP ratio is estimated by utilising the following two-way effects model: both random effects (RE)

$$\Delta x_{i,t} = \alpha + \beta x_{i,t-1} + (\mu_i + \lambda_t + e_{i,t}) \quad (3.13)$$

and fixed effects (FE)

[31] Quarterly GDP data were not available for Albania.

$$\Delta x_{i,t} = \mu_i + \lambda_t + \beta x_{i,t-1} + e_{i,t} \tag{3.14}$$

In RE estimation, $\mu_i$ is the country specific error term $\mu_i$ ~IID$(0, \delta^2)$ and $\lambda_t$ is the period specific error term $\lambda_t$ ~IID$(0, \delta^2)$.

In FE estimation, $\mu_i$ and $\lambda_t$ are dummy variables to be estimated.

In both cases, $e_{i,t}$ is the reminder (observation specific or idiosyncratic) error component $e_{i,t}$ ~IID$(0, \delta^2)$,

In both RE and FE approaches to estimations, the Western Balkans common mean value for the intercept ($\alpha$) and the speed of convergence for the WB ($\beta$) is estimated.

where:

$\Delta$ is the first differences of a current account balance as a share of GDP.

$\alpha$ is a constant term that represents autonomous growth in the current account balance to GDP ratio

$\beta$ is the speed of convergence for WB countries as the mean of the individual i groups.

*The null hypothesis is* that the current account deficit as a share of GDP does not converge; hence, $\beta$=0,

*the alternative hypothesis is* that the current account balance as a share of GDP converges to a long-run steady state, where $\beta$ should be expected to be negative and smaller than one.

5. ***In step five*** calculate the long-run steady state for the current account balance to GDP ratio. Long-run steady state is calculated as:

$$\text{Long-run steady state} = -\frac{\alpha}{\beta} \tag{3.15}$$

Those values are obtained from the step four estimation.

Implementation and discussion of results

Now in order to make this procedure operational[32] ***first*** it is necessary to perform test diagnostics. All regression results and diagnostics are reported in model 1 of Appendix 3.2. After it is confirmed that the two conditions from equation (3.3) are fulfilled, results are report. Table 3.5 reports estimated speed of convergence and calculated long-run steady state value for model one. Next Text box 3.1 presents how long-run steady state is calculated.

Text box 3.1, Bosnia and Herzegovina example

In the first model estimation procedure under section 3.4.2 it can be seen that the long-run steady state can be calculated if equation (3.12) is applied, hence:

$$\text{Long-run steady state} = -\frac{\alpha}{\beta} \tag{3.12}$$

Model 1 of Appendix 3.2 provides the estimation results of the model for Bosnia, with following estimation results:

$\alpha$ = - 0.26

$\beta$ = -1.448

Hence, long-run steady state for Bosnia $= -\frac{(-0.26)}{(-1.448)}$ or expressed in the percentage points -18.2%. Since it was indicated in equation (3.3) that $\beta$ is an indicator of the speed of convergence to its long-run mean, by simply transforming $\beta$ = -1.448 into a percentage, the obtained result for Bosnia's speed of convergence is -144.8%.

The same procedure is applied in order to calculate long-run steady state for Croatia, Macedonia and Albania. The calculations for these countries are presented in Table 3.5.

Table 3.5: Model 1, long-run steady state and speed of convergence

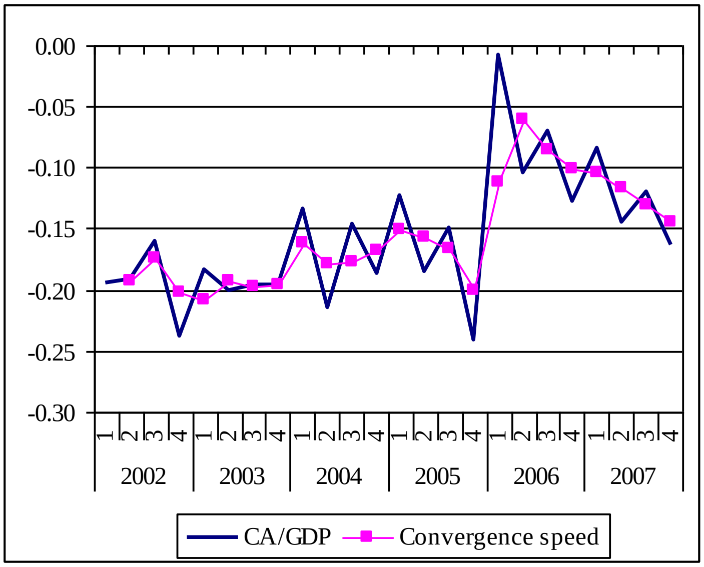
| Estimation | Bosnia | Croatia | Macedonia | Albania |
|---|---|---|---|---|
| Long run steady state | -18.2% | -8.1% | -4.5% | -6.2% |
| Speed of convergence | -144.8% | -106.2% | -83.1% | -131.3% |

Source: author's calculations (for data source see section 3.4.1)

[32] Empirical results were generated by EViews 6

Estimates are conducted country by country based on equation (3.3). Least squares regression results are reported in Appendix 3.2, model 1 for each country individually. Jiandog and Shang-Jin's (2007) proposition is that all variables should have a negative speed of convergence of less than one. Hence if x one period in the past is above its long-run average then, through the negative beta, the current rate of change of x falls until it becomes negative. Over time, negative growth of x reduces the level of x towards its long-run average. By symmetry, the same reasoning will raise the current level of x if lagged x is below its long-run average. The closer the speed of convergence is to one in absolute value, the faster the speed of convergence. Based on the findings (Table 3.5) it can be concluded that all variables have the expected negative sign, but all countries except Macedonia have a speed of convergence greater than one or 100%. Jiandog and Shang-Jin's (2007) say nothing about convergence speeds greater than one. BH's speed of convergence is -144.8% per quarter. This seems to be a result of a current account balance to GDP ratio path which is picking up seasonal effects and hence contains trends in both directions, this particularly exaggerates large changes in the observed current account balance to GDP ratio. Another consideration might relate to the particular period of data available. For example, in the BH data, as discussed above, a structural break in the first quarter of 2006 was evident. This structural break may have changed the behaviour of the current account balance to GDP ratio. Macroeconomic variables may not grow at a smooth long-run rate following shocks of a permanent nature and the overshooting effects of such shocks which may particularly affect small samples such as this one. The behaviour of the speed of convergence can be seen in Graph 3.2. The convergence speed is simply obtained by multiplying the obtained coefficients from the model for Bosnia (Appendix 3.2, model 1) with its relevant time series data.

Graph 3.2: Convergence speed for BH current account balance to GDP ratio




Source: author’s own calculation (for data source see section 3.4.1)

The observed variability of the current account balance to GDP ratio could be a signal of an economy vulnerable to external shocks. Based on the estimations, Albania’s speed of convergence is -131.3% per year, while Croatia’s speed of convergence is -106.2% per quarter. This degree of overshooting may reflect not only variability in the observed current account to GDP ratio but also that BH, Albania and Croatia are in the process of rapid changes to their economies.

Now turning to the steady state estimation, it can be noticed that Croatia’s current account balance to GDP is estimated at -8.1% in its long-run steady state rate, which is what would be expected to see based on a data provided in Table 3.1. In the context of the empirical findings on sustainable current account balance, the estimation suggests that each country in the Western Balkan group, except Macedonia, is far above the ‘maximum’ of -5% of current account balance to GDP ratio. Macedonia’s current account balance to GDP ratio is estimated at -4.5% at its long-run steady state rate.

Next the results from the second model estimation are discussed. The two-way fixed panel model results are reported in Appendix 3.2 for the model 2, under the Hausman test. Based on the estimation, the long-run steady state rate for BH is much higher than the estimated steady state rate for the Western Balkans. This is concluded based on quarterly data used in estimated panel regression. This estimate is presented in (Table 3.6).

Table 3.6: Model 2, long-run steady state and speed of convergence for WB

| Estimation | Quarterly data |
|---|---|
| Long run steady state | -17.1% |
| Speed of convergence | -97.3% |

Source: author's own calculation (for data source see section 3.4.1)

Based on Table 3.6 it can be noticed that Western Balkans current account balance to GDP ratio is estimated at -17.1% in its long-run steady state. There is a difference in the panel result (Table 3.6) and the by country results (Table 3.5). Panel result suggests a lower average where BH is considerably above the other countries. The estimated steady state rate at -17.1% for the Western Balkans is taken as an indicator of current account sustainability in this period. However, the earlier finding that the current account balance to GDP ratio is stationary is not a sufficient condition to assess its sustainability, it does however represent a minimum requirement for sustainability assessment based on less strict solvency conditions. This estimation also provides a warning of a potentially unsustainable current account deficit in BH, particularly if a reversal occurs. Reversals can bring sudden changes, like those that all countries face in the current financial crises. These reversals question current account sustainability and whether countries with persistent and high deficits will have sufficient funds to finance their deficits. According to the estimation Bosnia is the country which has a stationary current account deficit to GDP ratio which suggests sustainability, however its estimated steady state rate is well above the region's average which sends a warning signal of potentially unsustainable current account deficit in this country.

From Table 3.6 it is evident that the results with quarterly data suggest a -17.1% steady state rate as the indicator of current account sustainability in the WB region. The speed of convergence seems to be high for the Western Balkan countries, at -97.3% per quarter. The mean-reversion proposition suggests that countries with potentially high current account deficits will experience a significant degree of current account decrease just by returning to some underlying cross-country mean rate. This research interest is focused on BH and any indications of a possible unsustainable current account deficit. The estimated current account balance to GDP steady state rate for BH is -18.2%, significantly higher than the estimated WB steady state rate.

### 3.5 Conclusions

Overall, based on the estimated speeds of convergence speed and steady state rate calculations it can be concluded that there are concerns about external sustainability in the Western Balkans (particularly for BH) and the appropriateness of their recent policies with their nominal and real convergence objectives.

A stationary condition seems to be a necessary but not sufficient condition for current account sustainability. This condition presents a minimum requirement for current account sustainability assessment based on less strict intertemporal solvency conditions. BH’s current account balance to GDP ratio is found to be stationary but at a rather high negative level. It is assumed that the Western Balkan countries are aware that EU accession with high current account deficits is not possible. The empirical literature finds a stationary current account balance to GDP ratio consistent with a finite external debt to GDP ratio. It was found that four of the five WB countries have a stationary (negative) current account balance to GDP ratio and therefore met the minimum requirement for sustainability based on less strict intertemporal solvency conditions. In Chapter 4 by applying a fundamental equilibrium exchange rate approach, recent fundamental changes in BH’s economy will be examined as potential threats to its current account sustainability.

# Chapter 4: Estimating the Fundamental Equilibrium Exchange Rate for Bosnia and Herzegovina



## 4.1 Introduction

Chapter 3 assessed research on external sector imbalances and found that various variables have been found to impact on current account sustainability. This chapter, extends this research on current account sustainability by investigating further the connection between sustainability and exchange rate misalignment. The intention here is to estimate an equilibrium exchange rate for Bosnia and Herzegovina. To measure the real equilibrium exchange rate is difficult, because it is unobservable. Calculating the fundamental equilibrium exchange rate is an approach to estimating and so operationalising this concept. Section 2.4 considered the theoretical and empirical implementation of the fundamental equilibrium exchange rate. Hence this chapter, assess further the empirical approach to estimating the fundamental equilibrium exchange rate (FEER) and then estimate it for Bosnia and Herzegovina. This estimation uses an empirical model which explores the relationship between the real effective exchange rate and its fundamental variables.

This Chapter is organised in three sections. After this introduction, in section 4.2 the concept of the fundamental equilibrium exchange rate is further assessed. This approach is well-known in the literature that examines exchange rate misalignment. Hence section, 4.3 extends the analysis through estimating whether the current account sustainability in BH is threatened by exchange rate misalignment. The conclusions of this Chapter are presented in section 4.4.

## 4.2 Overview of the Fundamental Equilibrium Exchange Rate approach and its empirical application for Bosnia and Herzegovina

In order to assess the sustainability of BH's current account deficit its fundamental equilibrium exchange rate (FEER) will be estimated in this section. Chapter 3 introduced two views which argue that changes in the real exchange rate are an important indicator of current account sustainability; namely, the misalignment and fundamental views. Here the fundamental equilibrium exchange rate approach is used in order to test whether a movement in the real exchange rate represents a misalignment or whether the equilibrium real exchange rate itself has shifted because of changes in the economic fundamentals.

The FEER estimation will enable the investigation of how changes in the fundamental determinants of the current account are affecting the real effective exchange rate. Shifts in the real exchange rate are considered important for changes in the current account (section 2.4). First two key exchange rate related problems should be addressed. The first problem is how the real exchange rate should be measured; and the second problem is determining whether the real exchange rate is overvalued. Hence, in section 4.2.1 an operational definition of the nominal effective exchange rate (NEER) and real effective exchange rate (REER) is developed. Then the methodology underlying their calculation is explained, followed by a brief analysis of the movements in BH's NEER and REER indices. The calculation of the REER is of particular importance in calculating the fundamental equilibrium exchange rate, since it is often used as the dependent variable in the fundamental equilibrium exchange rate model (Baffes et al., 1997; Abdih and Tsangarides, 2010; Kemme and Roy, 2006). Hence, in the next section, NEER and REER are introduced. After these indices in section 4.2.2 the fundamental determinants of the

FEER are discussed. What then follows in section 4.2.3 is an estimation procedure for the FEER, empirical application and discussion of the empirical results for BH.

### 4.2.1 Nominal and real effective exchange rate for BH

In creating the indices of NEER and REER it is very important to take into account:

- the nominal exchange rate;
- the choice of foreign trade partners;
- the weighting system;
- and the base year.

The next paragraph concentrates upon the first two issues. Different options for choice of weights are available in the literature, as well as different options for choice of price or cost index (BIS Economic Papers No. 39, November 1993). In practice, due to limited data availability on tradable and non-tradable goods (section 2.4.4), but also due to the composition of developing countries' exports and imports that consist of a few basic competitive goods, CPI is used to construct REER. The emphasis is on the nominal effective exchange rate to serve as an indicator of trade competitiveness, since issues involved in the construction of nominal rates are equally important for the construction of real rates. The three most frequently used formulations (National Bank of Croatia, National Bank of Macedonia, National Bank of Serbia, CBBH, etc) are discussed next. The overall trade weights where weights are assigned to trading partners strictly in proportion to their share in the home country's exports and imports (basically the largest weight is assigned to a trading partner which constitutes BH main market; hence to those countries that also have a significant affect on BH price formation and BH terms of trade). Secondly the CPI calculated on the basis of basket of goods, which are mainly comparable and rapidly available across countries. Finally a geometric average based on the "time reversal test". This averaging method ensures that changes in the exchange rate between two points in time are identical irrespective of which date is chosen as the base (BIS, 1993) , hence the weighting structure is unchanged over time. The use of a common methodology also provides an opportunity for a comparative analysis of nominal effective exchange rates across countries. Therefore, this formulation has been used as the base for estimating nominal and real effective exchange rates for Bosnia and Herzegovina.

Nominal effective exchange rate

The nominal effective exchange rate (NEER) in Bosnia and Herzegovina is calculated according to the multilateral principle. According to this principle, the nominal effective exchange rate represents a summary indicator of the nominal value of the local currency. NEER is the weighted average of several nominal exchange rates with the currencies of the main trading partners (for a certain month or year, taking into account a particular base period). The nominal exchange rate is expressed through direct quoting (i.e. KM/EUR), meaning if the home currency is appreciating (KM is strengthening) then the exchange rate number (i.e. KM/EUR) decreases. The word 'effective' represents a weighted average of the group of countries (the main trading partners), whereas the nominal exchange rate is used to express the bi-lateral situation. The nominal effective exchange rate is an index number where decline is a sign of appreciation and rise a sign of depreciation.

Reflecting common practice (BIS, 1993) the following formulas were used to set up the indices:

$NEER_t = 100 \prod_i T_{it}^{w_i}$ where i = EUR, CNY, HRK, MKD, ROL, RUR, SRD, CHF, TRL, GBP, USD. (4.1)

Abbreviations used are internationally accepted ISO 4217 currency codes.

$T_{it}$ represents the average nominal exchange rates between KM and the main trading partners' currencies (i) recorded in the month (t), and divided by the base period.

$w_i$ is the weighted average for the currency (i), while ($\prod$) represents the operation of multiplication.

In order to calculate the overall trade weight the following equations are applied:

$w_i = v^I w_i^I + v^U w_i^U$ where (4.2)

$I$ – total exports of partner (i) to BH; $U$ – total imports of partner (i) from BH;

$I + U$ = total trade

$$v^{I} = \frac{I}{I+U} \text{ export share; } v^{U} = \frac{U}{I+U} \text{ import share;} \tag{4.3}$$

$$w_i^{I} = \frac{I_i}{I} \text{ export weight of partner (i) and } w_i^{U} = \frac{U_i}{U} \text{ import weight of partner (i)} \tag{4.4}$$

Combining export and import weights in the overall trade weight reflect the relative importance of domestic and foreign markets' share in the home country. Basically by using both imports and exports shares the overall participation of top 20 main trading partners in total BH trade is taken into account.

Real effective exchange rate

The real effective exchange rate (REER) is calculated from the nominal effective exchange rate, which is adjusted by the balance between the local economy price level and the price levels of the country's main trading partners. Therefore, when calculating the real effective exchange rate, the nominal exchange rate is deflated by relative prices or costs in the main trading partners.

The index of the real effective exchange rate is used to analyse the influence of an exchange rate change on the price competitiveness of the domestic economy. If there is an increase in BH's real effective exchange rate index this means a decrease in real KM value but, at the same time, an increase in the competitiveness of the local products and businesses in the global market. The real effective exchange rate is expressed as an index number which shows the average increase–appreciation-loss of price competitiveness (index below 100) or average decrease-depreciation-gain of price competitiveness (index above 100) compared to a base year. Calculation of the nominal (NEER) and real (REER) effective exchange rate indices is based on monthly data series. The time frame for the calculation covers from April 2002 to December 2007. The RPI time series was discontinued in January 2008 and it is no longer produced. April 2002 was set as the base year, as economic activity in BH stabilised in that month, with low inflation, stable monetary aggregates, relatively high foreign reserves and an annual real economic growth of 5.5%, albeit with a still high official rate of unemployment (42.3%). REER is an indicator mostly used to determine whether there is a need for exchange rate adjustment. That is why the selection of an appropriate base year is so important, especially in Bosnia and Herzegovina where the comparative base may change substantially between years.

In order to calculate the index of the real effective exchange rate the following formula has been used[33]:

$$REER_t = \sum_i \frac{w_i P^*_{it}}{P_t} NEER_t \qquad (4.5)$$

$P^*_{it}$ represents the base index of prices in month (t) for each country individually, while $P_t$ represents the index of domestic prices compared with the base period. In brief, REER was calculated as an transformation of NEER, adjusted by the relevant connection between weights and prices indices of the main trading partner countries. Deflation has been undertaken using the CPI, published by the IFS, except for Bosnia and Herzegovina. The BH Agency for Statistics in January 2008 published BH CPI for the first time with 2005 as the base year. The CPI time series is now available from January 2005 and it is based on survey data. Since the CPI time series was not available till 2008, the retail price index (RPI) was used instead. The RPI for BH was published by the CBBH based on data provided by Agencies for Statistics in RS and BH Federation. The CBBH used to calculate RPI as a weighted average of entities' monthly prices indices where the weights represented the share of the entities in BH’s GDP. Both statistical offices calculate monthly price indices but they apply a different methodology and use different commodity groups for calculation. The RPI time series was discontinued in January 2008 and the CPI has been used as the inflation proxy since then. In this thesis the REER index is calculated based on both indices and they are referred as: RPI based REER; and CPI based REER. For a robustness check section 4.2.6, estimates two FEER models: CPI based REER; and RPI based REER.  The correlation between RPI and CPI is 0.992, which suggests that the price indices track each other almost perfectly.

[33] BIS Economic Papers No. 39, November 1993

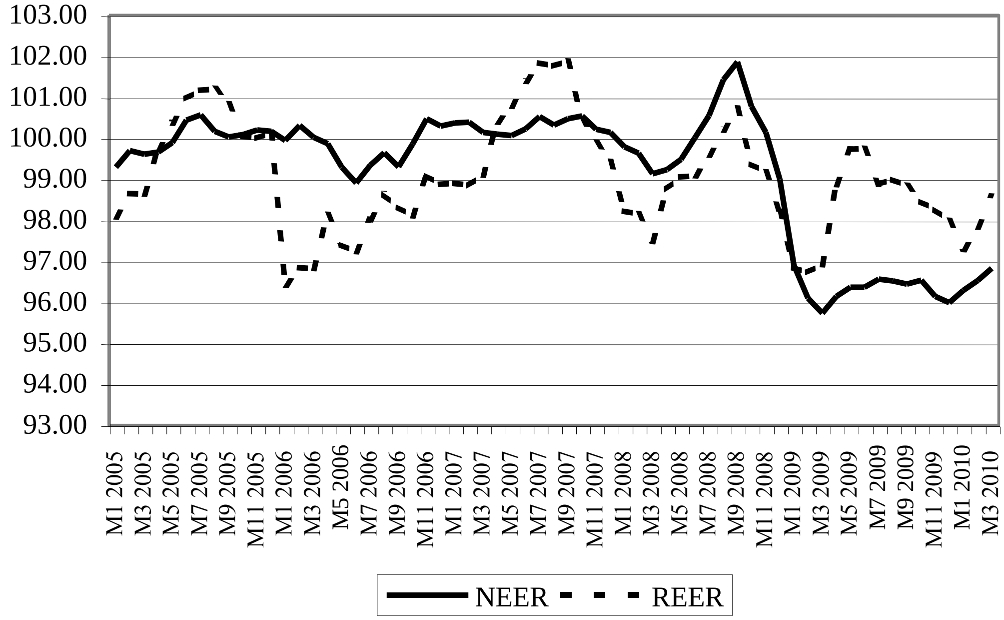
In total, twenty trade partners were selected in order to calculate these indices. The rule adopted was that in total the BH trading partners should have at least 85% participation in total foreign trade exchange with BH. These countries are: Austria, Czech Republic, France, Germany, Hungary, Italy, Lithuania, Poland, Slovenia, Holland, Croatia, China, UK, Macedonia, Romania, Russian Federation, USA, Serbia, Switzerland and Turkey. In total, during the period from 2002 to 2009 they account for 88.3% of BH's foreign trade by value. Their variation year by year is between 86.7% and 89.8%, with a very small standard deviation between 0.008 and 0.016.

The following two graphs (4.1 and 4.2) shows movements of the real and nominal effective exchange rate indices for the KM compared to the base period. In analysing the movements in the NEER it has to be kept in mind that these changes were mainly the result of changes in the exchange rate between the Euro (BH's anchor currency) and the currencies of the main trading partners (six of which have the euro as their domestic currency).

Graph 4.1: Nominal effective exchange rate and RPI based REER (April.2002=100) for the period from April 2002 to December 2007

Source: IFS, CBBH, author's calculation, decline is a sign of appreciation and rise a sign of depreciation

Graph 4.2: Nominal effective exchange rate and CPI based REER (2005=100) for the period from January 2005 to March 2010




Source: IFS, CBBH, author's calculation, decline is a sign of appreciation and rise a sign of depreciation

Graph 4.1 refers to the period April 2002 to December 2007. It displays the NEER and the RPI based REER and cannot be updated, since the RPI time series was discontinued in January 2008. Graph 4.1 shows a significant appreciation of NEER in the observed period, which settles at 92% at the end of 2004 and stays at around this level until the end of 2007. At the end of 2007 the NEER indicates a very slight decrease in the nominal effective exchange rate index. This decrease also indicates the appreciation of the KM against the currencies of its main trading partners in the given time period. In December 2007 (measured by the currencies of eleven main trading partners of BH) the NEER was 13 basis points below the level in November and 18 basis points above the 2006 average. This suggests that NEER was at much the same level from 2005 to 2007.

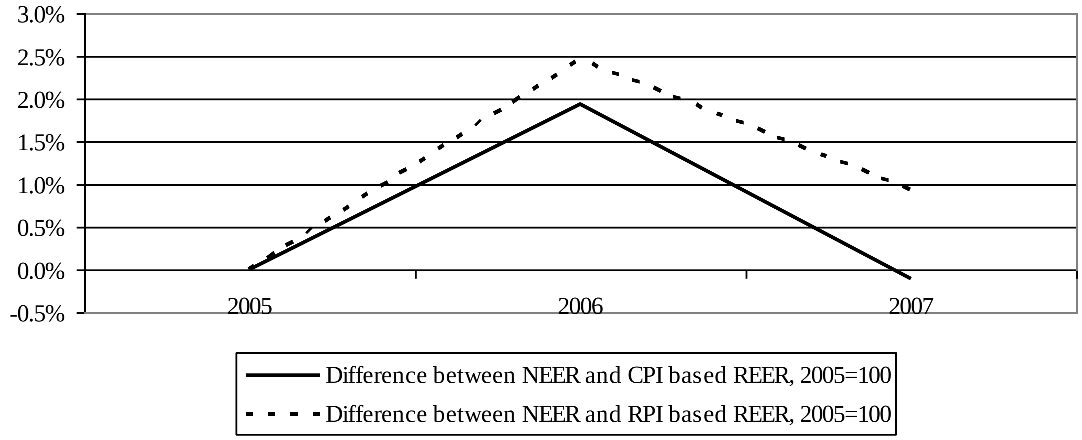
The same graph indicates the more variable behaviour of the RPI based REER. The decrease in the REER index shows a smaller appreciation of the real effective KM exchange rate at the end of 2007[34], which is an indicator of a small loss in price competitiveness of the domestic economy in the markets of the main trading partners. The beginning and end of the series appears to be more or less at the same level. In December 2007, the REER was 72 basis points below its level in November and 61 basis points above its 2006 average. The most obvious decrease in the REER index was in January 2006, which is likely to have been a result of VAT implementation and a slowdown in economic activity due to seasonal factors. The previous sales tax was calculated based on different rates, where some products were exempt (i.e. reproduction materials, raw materials, equipment, spare parts, food, medicines) and some taxed at a 20% rate (i.e. oil and oil derivatives). Hence this overall decrease could be due to the new tax regime, which is more expensive for BH's firms, as well as the overall slowdown of economic activity observed in every first quarter of BH's REER due to the holiday season. The change in price competitiveness is very small. Hence, unless the relevant price elasticities are very large, any real economy effects would likely to be small.

Graph 4.2 refers to the period from January 2005 to March 2010. It displays the NEER and the CPI based REER. Graph 4.2 indicates trends in NEER and REER based on the CPI. These time series are a bit shorter than those in graph 4.1 and their behaviour is based on a different base year selection. It can be noticed that until mid 2008 there was little variation in the NEER, though after that a movement toward a lower level can be noticed. It seems that the NEER at the end of 2008 settled at 4 percentage points below its value in the base year and stayed at this level until the beginning of 2010. The REER series is generally moving with the NEER but with a bit more variation, though within the range of +/- 3 percentage points. REER looks like a stationary series with some short-run variation but long-run stability. The end values of the NEER and CPI based REER in 2010 show a small depreciation. The latter means that the KM is depreciating compared to the average of main trading partners as a reflection of changes in the exchange rate between the EURO and the currencies of the main trading partners. Overall it appears that the REER is a mean reverting. In Graph 4.3 the annual differences between the two series

[34] In order to calculate REER data on consumer price index were used, published by IMF in its monthly publication IFS.

from the above Graphs, 4.1 and 4.2 are ploted. As can be seen from Graph 4.3 the two series track each other almost perfectly in the years in which they overlap.

Graph 4.3: The annual difference between NEER and CPI based REER, and NEER and RPI based REER




Source: author's calculation

Longer time series availability of NEER and REER indexes will provide us with an opportunity for a more detailed analysis of Bosnia and Herzegovina's competitiveness. The calculated NEER enables us to see how much the KM has depreciated or appreciated relative to the currency of each main trading partner individually and to a weighted average of these currencies. REER measures change in competitiveness relative to the base year, rather than the level of competitiveness at any given time. One problem in researching Bosnia and Herzegovina is the non-availability of long time series of comparable data. As Bosnia and Herzegovina statistics improve, so more opportunities for model development will also be created for the country (BH).

### 4.2.2 Fundamental variables and empirical application of Fundamental Equlibrium Exchange Rate

Discussion in Chapters 2 and 3 established that identification of the fundamentals that have an effect on macroeconomic imbalances is not an easy task. Egert et al. (2006) argue that the use of different fundamentals may be a result of different theoretical frameworks or may simply reflect ad hoc choices. Williamson (1994) makes a comparison of the alternative approaches and concludes that the relevant fundamentals for equilibrium exchange rate estimation are the terms of trade, tariffs and trade restrictions. Inclusion of these fundamentals means that the long-term relationship between the real exchange rate and its fundamentals can be established (Williamson, 1994). Thus, the process of estimation of the equilibrium exchange rate has to involve a clear theoretical framework, some judgment and an adequate empirical specification.

Akram et al. (2003) argue that the fundamental equilibrium exchange rate can be used as a benchmark for assessing the consistency of the level of the real exchange rate with the achievement of internal and external balance. In their model FEER is defined as the result of the simultaneous attainment of internal and external equilibrium. Hence in order to employ the FEER, two key issues should be addressed. *The first* is what determines the potential output growth associated with low inflation; and *the second* is the sustainability of the current account. As already discussed in section 2.4.2, in the Western Balkans (WB) actual output might be close to potential output given the presence of obsolete and insufficient capital. Much capital that continues to exist physically cannot - to a greater or lesser extent - be used profitably at existing wage rates. Hence, if a large part of the capital stock in transitional economies is obsolete, there may not be sufficient capital stock to support additional profitable production at existing wage rates, even after the initial transition recession. Here diminishing marginal returns to labour is assumed: meaning that if additional labour is added to the existing employment, then productivity is likely to fall below the existing wage rate, which is assumed to be downwardly inflexible in spite of mass unemployment (section 1.3.1). Wages are not falling to clear the labour market in these economies, partly because of the strong presence of the informal economy, which is setting a floor for the wages in the formal economy. Thus the gap between actual and potential output in the transition economies of the WB could be very small, even in the presence of very high rates of unemployment. Hence, it can be hypothesised that without additional useful capital, an addition of one unit of labour may lower productivity. If average productivity declines than unit labour cost rise with a corresponding loss of price competitiveness.

### 4.2.3 Further empirical considerations

There are some differences between the empirical approaches to FEER that are important to address. The main difference is whether models utilise a single equation or structural internal and external balance equations. Single equation models are usually employed when estimating equilibrium exchange rates (EER) for developing and transition economies. The advantage of this approach is that it overcomes the limited availability of time-series data which constrains the use of the Williamson (1994) methodology, based on large structural macro-econometric models. Structural equations are quite difficult to estimate for WB countries due to limited availability of the time-series data, as well as structural breaks incorporated in the data.

Influential work in this area is Edwards (1989, 1994). His 1989 work on a fully optimising model of the equilibrium real exchange rate is briefly discussed in section 2.4.2. Here his model from 1994 is introduced, and it relates to the choice of macroeconomic policy in a small open economy. Motivation for the model was a gap in the literature on the empirical analysis of the forces that affect real exchange rate behaviour in developing countries. In summary, the model is based on exchange rate behaviour analysis. Edwards (1994) argues that monetary and fiscal policy affect the exchange rate in the short run, while in the long run fundamentals are affecting the sustainability of the equilibrium exchange rate. Disequilibrium occurs if monetary and fiscal policies are not consistent with the chosen nominal exchange regime. This can be resolved by adjusting one or other policy based on the nature and the size of the above instability, the nominal exchange rate policy that is followed, as well as the stock of foreign reserves. The complete model is constructed from sixteen equations with perfect foresight assumed for the country that produces exportable and nontradable goods and consumes imported and the nontradable goods, with its residents holding both domestic currency and foreign currency. In the model it is assumed that the private sector has inherited a stock of foreign currency. The government in the model consumes imported goods, nontradable goods and it uses nondistortionary taxes and domestic credit for its financing. There are some capital flows in and the out of the country. The nominal exchange rate is assumed to be subject to a fixed exchange rate regime with a freely floating exchange rate for financial transactions (this is introduced in the model since most developing economies have developed a grey market for financial transactions). The price of exportable goods is assumed to be fixed in the foreign currency and equal to unity. Equilibrium is attained when four conditions holds simultaneously: the external sector is in equilibrium; the nontradable market clears; fiscal policy is sustainable; and portfolio equilibrium holds (Edwards, 1994). Higher import tariffs cause real equilibrium exchange rate appreciation, as well as additional consumption of nontradable goods. Changes in the terms of trade have an ambiguous effect on the real equilibrium exchange rate, because their improvement can result in an equilibrium real appreciation or depreciation, while capital inflows cause an equilibrium real exchange rate appreciation. Non-sustainable expansionary macro-economic policies generate a loss of foreign reserves, a current account deficit, an increased spread between the free and the fixed nominal rates and a real exchange rate overvaluation.

This discussion of Edwards (1994) was required in order to take into consideration how many variables are necessary in order to build a similar small structural equations model. This is quite difficult or almost impossible, since the WB countries have limited time-series data and BH does not even have tradable and nontradable sector data available. Since there is insufficient data to construct such a small structural equations model, what can be applied is a single equation model.

Abdih and Tsangarides (2010) model the fundamental equilibrium exchange rate by following Edwards (1989), who defines the equilibrium exchange rate as the simultaneous attainment of internal and external equilibrium. The main reason why Abdih and Tsangarides (2010) applied their model was in order to assess whether changes in the fundamentals impact the real effective exchange rates of the two CFA franc zones (Central and West Africa) with fixed exchange rate regimes. By separating the factors that can permanently affect the long-run equilibrium real exchange rate and the short-run misalignment of the nominal exchange rate, they used their model to describe nominal misalignment that results from policy variables. The model results in a long-run behaviour of the equilibrium exchange rate that can be explained by fluctuations in the terms of trade, government consumption, investment, openness and productivity.

This empirical work, applied a single equation approach, following Abdih and Tsangarides (2010) for the fundamental variables selection. Some modifications are made in terms of variable specification and econometric modelling. The main difference is that Abdih and Tsangarides (2010) applied a vector autoregression (VAR) model while, due to limited time series availability, this chapter applies the two-step Engle-Granger (1987) cointegration and error-correction approach (Baffes et al.,1997; Kemme and Roy, 2006). These are discussed next together with the estimation procedure.

### 4.2.4 Estimation procedure for the equilibrium exchange rate

There are a few deviations from Abdih and Tsangarides (2010). First, the focus is on a single country equilibrium exchange rate estimation while, Abdih and Tsangarides (2010) estimate a VAR model to focus on the two CFA Franc regions. In terms of the fundamental variable specification there is a need to make some modifications due to limited time-series data for BH. Since BH has not had a population survey since 1991; hence, the use of available quarterly GDP per capita, which is for BH produced by the Central Bank of Bosnia and Herzegovina (CBBH). Another deviation from Abdih and Tsangarides (2010) is the inclusion of the terms of trade: the ratio of the price of exports to the price of imports. Data on export prices and import prices were not available for BH, thus the terms of trade[35] had to be calculated. The available data on gross capital formation are only in yearly frequency and for the period 2004 to 2008, so FDI is used as a proxy. The remaining fundamental variables are the same as in Abdih and Tsangarides (2010): REER; government consumption; and trade controls. In the model, the proxy for exchange controls is the variable openness[36], the same as in Abdih and Tsangarides (2010). As trade controls are reduced, total trade is expected to increase. Thus, the resulting increased demand for imports will lead to external and internal imbalances that require depreciation to correct (so the expected sign is negative, given the supply side

[35] See section on data 4.2.5 and Kemme and Roy (2006)

[36] Openness of the economy is measured as the sum of exports and imports over GDP. Taking into account the trade and services flows over the estimated GDP.

weaknesses and corresponding lack of response to new export opportunities, discussed previously).

A transfer from the rest of the world will always result in an equilibrium real appreciation. Conversely, since in developing countries investment may have a high import content, a rise in the investment share of GDP could initially shift spending towards imported traded goods and thus depreciate the REER, which suggests that the expected sign is negative. FDI basically measures international financial flows and the FDI share of GDP is used as a proxy for the missing investment share of GDP as it can be argued that FDI also represents a sort of transfer from the rest of the world. International financial flows are not registering the re-export of imports so the expected sign is ambiguous given the two offsetting effects. Finally the effect of changes in government consumption will depend on the composition of consumption. The composition of changes in government spending will have an effect on the long-run equilibrium depending on whether government is currently spending more on tradable or nontradable goods. Abdih and Tsangarides (2010) stress that if government consumption falls predominantly on nontradables it will result in an equilibrium appreciation; if however it falls mainly on tradables it will result in equilibrium depreciation. Government demand for tradables increases the supply of domestic currency on the foreign exchange market, thereby tending to depreciate the domestic currency. Ceteris paribus, this should increase price competitiveness. The opposite applies if government consumption falls predominantly on nontradables. So its affect on the equilibrium exchange rate is ambiguous.

The last included variable in the model is productivity. In regards to productivity, Abdih and Tsangarides (2010) stress that productivity increase captures the Balassa-Samuelson effect and hence, causes a REER appreciation, since they define productivity in terms of tradables versus nontradables of one county. Since data on tradables and nontradables are not available, productivity is measured as per capita GDP relative to main trading partners. Based on discussion in section 4.2.2 in the Western Balkans, actual output might be close to potential output given the presence of obsolete and insufficient capital. The gap between actual and potential output in the transition economies of the WB could be very small, even in the presence of very high rates of unemployment. Hence, it can be hypothesised that without additional useful capital, an addition of one unit of labour may lower productivity. If average productivity declines then unit labour cost rise with a corresponding loss of price competitiveness. On the other hand productivity increase lowers unit labour costs and so should increase price competitiveness.

Next the estimation procedure is explained:
First, the REER is calculated based on specification (4.5) discussed in section 4.2 above:

$$REER_t = \sum_i \frac{w_i P^*_{it}}{P_t} NEER_t$$

In the model, the REER is the dependant variable. Kemme and Roy (2006) also used the REER in order to estimate the equilibrium exchange rate. The main difference between their calculation and the one discussed in section 4.2 is in the treatment of the nominal exchange rate. Kemme and Roy (2006) used indirect quoting (i.e. EUR/KM) to express the nominal exchange rate while in specification (4.5) direct quoting (i.e. KM/EUR) is used. To overcome this difference, equation (4.5) is treated as inverse (1/REER) in the model. The interpretation of the REER (inverse expression) is now different. An increase in the index of REER is an indicator of appreciation (i.e. loss of price competitiveness) and a decrease in the index of REER is an indicator of depreciation (i.e. gain of price competitiveness).

In order to estimate the equilibrium real effective exchange rate in traded and nontraded goods markets the following fundamentals are applied, with the expected signs reported.

$$F = (\underset{-}{LN(OPEN)}, \underset{\pm}{LN(GCGDP)}, \underset{\pm}{LN(INVEST)}, \underset{-}{LN(PROD)}, \underset{\pm}{LN(TOT)}) \tag{4.6}$$

Where, OPEN is specified as the ratio of the sum of exports and imports to GDP; GCGDP is the ratio of government consumption to GDP; INVEST is the ratio of foreign direct investment to GDP; PROD is per capita GDP relative to the main trading partners normalised to, respectively, 1 in 2003 (REER based RPI) and 2005 (REER based CPI); and TOT is terms of trade.

Now following Baffes et al. (1997) and Kemme and Roy (2006), the real equilibrium exchange rate (LN $REER_t^{eq}$) is specified as:

$$\text{LN}\, REER_t^{eq} = \beta' F_t^p \tag{4.7}$$

where $F_t^p$ represents the permanent values of fundamentals (where $F_t^p$ is a 1xk vector of k variables), and $\beta'$ represents the long-run parameters to be estimated (where $\beta'$ is a kx1 vector of k coefficients). The equilibrium exchange rate is an unobservable variable so it has to be estimated. In addition, both $F_t^p$ and $\beta$ must be estimated separately and then brought together in (4.7).

To estimate $\beta$, it is necessary to find a model that is consistent with equation (4.7). Thus the two-step Engle-Granger (1987) cointegration and error-correction mechanism will be applied (Baffes et al., 1997). This method applies OLS (ordinary least squares) to a static regression relating the levels of the REER to its fundamentals, thus the first step is to estimate $\beta$ by relating actual values of the REER to its fundamentals. In the model the $\beta$ s are estimated by the following equation:

$$\begin{aligned} REER\_LN_t &= \beta_0 + \beta_1 * OPEN\_LN_t + \beta_2 * INVEST\_LN_t + \beta_3 * GCGDP\_LN_t \\ &+ \beta_4 * PROD\_LN_t + \beta_5 * TOT\_LN_t + u_t \end{aligned} \tag{4.8}$$

Where the $\beta$ s are the parameters to be estimated and $u_t$ is assumed to be a serially uncorrelated random error.

Cointegration is an important condition for the existence of the relationship given in equation (4.8), meaning that the fundamental variables are stationary in first differences (an I(1) process) and that the residuals of equation (4.8) follow an I(0) process, meaning they are a mean-zero stationary random variable. The second step of the Engle-Granger method is given by equation (4.9) in which the lagged residuals from static regression (4.8) are used as the error correction mechanism:

$$D(REER\_LN_t) = \beta_0 + \beta_1 * D(OPEN\_LN_t) + \beta_2 * D(INVEST\_LN_t) + \beta_3 * D(GCGDP\_LN_t) + \beta_4 * D(PROD\_LN_t) + \beta_5 * D(TOT\_LN_t) + \beta_6 * ECM(-1) + v_t \quad (4.9)$$

where D stands for the first-difference of the corresponding variables and captures the short-run effects of the fundamentals, ECM(-1) is an error-correction mechanism and $V_t$ is an uncorrelated random error.

If there is a real undervaluation of the real effective exchange rate then the error correction term is expected to be negative and offsetting real appreciation should begin in the next period, thereby self-correcting the undervaluation. The opposite applies if there is a real overvaluation. A negative and significant value between zero and minus one indicates the presence of an adjustment mechanism; hence, via the Granger Representation Theorem, the presence of a long-run cointegrating relationship.

To estimate the $F_t^p$ in equation (4.7) (the permanent component), the most commonly used approaches are Beveridge-Nelson decomposition (B-N), the HP filter and moving averages. In order to estimate the permanent component of the fundamentals the same approach as Edwards (1994) and Baffes et al. (1997) is employed, hence by applying centred moving averages[37] of the fundamentals and also by obtaining fitted values directly from equation (4.8). These approaches are applied to small samples due to data limitations. Thus, as a robustness check, the HP filter[38] is also going to be applied on all fundamental variables based on the recommended smoothing factor, lambda 1600, for quarterly data. The B-N approach is not applied to the BH data since there are only twenty observations and the B-N approach is based on an underlying ARIMA specification, which is not a suitable method for small sample data[39].

[37] The moving averages approach will mechanically smooth the data and the same is true with the HP filter.
[38] Abdih and Tsangarides (2006) applied the HP filter as a robustness check as well, but they used an average of five smoothing factors since their data frequency was yearly.
[39] The B-N decomposition is particularly problematic in small samples, where the results can be highly sensitive to the underlying ARIMA specification and can often exacerbate turning points in economically implausible ways (Baffes et al. 1997:20). Small samples also could be misidentified as nonstationary, in

The equilibrium real exchange rate is then found by substituting the vector of the permanent fundamentals $F_t^p$ into equation (4.7) along with the estimates of $\beta$ obtained from equation (4.8). The final calculation is misalignment, which will indicate the difference between the observed real effective exchange rate and its estimated equilibrium level:

$$M_t = \text{LN}\, REER_t - \text{LN}\, REER_t^{eq} \qquad (4.10)$$

where $REER_t^{eq}$ is the long-run equilibrium real effective exchange rate and $REER_t$ is the actual real effective exchange rate. If M>0 this will be an implication that the currency is overvalued. When misalignment is calculated then it can be analysed whether BH's currency was overvalued or undervalued in 2007 and analyse its movements prior to that year.

4.2.5 Data

The quarterly data are the authors' own calculations based on data series provided by the CBBH. Two different time series were used in order to calculate the dependant variable, the REER. These time series are: the retail price index (RPI); and the consumer price index (CPI). Their frequency is monthly. As explained in section 4.2 the Retail Price Index was available until December 2007. In 2008 the CBBH discontinued this series, since the statistical agencies of the Federation and Republika Srpska stopped producing this index. In January 2008 the BH Agency for Statistics started to produce the Consumer Price Index (CPI) with a monthly frequency from January 2005. In order to check the robustness of the result due to small sample availability, equation (4.5) was calculated based on both RPI and CPI time series. That is why two FEER models were estimated and named *model 1* (REER based RPI) and *model 2* (REER based CPI). In section 4.2.6 the empirical results are presented. *Model* 1 refers to the period from January 2003 to December 2007, since the first available observation for government consumption is for

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which case B-N decomposition if applied will bias estimates due to fact that it extracts a component that is not there.

quarter one in 2003. *Model 2* refers to the period from January 2005 to September 2008. Data in both models are quarterly.

Table 4.1: List of variables:

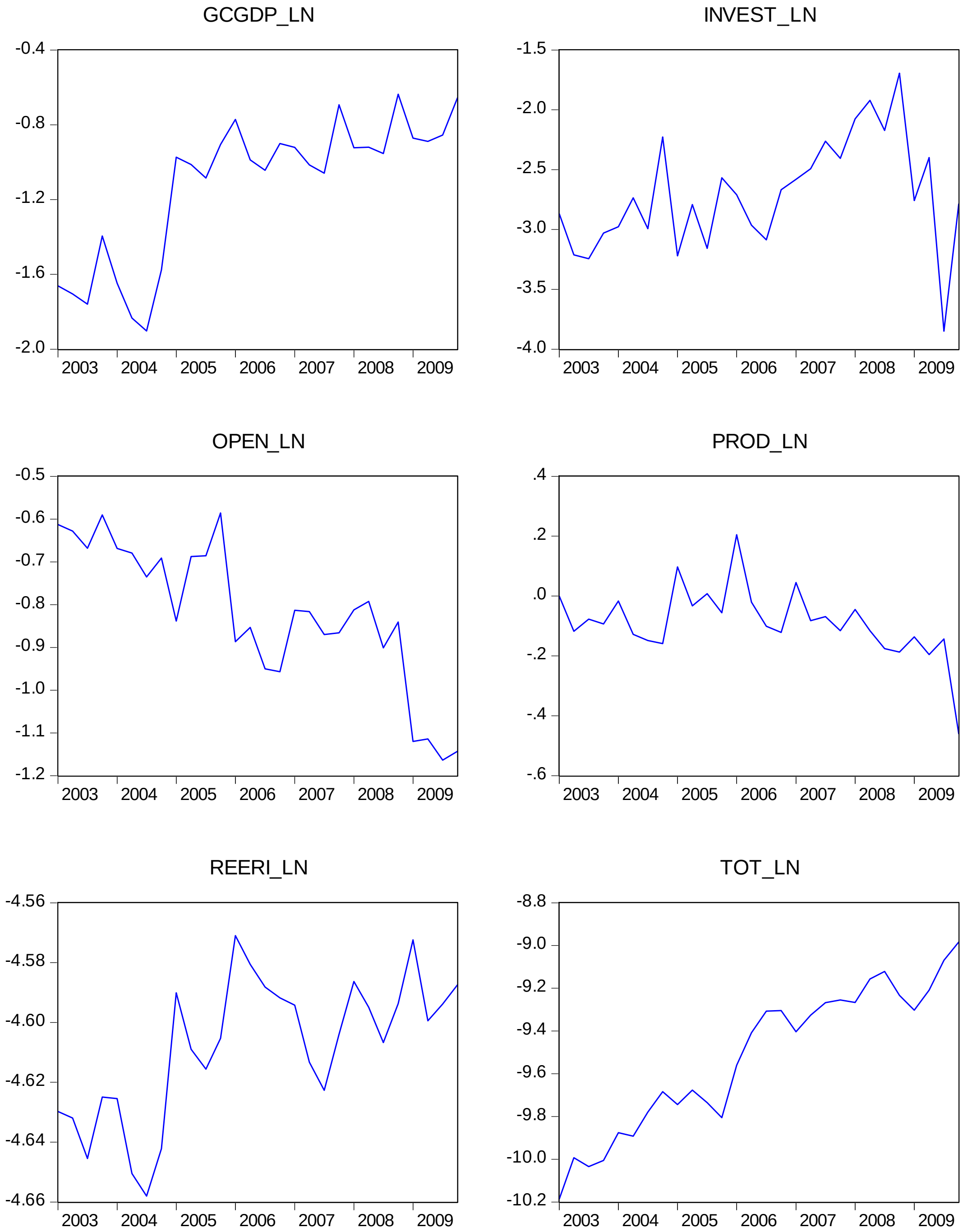
| | |
|---|---|
| REER | is the actual real effective exchange rate for BH. An increase in the index of REER is an indicator of appreciation (i.e. loss of price competitiveness) and a decrease in the index of REER is an indicator of depreciation (i.e. gain of price competitiveness). |
| $REER^{eq}$ | is the long-run equilibrium real effective exchange rate |
| OPEN | OPEN is specified as the ratio of the sum of exports and imports to GDP |
| GCGDP | is the ratio of government consumption to GDP |
| INVEST | is the ratio of foreign direct investment to GDP |
| PROD | is per capita GDP relative to main trading partners normalised to 1 in 2003. |
| TOT | is terms of trade. Data on tradables and nontradables are not available for BH and terms of trade are calculated as TOT = (EX/FGDP)/(IM/GDP)[40], where EX is BH exports, GDP is nominal GDP, IM is BH imports, and FGDP is the sum of the top twenty major BH export recipients GDP. |
| ECM | error correction mechanism |
| M | is misalignment between actual and long-run equilibrium REER |

### 4.2.6 Empirical results for Bosnia and Herzegovina

Before undertaking any econometrics first the data (Graph 4.4) is plotted, to get a feeling for what ought to be expected. All variables are in natural logarithms.

[40] Kemme and Roy (2006) used this approach for Russia, since TOT was not available.

Graph 4.4: Data plot




Source: author's own calculation (for data source see section 4.2.5)

Based on the data plots, the beginning and end of each series appear to be at rather different levels. Considerable short-run variation can be noticed. Stationary series tend to return to its mean value and fluctuate around it within a more or less constant range, while in non-stationary time series shocks never die out, hence their mean and variance change with time. To the effect of on balance most series appears to be non-stationary. The usual methods for eliminating trends are differencing and detrending, where detrending means regressing a variable on time and saving the residuals. If a series contains a unit root it can be made stationary by differencing.

Above quarterly data on openness, investment, government consumption, terms of trade and productivity were used in both models. All variables are in natural logarithms. The results from model 1 are reported in Tables 4.2, 4.3 and 4.4, while the results for model 2 are reported in Tables 4.5, 4.6 and 4.7. Results and diagnostic tests are discussed after these tables and in Appendix 4.1.

The PP and ADF unit root tests suggests that all variables are integrated I(1) in levels i.e. stationary in first differences, as it can be seen from the test reported in (Table 4.2) for model 1.

Table 4.2: Order of integration for fundamental variables in model 1, indicated by ADF and PP unit root tests

| *Variables (levels)* | ADF | PP | *Variables (differences)* | ADF | PP |
|---|---|---|---|---|---|
| REER_LN | I(0)* | I(0) | D(REER_LN) | I(1)** | I(1)** |
| OPEN_LN | I(0) | I(0) | D(OPEN_LN) | I(1)** | I(1)** |
| INVEST_LN | I(0) | I(0)* | D(INVEST_LN) | I(1)** | I(1)** |
| GCGDP_LN | I(0) | I(0)** | D(GCGDP_LN) | I(1)** | I(1)** |
| PROD_LN | I(0) | I(0)** | D(PROD_LN) | I(1)** | I(1)** |
| TOT_LN | I(0) | I(0) | D(TOT_LN) | I(1)** | I(1)** |

Note:
ADF is Augmented Dickey-Fuller test and PP is Phillips-Peron test.
In each case, Ho: the series is characterised by unit root. Significant result suggests rejection.
** Significant at 1% level or better
* Significant at 5% level or better

As already discussed in section 3.4.2, a likely weakness of the unit root tests is only 20 quarterly observations. In applied work the main criticism is that the power of the test is low if the process is stationary but with a root close to the non-stationary boundary; also it is difficult to distinguish between trend and drift, particularly in small samples. A low power basically implies that a series may be stationary but the Dickey-Fuller test suggests a unit root process. One solution to low power is to increase the number of observations. Since longer time series data are available for all the series since 2003 except for RPI based REER, it was decided to check the level of integration of each individual series to see if they follow a unit root process. Appendix 4.1 provide information on the longest sample size available for each series and ADF and PP test results. It was found that all variables are integrated I(1) in levels i.e. stationary in first differences. The results are consistent with the view that most macroeconomic variables are non-stationary in levels but stationary in first differences (Nelson and Plosser, 1982).

Estimated cointegrated and error-correction regressions can be seen from Table 4.3 for model 1 (RPI based REER is the dependent variable). Diagnostic results for model 1 can be seen from Table 4.4.

Table 4.3: Long run and short run estimation - model 1

| ***Model 1:*** | Coefficient estimates (t-statistics) | | | | | | |
|---|---|---|---|---|---|---|---|
| REER (dependent variable) | | | | | | | |
| Variable | Cointegrated Regression (static OLS) | | | Variable | Error Correction Model (dynamic OLS) | | |
| OPEN_LN | -0.147 | *** | (-5.32) | D(OPEN_LN) | -0.079 | ** | (-2.75) |
| INVEST_LN | -0.000 | | (-0.01) | D(INVEST_LN) | -0.002 | | (-0.70) |
| GCGDP_LN | 0.050 | *** | (3.90) | D(GCGDP_LN) | 0.052 | *** | (6.79) |
| PROD_LN | -0.112 | *** | (-3.03) | D(PROD_LN) | -0.026 | | (-0.65) |
| TOT_LN | -0.102 | *** | (-4.86) | D(TOT_LN) | -0.001 | | (-0.04) |
| C | -5.663 | *** | (-24.63) | C | -0.003 | * | (-1.89) |
| | | | | ECM(-1) | -0.623 | ** | (-2.74) |
| *Diagnostic tests for cointegrated regression* | | | | *Diagnostic tests for error correction model:* | | | |
| R-squared | 0.83 | | | R-squared | 0.90 | | |
| Adjusted R-squared | 0.77 | | | Adjusted R-squared | 0.86 | | |
| S.E. of regression | 0.00 | | | S.E. of regression | 0.00 | | |
| F-statistic: | 13.58 | | | F-statistic: | 13.58 | | |
| Prob (F-statistic) | 0.00 | | | Prob (F-statistic) | 0.00 | | |
| Durbin-Watson stat | 1.64 | | | Durbin-Watson stat | 2.08 | | |
| *ADF test for residual* | | | Prob. | | | | |
| test statistic: | -3.451 | (0)** | 0.022 | | | | |
| test critical values: | | | | | | | |
| 1% | -3.832 | | | | | | |
| 5% | -3.030 | | | | | | |
| 10% | -2.655 | | | | | | |

Note:
The symbols** and *** denote rejection of the null hypothesis at the 5% and 1% critical values, respectively.

Table 4.4: Model 1 diagnostic tests (p - values)

| Estimation technique: | | Cointegrating | ECM |
|---|---|---|---|
| Hypothesis | Diagnostic tests: | static OLS | dynamic OLS |
| | | 1 | 2 |
| Ho: normality | Jarque-Bera | 0.66 | 0.52 |
| Ho: no serial correlation | Godfrey LM Test | 0.68 | 0.35 |
| Ho: homoskedasticity | Breusch-Pagan-Gofrey | 0.77 | 0.54 |
| Ho: model has no omitted variables | Ramsey RESET Prob>F | 0.27 | 0.50 |
| Structural stability | CUSUM<br>CUSUM of squares | Yes<br>Yes | Yes<br>Yes |
| observations | | 20 | 19 |

Note:
The null hypothesis, in each case, is that the corresponding assumption of OLS regression holds. In each case, the p-value suggests non-rejection. Structural stability is indicated as "Yes" if CUSUM and CUSUM of squares tests are within the 5% significant lines.

The estimated results from the cointegration regressions (Table 4.3) are consistent with orthodox economic theory; namely, the estimated coefficients have the expected signs, though in the case of government consumption and FDI the anticipated signs were ambiguous. The estimated results are statistically and economically significant except for investment. The Error Correction Model includes a negative, highly significant and sensibly-size adjustment coefficient on the lagged error-correction mechanism (ECM), which supports the hypothesized presence of a long-run cointegrating relationship between the identified "fundamentals". Diagnostic test findings (Table 4.4) indicate that no major specification error exists. Besides above presented diagnostic tests on structural stability if the maintained model is valid, the recursive residuals will also be independently and normally distributed with zero mean and constant variance with plus and minus two standard errors at each point. In model 1 a plot of the recursive residuals is about the zero line (Appendix 4.1, model 1). If residuals are found outside the standard error bands that suggests instability in the parameters of the equation. It can be concluded that stability in the parameters is indicated by the recursive residuals plot based on model 1, cointegrated equation specification (see also Appendix 4.1, model 1). The economic interpretation of the estimated equations is provided after the model 2 results (Tables 4.5, 4.6 and 4.7).

In model 2 PP and ADF unit root tests suggests that all variables are integrated I(1) in levels or stationary in first differences, as can be seen from the test results reported in Table 4.5 one has to be careful with the interpretation of the model 2 results, since the data sample has only fifteen observations. Unit root tests suggests that the fundamental variables are stationary in first differences (an I(1) process) and that the residuals (Appendix 4.1, model 2) follow an I(0) process, meaning they are mean-zero stationary random variable. However the critical values and probabilities may not be accurate for such a small sample.

Table 4.5: Order of integration for fundamental variables in model 2, indicated by ADF and PP unit root tests

| *Variables (levels)* | ADF | PP | *Variables (differences)* | ADF | PP |
|---|---|---|---|---|---|
| REER_LN | I(0)* | I(0) | D(REER_LN) | I(1)* | I(1)* |
| OPEN_LN | I(0)** | I(0) | D(OPEN_LN) | I(1)** | I(1)* |
| INVEST_LN | I(0)* | I(0) | D(INVEST_LN) | I(1)* | I(1)* |
| GCGDP_LN | I(0) | I(0)** | D(GCGDP_LN) | I(1)** | I(1)** |
| PROD_LN | I(0) | I(0)* | D(PROD_LN) | I(1)** | I(1)** |
| TOT_LN | I(0) | I(0) | D(TOT_LN) | I(1)* | I(1)* |

Note:
ADF is Augmented Dickey-Fuller test and PP is Phillips-Peron test.
In each case, Ho: the series is characterised by a unit root. Significant result suggests rejection.
** Significant at 1% level or better
* Significant at 5% level or better

The estimated cointegrated and error-correction regressions can be seen in Table 4.6 for model 2 (FEER based CPI). Diagnostic results for model 2 can be seen in table 4.7.

Table 4.6: Long run and short run estimation - model 2

| ***Model 2:*** | Coefficient estimates (t-statistics) | | | | | |
|---|---|---|---|---|---|---|
| REER (dependent variable) | | | | | | |
| Cointegrated Regression | | | | Error Correction Model | | |
| Variable | (static OLS) | | | Variable | (dynamic OLS) | |
| OPEN_LN | -0.095 | ** | (-3.38) | D(OPEN_LN) | -0.105 ** | (-2.66) |
| INVEST_LN | -0.017 | ** | (-4.71) | D(INVEST_LN) | -0.009 ** | (-4.00) |
| GCGDP_LN | 0.020 | | (1.29) | D(GCGDP_LN) | 0.009 | (1.12) |
| PROD_LN | 0.026 | | (-3.03) | D(PROD_LN) | 0.030 | (1.50) |
| TOT_LN | -0.025 | | (-1.29) | D(TOT_LN) | -0.006 | (-0.16) |
| C | -4.954 | *** | (-23.12) | C | -0.001 | (-1.89) |
| | | | | ECM(-1) | -1.468 *** | (-2.74) |
| *Diagnostic tests for cointegrated regression* | | | | *Diagnostic tests for error correction model:* | | |
| R-squared | 0.85 | | | R-squared | 0.95 | |
| Adjusted R-squared | 0.77 | | | Adjusted R-squared | 0.91 | |
| S.E. of regression | 0.00 | | | S.E. of regression | 0.00 | |
| F-statistic: | 10.48 | | | F-statistic: | 23.71 | |
| Prob (F-statistic) | 0.00 | | | Prob (F-statistic) | 0.00 | |
| Durbin-Watson stat | 2.19 | | | Durbin-Watson stat | 1.15 | |
| *ADF test for residual* | | | Prob. | | | |
| test statistic: | -3.857 | (0)** | 0.013 | | | |
| test critical values: | | | | | | |
| 1% | -4.004 | | | | | |
| 5% | -3.099 | | | | | |
| 10% | -2.690 | | | | | |

Note:
The symbols** and *** denote rejection of the null hypothesis at the 5% and 1% critical values, respectively.

Table 4.7: Model 2 diagnostic tests (p - values)

| Estimation technique: | | Cointegrating | ECM |
|---|---|---|---|
| Hypothesis | Diagnostic tests: | static OLS | dynamic |
| | | 1 | 2 |
| Ho: normality | Jarque-Bera | 0.51 | 0.81 |
| Ho: no serial correlation | Godfrey LM Test | 0.61 | 0.44 |
| Ho: homoskedasticity | Breusch-Pagan-Gofrey | 0.45 | 0.64 |
| Ho: model has no omitted variables | Ramsey RESET Prob>F | 0.24 | 0.57 |
| Structural stability | CUSUM<br>CUSUM of squares | Yes<br>No | Yes<br>Yes |
| observations | | 15 | 14 |

Note:
The null hypothesis, in each case, is that the corresponding assumption of OLS regression holds. In each case, the p-value suggests non-rejection. Structural stability is indicated as "Yes" if CUSUM and CUSUM of squares tests are within the 5% significant lines.

The estimated results from the cointegration and the error-correction regressions (Table 4.6) are not all statistically and economically significant in these regressions. The sample size is very small, which could be a reason for such results. Diagnostic test findings (Table 4.7) indicate that no major specification error exists except for the stability test results (see also: Appendix 4.1, model 2 on recursive residuals and cusum tests) and the DW test which suggests a problem with first order serial correlation in the residuals. However Godfrey LM Test suggests no serial correlation in the residuals.

Next the economic interpretation of the estimated equations in Tables 4.3 (model 1) and 4.6 (model 2) is discussed:

- The lagged ECM measures the speed of adjustment of the REER to its equilibrium level. The adjustment speed estimated for BH model 1 is -0.62 and for model 2 is -1.41. The error-correction coefficients have the expected sign in both models. In model 1 the coefficient is below one, which suggests stability of the estimated model. The error-correction coefficient of model 2 also has an expected sign but it is above one which suggests potential instability. Although this result is consistent with "overshooting models' of exchange rate dynamics, new data will be needed to check the robustness of the result. Since quarterly GDP data are now available for 2009, model 2 can be estimated with a longer time frame (model 3). The diagnostic tests findings (Table 4.8) indicate that no major specification error exists for model 3. As in the case of model 2, the estimated results from the cointegration and the error-correction regressions (Table 4.6) are not all statistically and economically significant.

Table 4.8: Model 3 diagnostic tests (p – values)

| Estimation technique: | | Cointegrating | ECM |
|---|---|---|---|
| Hypothesis | Diagnostic tests: | static OLS | dynamic OLS |
| | | 1 | 2 |
| Ho: normality | Jarque-Bera | 0.81 | 0.39 |
| Ho: no serial correlation | Godfrey LM Test | 0.20 | 0.08 |
| Ho: homoskedasticity | Breusch-Pagan-Gofrey | 0.47 | 0.48 |
| Ho: model has no omitted variables | Ramsey RESET Prob>F | 0.75 | 0.40 |
| Structural stability | CUSUM<br>CUSUM of squares | Yes<br>Yes | Yes<br>Yes |
| observations | | 20 | 19 |

Note:
The null hypothesis, in each case, is that the corresponding assumption of OLS regression holds. In each case, the p-value suggests non-rejection. Structural stability is indicated as "Yes" if CUSUM and CUSUM of squares tests are within the 5% significant lines.

Table 4.9: Long run and short run estimation - model 3

***Model 3:*** Coefficient estimates (t-statistics)

REER (dependent variable)

| Variable | Cointegrated Regression (static OLS) | | | Variable | Error Correction Model (dynamic OLS) | | |
|---|---|---|---|---|---|---|---|
| OPEN_LN | -0.061 | ** | (-1.77) | D(OPEN_LN) | -0.077 | ** | (-2.69) |
| INVEST_LN | 0.001 | | (0.18) | D(INVEST_LN) | 0.005 | | (-0.79) |
| GCGDP_LN | 0.045 | ** | (1.83) | D(GCGDP_LN) | 0.022 | | (1.31) |
| PROD_LN | 0.052 | ** | (1.79) | D(PROD_LN) | 0.036 | | (1.58) |
| TOT_LN | -0.011 | | (-0.47) | D(TOT_LN) | -0.020 | | (-0.66) |
| C | -4.708 | *** | (-19.23) | C | -0.001 | | (-0.01) |
| | | | | ECM(-1) | -0.818 | *** | (-3.01) |
| *Diagnostic tests for cointegrated regression* | | | | *Diagnostic tests for error correction model:* | | | |
| R-squared | 0.48 | | | R-squared | 0.70 | | |
| Adjusted R-squared | 0.30 | | | Adjusted R-squared | 0.55 | | |
| S.E. of regression | 0.01 | | | S.E. of regression | 0.00 | | |
| F-statistic: | 2.61 | | | F-statistic: | 4.68 | | |
| Prob (F-statistic) | 0.07 | | | Prob (F-statistic) | 0.01 | | |
| Durbin-Watson stat | 1.39 | | | Durbin-Watson stat | 1.46 | | |
| *ADF test for residual* | | | Prob. | | | | |
| test statistic: | -3.796 | (0)** | 0.013 | | | | |
| test critical values: | | | | | | | |
| 1% | -3.959 | | | | | | |
| 5% | -3.081 | | | | | | |
| 10% | -2.681 | | | | | | |

Note:
The symbols** and *** denote rejection of the null hypothesis at the 5% and 1% critical values, respectively.

The results for model 3 suggest that adding more observations has improved the model diagnostics (Table 4.8). This is evident in the increased number of significant coefficients in the cointegrating regression (Table 4.9). However, the adjustment speed now indicates movement towards an equilibrium value rather than overshooting, for BH model 3 it is now estimated at -0.82 (compared to -1.47 for model 2).

To check the robustness of this approach the overlapping periods of both RPI and CPI were utilised in order to calculate a longer index series for the REER. With a longer series for the REER (model 4) the sample is increased to 28 observations. The results for model 4 (Table 4.10) suggest that adding more observations has confirmed model 3's findings (Table 4.9).

Table 4.10: Long run and short run estimation - model 4

| ***Model 4:*** | Coefficient estimates (t-statistics) | | | | | | |
|---|---|---|---|---|---|---|---|
| REER (dependent variable) | | | | | | | |
| Cointegrated Regression | | | | Error Correction Model | | | |
| Variable | (static OLS) | | | Variable | (dynamic OLS) | | |
| OPEN_LN | -0.056 | ** | (-2.14) | D(OPEN_LN) | -0.065 | ** | (-2.70) |
| INVEST_LN | 0.001 | | (-0.01) | D(INVEST_LN) | 0.001 | | (0.16) |
| GCGDP_LN | 0.050 | *** | (5.47) | D(GCGDP_LN) | 0.041 | ** | (4.26) |
| PROD_LN | 0.049 | ** | (2.37) | D(PROD_LN) | 0.040 | ** | (2.13) |
| TOT_LN | -0.015 | | (-0.91) | D(TOT_LN) | -0.008 | | (-0.37) |
| C | -4.739 | *** | (-29.38) | C | 0.000 | | (-0.17) |
| | | | | ECM(-1) | -0.833 | *** | (-3.74) |
| *Diagnostic tests for cointegrated regression* | | | | *Diagnostic tests for error correction model:* | | | |
| R-squared | 0.86 | | | R-squared | 0.80 | | |
| Adjusted R-squared | 0.83 | | | Adjusted R-squared | 0.74 | | |
| S.E. of regression | 0.01 | | | S.E. of regression | 0.00 | | |
| F-statistic: | 26.48 | | | F-statistic: | 13.06 | | |
| Prob (F-statistic) | 0.00 | | | Prob (F-statistic) | 0.00 | | |
| Durbin-Watson stat | 1.45 | | | Durbin-Watson stat | 1.68 | | |
| *ADF test for residual* | | | Prob. | | | | |
| test statistic: | -4.88 | (0)** | 0.001 | | | | |
| test critical values: | | | | | | | |
| 1% | -3.753 | | | | | | |
| 5% | -2.998 | | | | | | |
| 10% | -2.639 | | | | | | |

Note:
The symbols** and *** denote rejection of the null hypothesis at the 5% and 1% critical values, respectively.

Table 4.11: Model 4 diagnostic tests (p – values)

| Estimation technique: | | Cointegrating | ECM |
|---|---|---|---|
| Hypothesis | Diagnostic tests: | static OLS | dynamic OLS |
| | | 1 | 2 |
| Ho: normality | Jarque-Bera | 0.74 | 0.66 |
| Ho: no serial correlation | Godfrey LM Test | 0.17 | 0.23 |
| Ho: homoskedasticity | Breusch-Pagan-Gofrey | 0.30 | 0.31 |
| Ho: model has no omitted variables | Ramsey RESET Prob>F | 0.57 | 0.42 |
| Structural stability | CUSUM<br>CUSUM of squares | Yes<br>Yes | Yes<br>Yes |
| observations | | 28 | 27 |

Note:
The null hypothesis, in each case, is that the corresponding assumption of OLS regression holds. In each case, the p-value suggests non-rejection. Structural stability is indicated as "Yes" if CUSUM and CUSUM of squares tests are within the 5% significant lines.

The estimated results from the cointegrating and error correction regressions (Table 4.10) are consistent with orthodox economic theory; namely the estimated coefficients have the expected signs, though in the case of government consumption and FDI the anticipated signs were ambiguous. The estimated results are statistically and economically significant except for investment and terms of trade. The estimated coefficient on the lagged error correction mechanism indicates a negative and highly significant adjustment process, which supports the hypothesized presence of a long-run cointegrating relationship between the identified "fundamentals". Diagnostic test findings (Table 4.11) suggest that no major specification error exists (see also Appendix 4.1, model 4).

The adjustment speed now indicates movement toward an equilibrium level rather than overshooting. In BH model 4 this is estimated as -0.83. This is almost the same as in model 3, which is -0.82; while for model 2 it is -1.41. The error-correction coefficients have the expected sign in all models, in model 4 and 3 this coefficient is below one, which suggests stability of the estimated models as in model 1. Looking at model 1 and its diagnostic results it was found to be the most plausible of all the models. Hence, the decision is to focus on the model 1 results and their economic interpretation.

Baffes et al. (1997), applying the same approach, finds the speed of adjustment for Cote d'Ivoire to be -0.45 and for Burkina Faso -0.54. They also suggest using speed of adjustment estimates in order to calculate the number of years required to eliminate a given misalignment. What they find for Burkina Faso and Cote d'Ivoire is that to eliminate 95% of a shock to the real exchange rate would take slightly more then three years in Burkina Faso and eight years in Cote d'Ivoire. By applying (4.11) Baffes et al. (1997) find the time required to dissipate x% of a shock to the real exchange rate.

$$(1-|\beta|)^t=(1-x) \qquad (4.11)$$

where: t is the number of years and

$|\beta|$ is the absolute value of the speed of the adjustment parameter (ECM coefficient value of 0.62). Based on this proposition by simply plugging the numbers into (4.11) it was found that in order to eliminate 95% of a shock to the real effective exchange rate it would take slightly more than three quarters for BH based on model 1. These findings are quicker than what Baffes et al. (1997) calculated for Burkina Faso and Cote d'Ivoire. However, the findings are clearly consistent with BH's fixed exchange rate regime and the consistency of the REER with its equilibrium level. Assessing Graph 4.1 it can be noticed that both series are moving in the same direction within the range of +/-2 percentage points, suggesting that even though there is some variation it is a quite small.

In order to see the marginal impact of the fundamentals, the long-run model's elasticities from the cointegrating regression were evaluated by conducting a one percent increase in each of the REER fundamentals for model 1 (Table 4.3):

- Terms of trade increase is associated with a 0.10% depreciation of the real effective exchange rate. This indicates that an improvement in the terms of trade would result in REER depreciation, possibly working through an increased competitiveness in local products and business in global market.
- Government consumption increase is associated with a 0.05% appreciation of the real effective exchange rate. Government consumption has a positive impact on the REER suggesting that most of the government spending is directed toward nontradable goods.
- Investment is found to have no significant effect of the real effective exchange rate.

- Productivity increase is associated with a 0.11% depreciation of the real effective exchange rate. So, ceteris paribus, productivity increase leads to a gain in price competitiveness. It also suggests that relatively rising productivity growth – at least in tradables - can offset the effects of higher inflation on the real exchange rate, which is consistent with the de Grauwe's (1989) productivity modified PPP theory of long-run exchange rate determination.
- Openness is associated with a 0.15% depreciation of the real effective exchange rate. Since openness is negatively correlated with REER it indicates that an improvement of openness is associated with depreciation of the REER through increased competitiveness in exports

**4.3 Real exchange rate misalignment**

Three models were additionally applied (fitted, moving average and HP filter) in order to investigate potential misalignment of the REER. Given the above model 1 (equation 4.7) of the FEER, the estimates of the long-run equilibrium real exchange rate are obtained by substituting the values of the permanent components into the estimated cointegrated equation (equation 4.8). As discussed in section 4.2.4, the trend component of each nonstationary time-series is taken as the permanent value and placed in equation (4.7) along with the estimates of $\beta$ (obtained from equation 4.8). Montiel (2002) explains that though this methodology is relatively new it is particularly well suited for estimating the equilibrium exchange rate. This methodology relies on an appropriate specification of the long-run relationship between REER and its fundamental variables in equation 4.8. The main deficiency of this methodology is empirical ignorance of the short-run mechanism of adjustment. In principle, VAR system estimation is a solution to the above problem. Yet, the discussion in section 4.2.3 suggests that estimation of a VAR model would require a longer time-series than those available. Currently, single equation estimation seems to be the best solution given the current time series length.

REER equilibrium values are calculated for all three models and presented in Table (4.12).

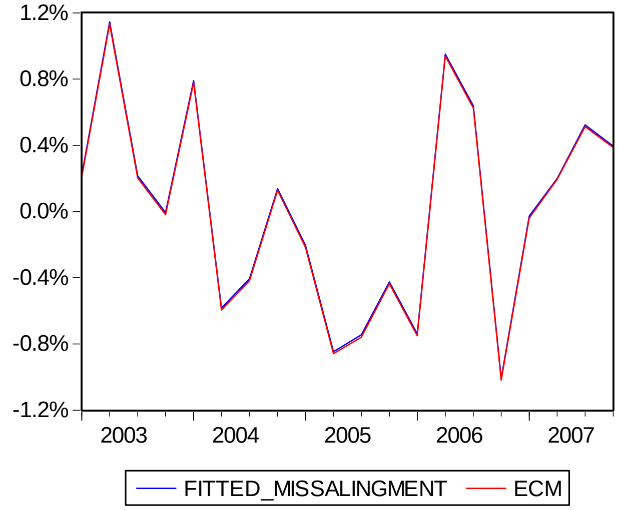
Table 4.12: Real effective exchange rate and equilibrium values

| OBS | REER | EQREER_FITTED | EQREER_HP | EQREER_MA | AVERAGE_EQ |
|---|---|---|---|---|---|
| 2003Q1 | 98.08 | 98.30 | 99.11 | | 98.71 |
| 2003Q2 | 98.41 | 99.54 | 99.21 | 99.27 | 99.34 |
| 2003Q3 | 99.76 | 99.98 | 99.30 | 99.12 | 99.47 |
| 2003Q4 | 97.87 | 97.86 | 99.39 | 98.92 | 98.72 |
| 2004Q1 | 98.14 | 98.92 | 99.48 | 98.92 | 99.11 |
| 2004Q2 | 100.56 | 99.98 | 99.56 | 99.98 | 99.84 |
| 2004Q3 | 101.47 | 101.05 | 99.65 | 100.39 | 100.37 |
| 2004Q4 | 100.02 | 100.16 | 99.73 | 100.31 | 100.07 |
| 2005Q1 | 99.93 | 99.73 | 99.81 | 100.29 | 99.94 |
| 2005Q2 | 101.85 | 100.99 | 99.89 | 100.86 | 100.58 |
| 2005Q3 | 102.63 | 101.86 | 99.96 | 101.36 | 101.06 |
| 2005Q4 | 101.65 | 101.21 | 100.03 | 100.13 | 100.46 |
| 2006Q1 | 98.09 | 97.37 | 100.09 | 99.31 | 98.92 |
| 2006Q2 | 98.44 | 99.38 | 100.16 | 98.75 | 99.43 |
| 2006Q3 | 98.89 | 99.52 | 100.24 | 99.01 | 99.59 |
| 2006Q4 | 99.12 | 98.12 | 100.32 | 99.15 | 99.20 |
| 2007Q1 | 99.85 | 99.82 | 100.40 | 99.75 | 99.99 |
| 2007Q2 | 101.12 | 101.32 | 100.48 | 101.25 | 101.02 |
| 2007Q3 | 102.09 | 102.62 | 100.57 | 101.45 | 101.55 |
| 2007Q4 | 100.04 | 100.43 | 100.65 | | 100.54 |

Note:
REER is calculated based on equation (4.5). AVERAGE_EQ is average of: EQREER_FITTED (the fitted values from estimating equation 4.8), EQREER_HP and EQREER_MA values.

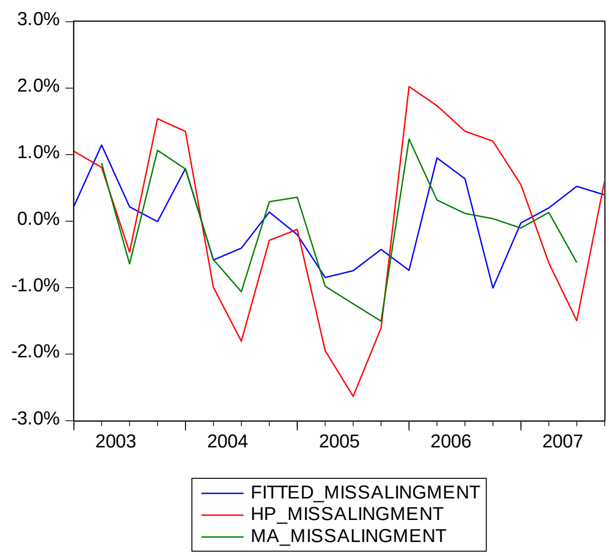
The estimation procedure is discussed in section 4.2.4; fitted values are obtained directly from regression (4.8) and applied to (4.7) (where the fitted values represent the RHS). Then the misalignment is calculated based on equation (4.10). All three applied models indicate that there is a small misalignment evident in the form of an undervaluation. However the calculated misalignments (M) between real and equilibrium exchange rate are very small so that misalignment cannot be identified precisely. The M calculated from the *fitted model* (4.10) is found to be between 1.2% and -0.9%. If estimation is correctly undertaken, the results from (4.10) should be equal to the residuals from equation (4.8). However a really small deviation can be noticed between M calculated from 4.10 and the residual from equation (4.8). This deviation can be seen in Graph (4.5) and it comes from the investment variable. This variable is found to be insignificant and for that reason it is not accounted for in the fitted model and that is why a small deviation may be noticed in Graph (4.5)

Graph 4.5: REER fitted misalignment (from 4.10) and residuals (from 4.8)




Misalignment from the moving average model[41] is found to be between 1.4% and -1.5%; while, based on HP model, M is between 1.5% and -2.6%. Hence there is consistency in all three estimated methods. The estimates indicate that REER misalignment (Graph 4.6) seems not to be an immediate threat to BH's current account sustainability. The conclusion is that the worsening of the current account has not been caused by real exchange rate appreciation.

Graph 4.6: REER misalignment (HP, fitted and moving average)




[41] Obtained in EViews 6.0 using the @movavc(x,n) command.

## 4.4 Conclusions

In BH the process of transition is still ongoing and further implementation of reforms is required to produce a significant improvement in its firms' competitiveness. Even though transition countries usually do not have long time series data available, it was shown that empirical work can be developed even with limited time series availability.

Based on the sample of quarterly data, the long-run behaviour of the REER, can be taken as reflecting fluctuations in openness, government consumption, terms of trade and productivity. It is indicated that REER misalignment is not an immediate threat to BH's current account sustainability. The high and persistent current account deficit does not appear to have been caused by a real exchange rate appreciation. The main finding is that BH's current account sustainability is not threatened by exchange rate misalignment, thus there is no need to adjust the peg. As a robustness check it would be very desirable to re-estimate the model as new data becomes available.

# Chapter 5: Trade deficit and trade agreements



## 5.1 Introduction

The overall aim of this research is to investigate if the persistent current account deficit in Bosnia and Herzegovina is sustainable. In the previous chapters an initial analysis of Bosnia and Herzegovina's international trade is conducted and compared with that of its main trading partner countries. Theories of current account sustainability are also critically explored in the context of transition in the Western Balkans and an empirical model developed in order to assess current account sustainability in Bosnia and Herzegovina.

Since the particular attention in this research is devoted to an analysis of why Bosnia and Herzegovina runs a relatively high current account deficit, the trade component of the current account deficit is explored further. A trade deficit has been the major part of the current account deficits in BH. In the initial analysis of Chapter 1 a high and persistent trade deficit is seen as a possible threat to a country's current account sustainability. A trade deficit was identified as the only component of the BH current account deficit that persisted over the whole observed time period. All other components of the current account were found to have a surplus. Still the question remains as to the cause of this high trade deficit, and its sustainability in BH. It was identified that the trade imbalance was large during the whole observed time period and in 2008 BH's trade deficit was around 64.5% of GDP.

In order to close the remaining knowledge gap with respect to what causes the high trade deficit in BH, in this chapter an analysis of its international trade is conducted and compared with that of other Western Balkans countries. In terms of trade deficit sustainability in Western Balkan countries, free trade agreements may be an important part of achieving a smooth transition and accession to the EU. The expansion of regionalism has generated an extensive theoretical and empirical literature which examines effects of free trade agreements on trade flows. This chapter will investigate the development of trade agreements and examine their impact on trade flows. The impact of intra-European trade agreements on the Western Balkans are of particular importance for regional trade integration. Trade agreements typically have a positive effect on trade growth (Herderschee and Qiao, 2007) and hence have the potential to affect the nature and sustainability of current account deficits in the Western Balkans.

This Chapter is organised in five sections. After this introduction (5.1), section 5.2 starts with the further analysis of BH's trade developments. Chapter 1 presented a BH churning of trade and conduct descriptive analysis of BH main export and import commodity groups. Here a descriptive analysis of BH's international trade is conducted and compared with that of other Western Balkan countries. This analysis suggests that BH has an unbalanced trade with other WB countries. This suggestion also raises the question as to the implications for BH of expanding its trade with WB. Therefore in section 5.3 the concept of free trade agreements is introduced with a short summary of customs union theory and a discussion of the establishment of the Western Balkans' free trade agreement in a form of the new CEFTA. Next, section, 5.4 extends the analysis further through critically evaluating the empirical literature which examined the impact of free trade agreements on trade flows. The conclusions of this Chapter are presented in section 5.5.

## 5.2 Western Balkans' trade with a focus on Bosnia and Herzegovina

The recent international trade literature has left aside the trade deficit issue and focused more on trade creation through extensive analyses of free trade agreements (Feenstra, 2002). The analysis of trade balance was an important topic for discussion in the 1990's during the transition period for the majority of ex-socialist countries. An interesting approach to analysing the trade deficit in the transition period is that of Bole's (1999) assessment of Slovenia. Bole is suggesting that a current account surplus in transitional economies at the beginning of the stabilising and restructuring phases turns almost systematically into a deficit. Based on discussion in section 1.1 it can be argued that Bosnia and Herzegovina does not fit with such a claim. A claim that a current account surplus was a stylised fact at the beginning of the transition period requires supporting evidence. To state this as robust for all transition economies is implausible without strong empirical evidence, which Bole does not advance. Indeed, according to the EBRD transition report for 1998, in the data period from 1991 to 1997 almost half of the twenty-six countries covered in the report had a current account deficit, including all countries of the WBs except Serbia and Montenegro. Blejer and Skreb (1999) suggest that current account deficits as a whole mainly follow the patterns of the trade deficits in the transition economies. Next the focus is on BH's trade deficit.

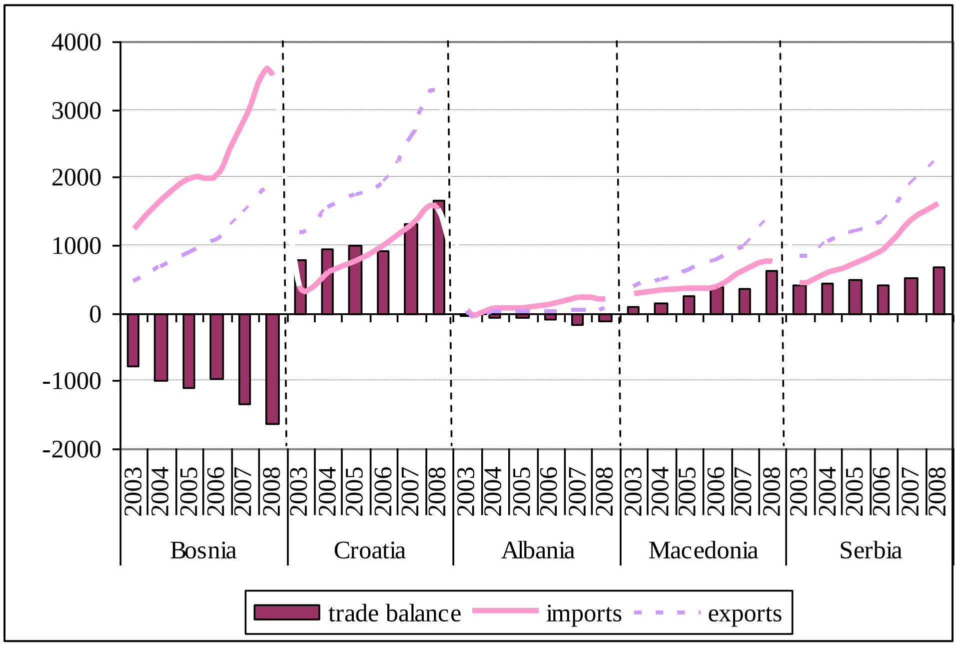
### 5.2.1 Descriptive analysis of Bosnia and Herzegovina's trade

BH's trade balance is a main contributor to the negative balance on the current account; hence, it is sensible to investigate the trade deficit and assess its future prospects. In their analysis of the trade of transition economies, Hillman and Ursprung (1999) argue that special aspects associated with transition should be included, like changes in the external trading relations of the economies; large technology gaps; privatisation and foreign investment experiences; even the history and the legacy of their institutions. Havrylyshyn and Al-Atrash (1999) seem to agree with this statement, though they investigate just one of these transitional aspects. Their focus was on ex-socialist countries and a change in the external trading relations of their economies. Havrylyshyn and Al-Atrash argue that external trading relations changed through a shift from trading patterns established by central-plan decisions to new patterns determined by comparative-advantage. Other aspects are analysed in the trade literature and explored for different countries, like the choice of an international trade policy; sources of competitive advantage; geographic diversification; etc. A full assessment of many of these different aspects remains difficult for the Western Balkan countries due to data problems. BH's data are limited and also not available for the period when BH was a part of Yugoslavia. To assess changes in BH trading patterns established by central-plan decisions is practically impossible. Even to assess trade changes in the recent past (from the late 90s) is difficult, since data is limited. Comparable trade data for BH is mainly available from 2003 on the UN harmonised system classification, while the standard international classification (SITC) is available as of 2005. Therefore it is sensible to initially conduct a descriptive analysis of BH trade patterns.

Based on CBBH's yearly report from 1999, BH trade deficit at the end of 1999 was EURO -2.07 billions. The CBBH clarifies in its report that this estimate was based on the available customs declarations. In its more recent publications, the CBBH yearly report from 2008, this figure is revised and new data presented. Based on the new and revised data, which are available for the period from 1998 to 2008 (CBBH, 2008), an acceleration of imports was the main reason for the increase in the trade deficit after 1998. In nominal terms BH's trade deficit has increased from EURO 2.3 (1998) billion to almost EURO 8.5 billions (2008). In the period from 1998 to 2008, BH's trade deficit expanded by almost 6.5 billion in nominal terms. For a small open economy with approximately four million inhabitants[42] the BH's trade deficit can be considered as high. BH's trade deficit is also regional. The Graph 5.1 presents BH's trade deficit with the WBs and compares it with those of the other WB countries.

[42] The last population survey was conduct in 1991, a new population survey according to BH Agency for statistics is planned for 31 March 2011.

Graph 5.1: Western Balkans intra-trade in millions of USD

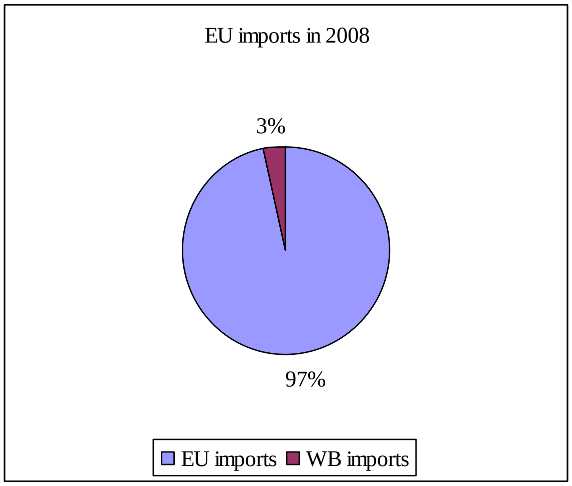


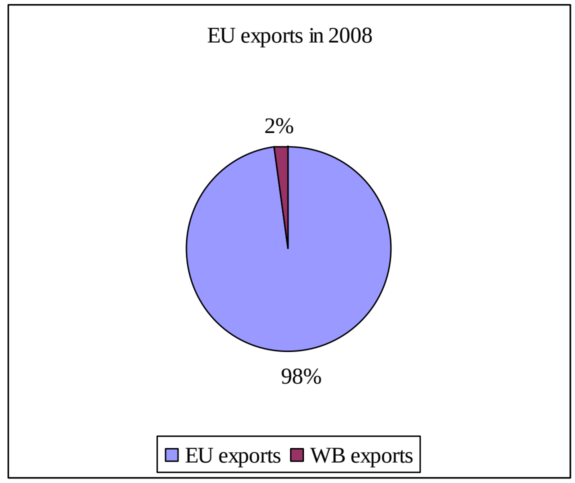

Source: CBBH and author's own calculation

Looking at Graph 5.1 it can be noticed that BH and Albania are the only countries that have registered a trade deficit with other WB countries in the observed period. As can be seen from the Graph 5.1, the Albanian trade deficit is small compared to that of BH. This together with the data on other WB countries imports and exports suggest that there are substantial net exports to BH from other WB countries. Chapter 1 presented BH's main export and import trading partners, initial trade analysis implied that BH's main trading partners are EU and neighbouring countries.

The Graph 5.2 suggests that WB's share in EU's trade in 2008 can be seen as asymmetric compared to the EU's share in WB's trade.

Graph 5.2: European Union's trade with Western Balkan in 2008

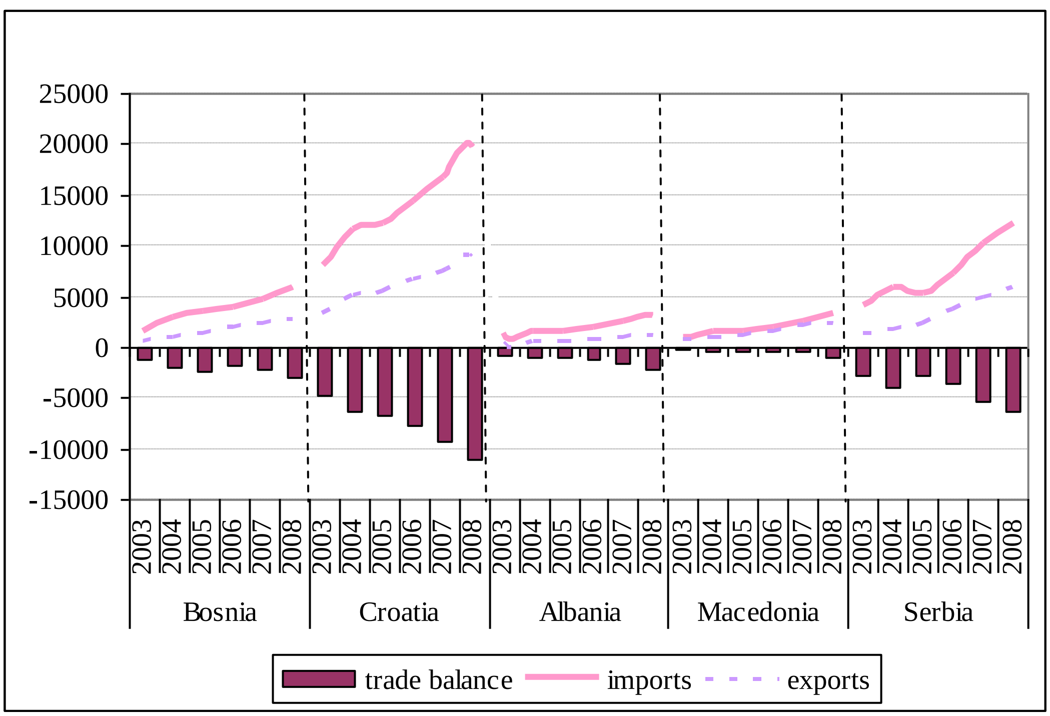



Source: CBBH and author's own calculation

Looking from the WB's perspective it is noticeable (Graph 5.3) that all WB countries have registered a persistent trade deficit with the EU in the observed period. Analysing each WB country individually, the highest trade deficit is noticeable between Croatia and EU, followed by Serbia, BH, Albania and then Macedonia.

Graph 5.3: Western Balkans' trade with European Union in millions of USD




Source: CBBH and author's own calculation

Since the focus is on BH, in Tables 5.1 and 5.2 the overall export and import structure of BH is provided.

Table 5.1 Structure of Bosnia and Herzegovina's exports

| Total | Exports | | | | |
|---|---|---|---|---|---|
| | 2005 | 2006 | 2007 | 2008 | 2009 |
| **EU 27, of which** | **54.7%** | **59.7%** | **57.3%** | **55.2%** | **54.2%** |
| Italy | 13.1% | 13.8% | 13.1% | 12.6% | 12.7% |
| Germany | 11.3% | 12.9% | 12.8% | 13.6% | 14.7% |
| Slovenia | 9.7% | 12.2% | 10.9% | 9.2% | 8.4% |
| **SEE* of which** | **37.2%** | **32.9%** | **35.8%** | **37.1%** | **38.1%** |
| Croatia | 20.5% | 18.7% | 18.4% | 17.2% | 17.1% |
| Serbia | 15.5% | 13.2% | 11.7% | 14.0% | 13.4% |
| **Other countries** | **8.1%** | **7.4%** | **6.9%** | **7.7%** | **7.7%** |

Source: CBBH and author's own calculation

Table 5.2 Structure of Bosnia and Herzegovina's imports

| Total | Imports | | | | |
|---|---|---|---|---|---|
| | 2005 | 2006 | 2007 | 2008 | 2009 |
| **EU 27, of which** | **53.9%** | **53.0%** | **47.8%** | **48.0%** | **49.1%** |
| Italy | 9.0% | 9.0% | 9.0% | 9.3% | 10.1% |
| Germany | 14.4% | 12.4% | 12.5% | 11.8% | 11.3% |
| Slovenia | 7.0% | 7.6% | 6.4% | 5.9% | 6.1% |
| **SEE* of which** | **27.9%** | **28.0%** | **29.1%** | **28.9%** | **26.8%** |
| Croatia | 16.9% | 17.1% | 17.6% | 17.1% | 15.0% |
| Serbia | 10.2% | 9.8% | 9.4% | 10.6% | 10.4% |
| **Other countries** | **18.2%** | **19.0%** | **23.1%** | **23.1%** | **24.1%** |

Source: CBBH and author's own calculation

Starting from 2005 onwards, Tables 5.1 and 5.2, suggest a small change of WB and EU shares in BH's total trade. It can be noticed from the above tables that in the most recent years the trade with WB seemed to settle at around 38% of BH total exports and 27% of BH total imports. The largest shares of BH trade with the WB are with Serbia and Croatia; a quick calculation shows that these two countries account for almost all BH trade with the WBs. The historically close connections between BH, Serbia and Croatia could be a reason why BH is so strongly oriented to trade with these two particular countries (by applying country-pair fixed effects the effect of history is investigated in Chapter 6 ). Caporale et al. (2008) argue that the closer two countries are the higher the net welfare gain from increased trade. In other words, if two countries are closer then trade creation is also more likely. In contrast, it could be suggested that the strong orientation of BH towards trading with Serbia and Croatia may mean that this trade is near its current maximum potential level. Further trade creation between these countries is less likely since BH's trade seems to be already heavily oriented towards these two particular WB countries, especially its imports.

Havrylyshyn and Al-Atrash's (1999) trade deficit analysis is interesting, since it narrows the issue to the degree of trade openness and geographical diversification. They undertook an applied empirical investigation to assess the effect of an economy's size and its level of development on the determinants of exports. They find that transition countries that have made the most progress in structural reforms have gone furthest in diversifying their exports to new destinations. Havrylyshyn and Al-Atrash's (1999) finding may suggest that slow reform progress in BH is an obstacle to expanding trade to other markets. Hillman and Ursprung (1999) argue that it is natural to expect that domestic consumers would prefer to purchase the more modern sophisticated and fashionable imported foreign goods if they can afford to do so. It can be argued that countries may also target an improved standard of quality and technology to gain competitive advantage in their goods to confront foreign competition in the home market and abroad. In order for this to happen a country will need to have evident progress in its reforms, which BH seems to lack.

### 5.2.2 The underling factors in Bosnia and Herzegovina's trade deficit

Chapter 3 provided a list of factors that have been considered important for a deficit in trade analysis. Roosa (1962) argues that the key to assessing a so-called "basic deficit", a deficit in trade, should be analysing the underlying factors influencing it. Common sense is supportive at this point, since it can be used to argue that war is one of the first underlying factors in trade deficit creation in BH. From the previous discussions in sections 1.1; 3.1 and 3.2 on BH's progress towards integration into regional markets, it seems that BH is still lagging behind the other Western Balkan countries. For example, the privatisation of the state companies like telecommunications and electricity distribution is still on-going. Other Western Balkan countries have already finished these big privatisations. The collapse of Yugoslavia has pushed all its ex-republics to restructure. BH had an additional burden of a severely destroyed economy and, as the outcome, a delayed integration processes with the EU. Other ex-Yugoslavian republics started to compete for regional market dominance in the early 90s, so it is not surprising that their transition progress is faster than that of BH and their data indicate their road towards EU is faster. All this seems to be reflected in the trade data balance and high figure of BH trade deficit. In other words it can be argued that the main factor underlying trade deficit in BH is strong demand for imported goods and also BH's supply side weaknesses. Based on the discussion in Chapter 4 on its obsolete and insufficient capital stock, it can be argued that BH seems not yet to have the capacity to produce and export goods with sufficient value to eliminate or even greatly reduce the trade deficit. Continuing this investigation the next step is to assess BH's import structure in order to distinguish which group of goods have been in such strong demand in BH.

In order to conduct this assessment SITC-level classification was used. Bole (1999) used SITC - level classification to investigate investment driven changes in Slovenia at the one digit standard international trade classification – SITC - level. Leamer (1998) also used SITC – level classification, but in order to identify four aggregate measures of trade intensity: overall; manufactures; agriculture and resources. In Table 5.3 the structure of BH's import at the one digit SITC – level is presented. All data are presented as % GDP. In the Appendix 5.1, Table A5.1 is provided in order to identify the structure of Western Balkans imports based on one digit SITC - level classification.

Table 5.3: Structure of BH's imports by sections of SITC (in GDP %)

| Imports | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|
| Food and live animals | 8.8 | 7.4 | 7.5 | 7.6 |
| Beverages and tobacco | 2.0 | 2.1 | 2.0 | 1.9 |
| Crude materials | 2.2 | 2.4 | 2.4 | 2.5 |
| Mineral fuels | 8.6 | 9.2 | 9.0 | 10.6 |
| Oil and fats | 0.5 | 0.4 | 0.4 | 0.4 |
| Chemical products | 7.1 | 6.4 | 6.8 | 6.7 |
| Manufactured materials | 13.1 | 12.5 | 14.3 | 13.7 |
| Machinery and transport equipment | 16.8 | 13.5 | 15.5 | 15.2 |
| Miscellaneous manufactured articles | 6.8 | 5.8 | 6.2 | 6.1 |
| Other | 0.1 | 0.0 | 0.0 | 0.0 |

Source: CBBH and author's own calculation

It can be argued that SITC classification can be evaluated as useful, since it points to the most significant concentrations in a country's imports. This also suggests which goods are possible sources of the trade deficit. The import of mineral fuels, manufactured materials and machinery and transport equipment seems to contribute the most to the import increase in the observed period (Table 5.3). Similar patterns with high values in imports of manufacturing materials, machinery and transport equipment (expressed as % GDP) can be noticed in all other WB countries (see Appendix 5.1). Hence, it can be hypothesised that a factor contributing to the trade deficit in BH and other WB countries is the technological restructuring that is underway in these countries. Overall, it can be argued that a high trade deficit just like the current account deficit does not have to mean a "disaster" for a country as long as it is known why it is occurring. For a post-conflict country like Bosnia and Herzegovina, with huge needs in reconstruction and development processes, one can argue that a certain level of trade deficit is expected and desirable.

Transition countries face a challenge of whether to choose to improve the quality of their products or to try to develop simultaneously various capabilities for sophisticated new product-mixes. All this is costly and takes time. The EBRD in its 2008 transition report claims that countries with solid export bases (more diversified) tend to perform better than those without, and that economies with more sophisticated exports (new and higher-value exports) tend to grow faster.

Havrylyshyn and Al-Atrash (1999) argue that the transition toward more balanced trade cannot be achieved without difficulties. International trade theory emphasises that key factors in assessing balanced trade is the competitive framework. Woodland (1989) argues that a competitive framework yields the result that international trade occurs if the autarky prices are different from one country to another; in this case, in the absence of transportation costs, the price differential encourages international trade. Based on the comparative advantage framework, differences in technology are the sources of autarky price differentials; while based on the Heckscher-Ohlin framework differences in relative factor endowments between countries and input ratios between products are the sources of price differentials (Frankel et al., 1996). Woodland (1989) also stresses that differences in tastes, income distribution and structure of taxation are other possible reasons for pre-trade price differentials.

It can be argued that “regionalisation” could bring countries closer and help countries in their changes towards more integrated trading relations and more balanced trade. Customs union theory advances that free trade agreements seems to be a tool in this process, hence their role will be explored in the next section (Root, 1978). The analysis starts with a short introduction to the ‘pure’ theory of trade, since this theory dominates explanations of international trade (Dixit and Norman, 1980; Root 1978; Woodland, 1989; Caves et al., 1993; Husted and Melvin 1997)

### 5.2.3 The ‘pure’ theory of trade

The pure theory of trade has its roots back in the eighteenth century; it addressed questions like why do countries export and import certain products, at what terms of trade, with what gains and etc? It progenitor was Adam Smith with the theory of absolute advantage. According to this theory all countries would specialise in goods they were best suited to produce due to their natural and acquired advantages (Root, 1978). The next important step in the development of pure theory was Ricardo’s concept of comparative advantage. His proposition was based on the more realistic question of what if country did not have an absolute cost advantage in any product. He developed the theory by introducing the concept of comparatively more efficient production, whereby each country specialises in production of those products in which it is comparatively more efficient.

New trade theory emphasises the role of geography in the economic analysis of trade where increasing returns play a significant role. Krugman (1991b) argues that increasing returns generate inherent advantages to specialisation, rather than just arising from taking advantage of exogenous differences in resources or productivity. He stresses that the observed geographical concentration of production is a result of interactions between economies of scale, costs of transportation and demand. The new trade theory also provides an analysis of trade between countries and the location of production within countries (Krugman, 2009). Krugman (1991a, 2009) suggests a ‘core-periphery’ model as a starting point for the new economic geography. According to this model some countries are too small to accommodate a number of small industrial districts so they have an incentive to concentrate their production in a single location close to the largest market. By choosing the location close to the largest market, their transport costs are minimised and their products are pulled by larger ‘core’ neighbour countries which then exports to other markets. Krugman (1991a) argues that if trade were completely free the immobility of labour would not pose a barrier to industry localisation, since each country would tend to develop its own industries. In this way each country would export the product it has in excess and import those it does not have.

It can be argued that studies of the early 2000s (such as: Christie, 2002; Vujcic and Sosic, 2004; Bussière et al., 2005) are more likely to observe members of a free trade area who had a common shared recent history such as being a state in a unified Federation. If this is applied to the Western Balkans, and taking into consideration its desire to become more integrated with free movements of capital and labour, it does make more sense to think of the relations between WB’s component nations or attempt to rebuild some of the strong economic links of the previous joint Federation.

Root (1978:146) stresses that the pure theory of trade demonstrates that for the world as a whole free trade leads to a higher level of output and income than does autarky. He argues that the argument for free trade is conditional and it actually depends on a country’s choice to either be influenced or not to be influenced by other countries. It seems that the issue of free trade versus protection is in trade theory literature one of the most extensive and durable (Dixit and Norman, 1980; Woodland, 1989; Krishna and Krueger, 1995; Li et al., 2003). It can be argue that the pure theory of trade assumes perfect competition. Since assumptions for optimum conditions are only partially matched in actual markets, more trade will not necessarily bring higher allocative efficiency into domestic or world markets (Dixit and Norman, 1980). Based on the pure theory of trade, Pareto optimum requires the simultaneous attainment of all optimum conditions. The theory of the second best is applied when private monopoly, government policies and externalities create divergence between private and social costs and benefits (Root, 1978). It can be argued that if these created divergences cannot be eliminated, the first best policy of free trade is no longer the optimal choice and second best policy may be applied. A second best policy is to create new divergences that will offset those existing. One example of the second best theory is creation of custom unions and free trade areas. These are discussed in section 5.3.

**5.3 Trade creation and forward-looking aspects of trade in the Western Balkans**

A free trade agreement according to the Organisation of American State's Foreign Trade Information System (SICE[43]) is defined as economic integration in which countries eliminate substantially all tariffs and non-tariff barriers among themselves. This section investigates the development of trade agreements and examines their impact on trade flows. In terms of trade deficit sustainability in Western Balkan countries, free trade agreements may be an important part of achieving a smooth transition and accession to the EU. In January 2009 the World Trade Organisation released a database on regional trade agreements. Their press release number 548, records that some 421 regional trade agreements had been notified and 230 agreements were in force. The expansion of regionalism has generated extensive theoretical and empirical literature, which examines the effects of free trade agreements on trade flows. Therefore custom unions and free trade areas are briefly introduced. Then section 5.3.2 discuss the WB free trade agreement in the form of the new Central European Free Trade Agreement (CEFTA).

5.3.1 Custom unions and free trade areas

The main feature of custom unions (CU) and free trade areas (FTA) involves the abolition of all restrictions on trade among countries and a common external tariff. However there is a difference between a CU and free trade area and it is reflected in the

[43] SICE is an organisation which is focused on collecting information on national and international trade policy and trade development progress.

treatment of tariffs towards third countries. For example, in the case of a free trade area member countries will remove restrictions on trade between themselves but retain their own tariff with non-member countries. In the case of a CU, countries will also remove restrictions on trade between themselves but they will introduce a common tariff with all non-member countries.

Root (1978) stresses both potentially positive and negative welfare effects of CUs. He refers to the positive effect as trade creation and the negative as trade diversion. A positive effect occurs when new trade is created as a result of elimination of internal tariffs. The term positive means that new trade is created but under the condition that it does not eliminate third country's imports. In other words, trade creation basically presents the shift from high-cost producers to lower-cost producers but inside the union. A negative trade effect may occur as a consequence of replacing imports from third countries' with imports from a higher-cost fellow union member (commonly referred to as trade displacement). It can be argued that a free trade area and CU are stages of economic integration. Free trade area and CU are basically established among countries which remove restrictions on mutual trade (Caves et al., 1993; Husted and Melvin 1997). Hence, theoretically the introduction of free trade area can contribute to economic development and improved regional cooperation.

Even if it is generally accepted by economists (Irwin 1997; Elwell 2005) the phrase that "free trade among nations improves overall economic welfare" raises the question: "do all countries benefit from free trade?" Free trade has its benefits but also its disadvantages especially for smaller less developed economies. A country will experience improvements in its terms of trade when the price which the country is paying for the imports falls, while the price which the country receives for its exports remains unchanged. The terms of trade argument is based on the proposition that at least part of an import tariff is absorbed by foreign suppliers and it considers two cases. In t*he first*, the entire duty is absorbed by foreign supplier, hence there is a perfectly inelastic supply. In this way the duty does not affect the price paid by domestic consumers, so the tariff imposing country is a pure 'monopsonist' that can constantly improve its terms of trade by raising its import duty. In *the second* case, if import supply is considered as perfectly elastic, a country cannot improve its terms of trade by increasing duty since the whole duty is absorbed by consumers. The national net gain will be dependant on the trade-off effect, the optimal tariff rate will depend on the price elasticity's of import demand and import supply (Root 1978). It can be argued that the country will have an incentive to change its optimal tariff in order to maximise its net national gain. This actually means that the optimal tariff provides a gain only for the tariff-levying country, while everybody else is hurt by this action.

Caves et al. (1993) question any presumption that FTA leads to net gains. They stress that for trade creation to predominate the two economies (or more) should be competitive before the FTA but also potentially complementary after it comes into effect. It can be argued that the gain in trade is a result of differences between member countries, but countries are not only economically different but there are also political, social, geographical etc differences (Baier and Bergstrand, 2002). The politics of FTA are discussed in section 5.3.2, and the influence of distance in section 5.3.3. Baier and Bergstrand (2002) stress that the world is not so generous as to make all countries identical in terms of economic size or relative factor endowments. They argue that governments are generally given a mandate to maximise public welfare. In reality, imperfect market structures exist with little competition where a few firms own specific factors. Baier and Bergstrand (2002) suggests that, in the absence of special interest lobbies or government distributional preferences, a country's government would act as social planner, maximising the welfare of the country's representative household.

Referring back to BH, it can be argued that when a FTA/CU is formed between two countries trade creation occurs as, in each country, the relatively more efficient industries expand through greater exporting opportunities and the relatively less efficient industries decline through greater import competition. Then in BH additional imports can appear almost instantly such that import supply may be approximately perfectly price elastic, which in turn wipes out BH import-competing industry, while BH exports respond only slowly, because of delayed and/or inadequate enterprise restructuring and poor institutions (such that supply is highly inelastic, even supposing that the macroeconomic environment is favourable). Even the classic model acknowledges "adjustment costs"; as, even in the most well-functioning market economy, labour and capital cannot be moved completely smoothly, i.e. without loss of output and employment, from shrinking import-competing industries into expanding exporting industries. At the very least, such "adjustment" costs may be particularly large and prolonged for BH.

### 5.3.2 Free trade agreements

Baier et al. (2007) stress that before considering formation of free trade agreement two dimensions should be distinguished. The *first* dimension he explains as static versus dynamic determinants of FTAs. The *second* dimension he explains as the economics versus the politics of FTAs. The *first* dimension considers the world in long-run equilibrium through theoretical analysis of why countries are likely to belong to an FTA. The *second* dimension intends to distinguish which “force” (economics or politics) is more important in the long-run view and in the short to medium-run view. Baier et al. (2007) citing Bergstren (1996) argues that in the short run political factors are likely to be relatively more important because of special interest groups (i.e. lobbies) while, in the long run, economic welfare considerations are likely to be dominant. He argues that national governments are empowered to sign the treaties regarding international commerce and that it is common to assume that governments’ objective is to maximise the welfare of individuals. In contrast, in all WB countries political factors seems to be dominant in both the long run and the short run. The conflict in the early 1990s between Croatia, BH and Serbia has resulted in complicated relations between those countries and with the other ex-Yugoslavian Republics. It can be argued that this as a whole presents an important obstacle to more integrated regional trade. For example, unsolved issues between Croatia and Slovenia on border crossing are complicating Croatia’s EU membership. Croatia and BH have unresolved issues on the latter’s participation in the ownership of Croatia’s port Ploče. This port was built by BH when both countries were Republics of ex-Yugoslavia. This port is also BH’s only exit to international waters. Another very complex political issue for WB’s is Serbia’s refusal to recognise Kosovo as an independent state. If it did so it might cause Republika Srpska to declare independence from BH, which would threaten the Dayton peace agreement and another conflict in BH could happen. All these are very complex and important political issues that seem to constrain these countries' trade integration in the long run.

As the particular interest is the Western Balkan's region and sustainability of BH trade deficit, it is sensible to discuss whether Western Balkan regionalisation, in the light of signing a new Central Free Trade Agreement (CEFTA), could bring more balanced trade for BH and the other countries of WB.

The Central Free European Trade Agreement

As discussed above, theoretically the introduction of a free trade area can contribute to economic development and improved regional cooperation. The Central Free European Trade Agreement was signed by Albania, Bosnia and Herzegovina, Croatia, Macedonia, Moldova, Montenegro and Serbia (including Kosovo as defined by UN Security Council resolution 1244) on December 19, 2006 in Bucharest. Bosnia and Herzegovina's parliament ratified the agreement on September 6, 2007. This delay in the ratification was due to criticisms by the local agricultural lobby. BH's farmers were worried that CEFTA's provisions for removing customs duties may further weaken their position in local and regional markets. The Office of the Higher Representative, had been insisting that BH should ratify the agreement (OHR, 2007).

According to the European Commission (2006) the main reason why CEFTA countries entered into their agreement was the expected real economic benefits for their economies. EU Enlargement Commissioner Olli Rehn regarding CEFTA said[44]: "It makes an important contribution to economic development and regional co-operation." In the same statement EU Trade Commissioner Peter Mandelson said: ".... The expanded CEFTA will offer real economic benefits to all sides. But it also sends an important political signal. Closer trade relations in South Eastern Europe are a foundation for stability and growing prosperity."

[44] Europa press releases IP/06/1837, 19 December 2006, available at http://europa.eu

It can be argued that these statements need supporting evidence. Based on this it can be argued that the above statements of Euopean Commission officials are an integral part of the second dimension or "politics". It is reasonable to expect that the EU wants to see CEFTA countries as integrated economies. All these countries are potential candidates for EU membership. The EU is continually working on the development of its economic union, since it has a single monetary system, central bank, as well as working towards the establishment of unified fiscal system and a common foreign economic policy. According to economic integration theory the final stage of an economic union is full integration of the member countries. As already discussed in Chapter 3 that, according to EC decision no. 533/2004, the "EC confirmed it determination fully and effectively to support the European perspective of the WB countries, affirming that WB will become an integral part of the EU once they meet the established criteria". Hence the EU perceives the Western Balkans as potential members and therefore it is not surprising that EU officials support CEFTA. Since the concern is with the efficiency of FTA formation the focus will remain on an assessment of economic welfare effects that could result from forming an FTA. Since CEFTA was signed in 2007 between WB countries it is posible to evaluate only whether it has had an effect in the short run.

It can be argued that though WB countries are close geographically, data deficiencies make it difficult to examine the potential trade gains for each WB country. What is available is various reports from different organisations on Western Balkan progress: i.e. the IMF's country progress report; public information notice (IMF PINs); or World Bank (2006) investment horizon study; etc. According to the World Bank's investment horizon study, the Western Balkans is a growing base for manufacturing and also contains expanding food and beverage sectors. From the descriptive analysis in section 5.2 it is known that the highest concentration of WB imports is in the manufacturing and machinery sections. From this it can be indicated that the countries of the WB could benefit from FTA by expanding manufacturing and service industries in such a way that high cost producers inside the FTA will be replaced by lower cost producers, assuming that they are not all net importers of these goods.

Overall it is expected to see an FTA signed between countries that already trade extensively in complementary goods. Still it can be argued that each country has its unique economic characteristics that influence its decision to form an FTA. In order to assess whether forming an FTA was a good policy decision for all Western Balkan countries, an ex-post empirical analysis will be required. The later sections will consider empirical findings of an FTA effect on trade flows, but first the theoretical foundation of empirical gravity equations that have been used to model trade flows are discussed .The empirical analysis is reported in Chapter 6.

### 5.3.3 Theoretical foundation of empirical gravity equations

Gravity equations have been used increasingly to analyse patterns of international trade (Frankel et al., 1996; Rose 2000; Glick and Rose 2001; Bun 2006; Baier et al., 2007; Caporale et al., 2008). Bun (2006), for example, discusses gravity equations used in empirical applications to international trade even back in the 1960s. He explains that the gravity equations are based on the Newton's gravity concept. The standard gravity model is used to explain the volume of trade between countries conditioning on their national income and the distance between them. Hence,

$$T_{ij} = C \frac{Y_i Y_j}{D_{ij}} \qquad (5.1)$$

Applied to economic flows (i.e. bilateral trade) the intensity of trade flows between two countries ($T_{ij}$), where i and j index countries (and $i \neq j$), is a product of:

- their national incomes ($Y_i$ and $Y_j$) divided by
- the distance between them ($D_{ij}$)
- with the result multiplied by some constant term C

Taking logs and adding an error (normally distributed) for estimation purposes, trade flows can be estimated as:

$$\ln T_{ij} = C + \ln Y_i + \ln Y_j - \ln D_{ij} + u_{ij} \qquad (5.2)$$

This is the standard “gravity” equation. The anticipated effects of this standard model would be the higher the GDP (for country pairs) the higher the trade flows and the greater the distance between the countries the lower the trade. In the recent literature which is reviewed in section 5.4 this standard model has been supplemented by other explanatory variables, including: income per capita; currency union dummy variables; FTA dummy variables; cultural characteristics; etc (Rose 2000; Bun 2006).

Bun (2006) stresses that given its success in empirical applications the theoretical framework for gravity equations is something on which many authors are still trying to improve. What Bun means by the empirical success of gravity equations is that the results obtained correspond to those anticipated in theory. In the application of gravity equations the coefficient on the variable that measures economic size should be significant and with a proportional impact on trade, while distance should yield a negative sign. Distance may also capture “psychic” costs such as language and cultural differences that may vary with distance. Intuitively distance as a variable will imply that transportation costs, road conditions, border crossings etc. between countries or regions is comparable and that the distribution of the economic activity is evenly distributed in and around the capital city. Still some goods are transported by rail, air, river, see, so it is not only road distance that matters. Some developed countries will also have several economic centres like the UK, USA, Turkey, Russia, etc but also transition countries like Bosnia and Herzegovina, Croatia, Serbia etc. Moreover, not all countries trade with all other countries and not in all goods. Most of these complications are neglected in empirical estimations and have to be accounted for when interpreting the empirical results of gravity equations.

Others that have argued that the theoretical foundations of the gravity model are adequate. For example, Frankel et al. (1996) use Krugman’s model (1991b) without transportation costs to develop an imperfect substitution model arguing that this model of trade gives the basic gravity relationship. They use an example in which the world is heading toward three large adjunct trading countries blocks and demonstrate that economic welfare is diminished by a consolidation of FTA into a few large blocks. In their example each of the blocks is tempted to exploit its monopolistic power by raising their tariffs. It is indicated that raising tariffs would present a self-defeating strategy since all blocs will attempt to raise tariffs in order to improve their terms of trade. However, elimination of the tariffs within blocs would imply more distortions since, in this setup, goods can be purchased from non-members or fellow-members. These distortions are then eliminated by the decision to purchase the goods from fellow members or domestic producers. The underlying assumption in the whole exercise is trade without transportation costs. Once significant transportation costs are introduced, then consolidation within the block becomes the optimal outcome and there is no trade diverted from the trading block. Frankel et al. (1996) recognise that their model is highly stylised and that many factors are left out. The model can be described as a useful attempt to highlight the role which geography has in the trade-off between trade-creation and trade diversion. In particular, as discussed in section 5.3.1, the custom union combine's internal free trade with external protectionism, the effects of forming a custom union will be positive only if trade creation exceeds trade diversion. There is no theoretical presumption that this condition will hold; it is an empirical question.

Caporale et al. (2008:9) suggest that the "new international trade theory provided theoretical justification for gravity equations in terms of increasing returns to scale, imperfect competition and geography (transportation costs)". However, they provide no arguments to support this viewpoint. Anderson and van Wincoop (2003) provide an alternative view arguing that there is a lack of clear theoretical foundations for gravity equations. Their main contribution is in stressing the importance of trade barriers and their implications. They refer to Anderson (1979) in order to argue the importance of inclusion of average trade barriers, or "multilateral resistance" in the gravity literature. Anderson and van Wincoop (2003) refer to the persistence of price differentials as indicating multilateral resistance, explaining that prices differ between locations as a result of trade costs (like information costs, design costs, various legal costs etc). Hence ignoring prices can result in omitted variable bias. Shepotylo (2009) stresses that the multilateral resistance term is not directly observable and defines it as an integral measure of trade barriers of a single country compared to all its trading partners. Anderson and van Wincoop (2003) argue that the gravity literature does not typically include multilateral resistance, or if it is included then it is in a form of an atheoretic variable related to distance. The problem is in the atheoretic variable, since it does not capture any of the other trade barriers. They used the assumption of a constant elasticity of substitution between all goods to derive a decomposition of trade resistance into three components. The *first* component is the bilateral trade barrier between region *i* and region *j*; the *second* component is *i's* resistance to trade with all regions; and the *third* component is *j's* resistance to trade with all regions. Their assumption is that each region is specialised in the production of only one good with homothetic preferences subject to budget constraint. Essentially they are separating bilateral flows of exports across countries from production and consumption within countries. What they argue is that price differs between locations due to trade costs which are not directly observable. The key implication of their theoretical gravity equation is that trade between regions is determined by relative trade barriers.

To develop a theoretical foundation for the gravity model Feensta (2002) calls upon the monopolistic competition and Heckscher-Ohlin models. Specifically, a Heckschen-Ohlin model with a continuum of goods, since this theory under the assumption of unequal factor prices allows complete specialisation in different products.  Based on these two models, Feenstra (2002) stresses that the common feature of monopolistic competition and the Heckscher-Ohlin model with a continuum of goods is that they have many more goods than factors, which allows complete specialisation in different product varieties across countries. According to Feenstra (2002), gravity equations typically assume that trade between two countries is directly proportional to the product of these countries' gross domestic products.

### 5.4 Empirical studies of the impact of Free Trade Agreements

This renewed attention to the theoretical foundations of gravity equations has resulted in formulations of the gravity equations that derive from general equilibrium modelling of bilateral trade patterns (Feenstra, 2002; Anderson and van Wincoop, 2003; Shepotylo, 2009). Gravity equations are widely used in the empirical analysis of international trade flows. The particular attention is to estimate the trade potential of Bosnia and Herzegovina in order to assess its trade deficit sustainability.

To the best of knowledge, no empirical literature on the Western Balkans' trade potential is available. What is available is rather a brief literature on some countries of Western Balkans like Vujcic and Sosic's (2004) gravity estimates for Croatia and Christie's (2002) empirical study of potential trade in Southeast Europe. They apply only a basic gravity model. Both papers are relatively crude, containing serious deficiencies. Vujcic and Sosic (2004) for example did not explain properly the dependant variable in the gravity model or even the estimation technique they applied. In their gravity estimation the dependant variable is the natural logarithm of Croatian trade, but they did not explain how they define trade. They indicate that they used panel data but without explanation of the estimation technique which they applied. They also stress that they had a high colinearity in their estimation resulting from several dummy variables included in model. Probably what they meant was the problem of multicolinearity. That is why they decided to add one by one dummy variables into the basic gravity model, hence they produce a total of fourteen estimated equations. This could suggest that they only applied OLS without any attempt to estimate fixed or random effects. Moreover, it is very difficult to evaluate their results, since diagnostic tests are not reported at all. What is reported is just the authors' selection of tables with results from the 14 estimated equations. According to their findings, the largest trade potential for Croatia is with the EU and CEFTA. In contrast, Christie (2002) is more transparent regarding diagnostic tests and the estimation technique used. He clearly states it is OLS. However his estimation of Croatia's potential trade seems to be problematic for two reasons. The first is due to a missing data problem and the second to the potential GDP calculation. Christie (2002) had created a database by collecting from different data sources in order to fill in the missing figures for i.e. GDP, distance and c.i.f. imports. He did not indicate whether those different sources applied the same calculation methodology. In regards to the potential GDP calculation, Christie (2002) only explains that potential GDP can be "an educated guess" for the countries of the region. An "educated guess" questions the validity of his estimation as well as what he considers as the region. This seems to be also problematic since he selects sub-groups of southeast European countries in order to see whether those selected countries "may qualify" as a region. The criteria for selection of sub-groups seemed to be only his wider view of South East Europe. Based on the results from the estimated gravity equations, he suggests that there is no clear economic block in South Eastern Europe.

A more comprehensive empirical work is that of Bussière et al. (2005), providing an assessment of the trade integration of Southeast Europe. They use a country-pair fixed effect models to account for unobservable factors, arguing that these specifications fully utilise the panel dimensions of trade flows between countries. As the inclusion of fixed effects does not allow estimation of the time-invariant variables, like distance, they apply the two-step procedure of Cheng and Wall (2005). Bussière et al. (2005) also assessed potential trade for Southeast Europe based on a trade condition indicator. This indicator is calculated from estimated country-pair effects on time-invariant variables, like distance. The indicator presents an indication of the countries' average degree of integration into the world economy after time-invariant variables had been filtered out. Bussière et al. (2005) find Bosnia and Herzegovina had reached only 15% of the average trade level (based on data from 1997 to 2003), which suggests that BH still has potential to integrate more fully into the world economy. This section investigates research findings on the impact of trade agreements on trade flows and then in Chapter 6 an empirical analysis of BH trade potential is carried out.

Estimating a gravity equations and assessing the trade patterns based on the empirical results has its econometric challenges. Recent papers use different estimation techniques i.e. cross-section, panel or OLS. It seems that the more recent empirical work on trade using gravity models is based on panel data. Panel data refers to the pooling of observations on a cross-section, typically, of countries over several time periods (Baltagi, 2008). In this fashion panel data enable controlling for unobserved heterogeneity in either individual country effects; time effects or even both depending on the approach applied. A fixed effects approach would be appropriate if it is assumed that some or all explanatory variables are correlated with the error term, while a random effects approach would be appropriate if all explanatory variables are assumed not correlated with the error-term (Mundlak, 1978). The next section presents a literature review of the effects of FTA on trade flows, discuss different estimation techniques and provide a summary of key recent studies.

### 5.4.1 Review of key recent studies using gravity equation models

One of the early papers that utilise gravity equations in the estimation of the effect of trade areas on trade creation was that of Aitken (1973). Even though he does not explicitly indicate that the model applied is a gravity equation, it is presumed that it is a gravity model, since distance is one of its core variables. The model is applied to the analysis of cross-sectional trade flows. The intention of Aitken (1973) was to estimate whether the European Economic Community (EEC) and European Free Trade Association (EFTA) have experienced a cumulative growth in gross trade creation over their integration period. He estimates a trade preference coefficient from seventeen periods and based on this coefficient he claims that trade had increased as a result of the formation of EEC and EFTA. He identifies a single year as a base year for projections of trade after running seventeen regressions and in order to estimate trade creation in the absence of the economic integration. Two strong assumptions are imposed with an explanation that they could have a “small” effect on integration. These assumptions are the degree of trade liberalisation and the effects of changes in competitive position among countries. Aitken (1973) is using cross-sectional data and these estimates are relevant for a specific point in time.  It can be argued that the time effect was relevant for the study since in order to identify 1958 as a base year seventeen regressions were necessary. In principle, a series of cross-section regressions may be reasonable especially given the theoretical and practical limitations on panel analysis in the early 1970s. The problems are likely to be small sample size, hence multicollinearity, and severe constraints on the ability to control for fixed effects. With respect to both problems, panel analysis is the solution.

Table 5.4 summarises the relevant theory; data; model; technique used; FTA treatment (whether membership is modelled as endogenous or exogenous); results and other comments from recent studies of the effects of membership of a FTA. In assessing these studies two key issues are addressed. The first is to assess their different empirical findings with respect to FTA influence on trade flows. The second is to stress the availability of different empirical techniques for the estimation of some FTA's impact on trade flows. Then specific aspects of these studies are discussed in the order that they are listed in table 5.4.

Table 5.4: Summary of reviewed studies on FTA effect on trade flows

| Study | Theory | Data | Model | Technique | FTA treatment | Result | Other comments |
|---|---|---|---|---|---|---|---|
| Frankel et al., (1996) | Customs union theory; Monopolistic-competition model of trade | 1965-1992<br>63 countries | Descriptive analysis of summarised research and one on gravity equations | Parameters and estimates of gravity model | Not specified | Results are mixed | unconditional analysis |
| Baire and Bergstrand (2002) | Preferential trading agreements; Monopolistic competition, Heckscher-Ohlin | 1960 and 1996<br>1431 country pairs | Probit model, where FTA takes value 1 if two countries have FTA and 0 otherwise | Quantitative choice | Endogenous | For two countries in different continents the welfare gains from FTA are likely to be greater. | |
| Bussière et al., (2005) | Constant elasticity of substitution | 1980-2003<br>61 countries and 51863 observations | Gravity model with bilateral trade between country i and country j = f (real GDP; distance; territory; border; language; EU; Asean; Mercosur; CEFTA; NAFTA; RER) | OLS, FE, RE, DOLS two-stage out of sample approach | Endogenous | CEE countries, trade flows approached their "potential" level with euro area. SEE countries have a low degree of trade integration with euro area. | |

| Study | Theory | Data | Model | Technique | FTA treatment | Result | Other comments |
|---|---|---|---|---|---|---|---|
| Spies and Marques (2009) | Customs union theory | 1991-2003 204 countries and 32245 observations | gravity model with trade flows = f (nominal GDP;language; common land border; landlocked; distance; FTA for contracting parties and for non-contracting parties; RER) | unbalanced panel with FE, RE and FEVD | Not specified | FTA has created new trade of CEECs with the EU while the imports of Czech Republic and Slovakia increased with the rest of the world. | Heteroskedasticity and serial correlation of the error terms occurred not discussed how the problem was solved |
| Anderson and van Wincoop (2003) | Constant elasticity of substitution | 30 states, 10 provinces and 21 region (two country model); 22 countries or 61 regions (multilateral model) | gravity equations are developed for two country model and multilateral country model with multilateral resistance terms | non-linear least squares; fixed effect estimator | Not specified | Improved estimation for theoretically based gravity model. Border reduces bilateral national trade levels | Potential bias if multilateral resistance terms are not accounted for |
| Simawaka (2006) | Not specified | 2000-2004 8 countries | Gravity model with product of bilateral trade between country i and country j = f (real GDP; distance; region; border; exchange rate) | OLS, FE, RE | Not specified | Regional trade agreements have been insignificant. | A selective literature review of empirical methodology was provided but paper does not refer to specific theoretical approach followed.Time-invariant variable issue is not addressed. |

| Study | Theory | Data | Model | Technique | FTA treatment | Result | Other comments |
|---|---|---|---|---|---|---|---|
| Caporale et al., (2008) | Linnemann (1966), derived from Walrasian general equilibrium model | 1987-2005<br>19 countries | Gravity model with average value of bilateral trade between country i and country j = f (GDP; geographical distance; income per capita; political stability; landlocked; association agreement) | FE, RE, FEVD | Endogenous | FTA variable has a positive and statistically significant effect on bilateral trade regardless of the estimation technique or sample of countries chosen. | |
| Baire and Bergstand (2005) | Customs union theory | data on five years intervals from 1960 to 2000<br>96 countries | gravity model with cross-section time series, where merchandise trade flow = f (nominal GDP; language; common land border; FTA; multilateral resistance terms distance) | Quantitative choice, OLS, FE, RE | Endogenous | FTAs has positive and significant effect on trade flows. | Zero trade flows are excluded. Empirical evidence that FTA has positive effect on trade flows when using panel data analysis and controlling for endogeneity of FTA. |
| Alba et al., (2008) | Not specified | 1960-1999<br>99 countries | Gravity model with volume of bilateral trade between country i and country j = f (real GDP; distance; region; border; exchange rate) | OLS, FE, FD | Endogenous | FTA has positive and significant effect on trade flows. | 43 explanatory variables are used and only listed in the appendix. A selective literature review of empirical methodology was provided but paper does not refer to specific theoretical approach followed. |

Frankel et al. (1996) summarise research conducted in the early 1990s on the effects of free trade areas. In their analysis they assumed three continents and that the first-best solution of the worldwide free trade is not attainable for political reasons. Then the economic welfare of these areas is assessed through different scenarios, i.e. with and without transportation costs. It is hard to discuss the robustness of their findings since neither diagnostic tests nor regression estimates are reported. A more systematic empirical analysis is that of Baier and Bergstrand (2002) on the economic determinants of free trade agreements. They used a qualitative choice methodology to determine the likelihood of country pairs forming an FTA based on their economic characteristics. What they found was that where the countries are more similar economically the welfare gains from participating in a FTA were greater and that those countries were indeed more likely to be participating in FTAs.

Bussière et al. (2005) estimate the trade potential of Central and Eastern European countries. They use a country pair fixed effect models to account for unobservable factors, arguing that an additional benefit of country pair fixed effect models is that they should reduce endogeneity bias. Endogeneity bias could arise if some of the right hand side variables have some endogenous characteristics or if a measurement error exists. For instance, the error term may be representing unobservable policy-related barriers tending to reduce trade between the countries. Bussière et al. (2005) argue that free trade areas may depend on the initial level of bilateral trade between two countries and that high trade flows may lead to the establishment of a FTA. Hence they apply panel data econometrics with country pair fixed effects which should reduce endogeneity bias. They also propose a new measure of trade integration called the “trade condition indicator”. This indicator is calculated from country-pair specific effects after controlling for the levels of the time-invariant variables, like distance. A trade condition indicator corresponds to the part of fixed effects that is not explained by the fundamental variables. Based on this indicator, most of the Central European countries are viewed as already at their maximum potential level of trade integration with euro area countries. The trade condition indicator is discussed in more detail in Chapter 6.

Spies and Marques (2009) argue that country pair fixed effect models are producing biased estimates, since they do not account for the partially time-invariant character of multilateral resistance variables. Using gravity equations they build upon the earlier work of Anderson and van Wincoop (2003) who stress that multilateral resistance can be described through relative price terms. Spies and Marques (2009) argue that bilateral trade depends on bilateral trade costs, but also on the average resistance to trade with the rest of the world. In their research multilateral terms are defined as averages over all partner countries (i.g. the real exchange rate of each importer's currency is defined against the average of all exporters' currencies). Spies and Marques (2009) assumed that the unobservable trade cost variable is a log-linear function of a set of observable variables (i.e.: landlocked, common border, common language etc) that influence trade costs. Their intention was to examine whether the FTA signed in the 1990s between the EU15 and CEEC countries is trade diverting or trade creating. Hence, they had to create a dummy for contracting parties and non-contracting parties. In this way they capture the impact of the FTA on the trade of group members with non-members. What they have found is that the FTA has created new trade of CEECs with the EU, while the imports of the Czech Republic and Slovakia increased from the rest of the world.

Using panel data estimation techniques, Simwaka (2006) found that regional economic groupings have an insignificant effect on trade flows in Malawi. In contrast, Caporale et al. (2008) find that both fixed and random effects estimation suggests a positive and significant effect of FTA on trade flows between the EU15 and CEEC-4 countries (Bulgaria, Hungary, Poland and Romania). Besides fixed effects and random effects they also applied the fixed effect vector decomposition (FEVD) technique, which is a three-step procedure developed by Plumper and Troeger (2004). With the FEVD they account for time-invariant variables, like distance. Caporale et al. (2008) argue that the larger and more similar two countries are in economic size the more likely they are to sign a regional trade agreement, since the agreement will lead to greater trade creation and welfare gains. The reasons for their greater welfare gains the exploiting of economies of scale in the presence of differentiated products and trade creation based upon exploiting differences in factor endowments between countries reflecting the traditional competitive advantage. In their model, FTA is considered endogenous explaining that potential bias can result from not considering this variable as endogenous, since potentially omitted variables can be correlated with the regional agreement variable. Their procedure is based on unit fixed effects estimation. The unit fixed effects are a vector of the mean effect of omitted variables, which also includes the effect of time-invariant variables (Plumper and Troeger, 2004; Caporale et al., 2008). The whole procedure is explained through three steps and in their model national income; transportation costs and regional agreements are the basic determinants of trade. Plumper and Troeger (2004) suggest this procedure as the most suitable for small samples.

In estimating the effect of participating in a FTA on countries' trade flows, Baier and Bergstrand (2002; 2005) also consider FTA membership as endogenous and use fixed effect panel data and first difference regressions to eliminate time-invariant omitted variables that are usually included in cross-section regressions. Baier and Bergstrand (2005) found that participating in a FTA has a significant positive effect on the trade flows of member countries. Their estimation basically suggest that an FTA will on average increase two FTA country members' trade by about 86 percent after 15 years. This represents a bit more then six times the effect estimated using OLS (only a 14 percent increase). Alba et al. (2008) also find FTAs to have a significant and positive effect on the trade flows of member countries.

Overall, it can be argued that in a trade analysis some components of trade costs are typically not measurable. Hence, estimating only a cross-section relationship could result in an inconsistent estimator, since unobservable (not measurable) costs will be captured by the error-term. Bun (2006) stresses that unobserved determinants of trade are usually correlated with observed explanatory variables, for example due to an omitted policy variable which can be an important determinant of a country's decision to enter into a FTA. Therefore, the usual least squares estimators are inconsistent. This could result in an omitted variables problem. Baltagi (2008) suggests using the Hausman (1987) test, which is based on the difference between the fixed and random effects estimators. He also suggests not stopping at this point, since one should be careful regarding the test's interpretation, since applied research interprets a rejection as an adoption of the fixed effects model and non-rejection as an adoption of the random effects model.

Estimating gravity equations and assessing the trade patterns has its econometric challenges. The recent empirical literature review suggests that, in general, FTAs have a significant influence on trade flows. However, the majority of studies' empirical evidence is tainted by potential endogeneity bias and more recent studies use different approaches to deal with the time-invariant character of the distance variable. The majority of studies use fixed effects approaches to deal with this issue. Hence, including the time dummies in fixed effects estimation should eliminate the bias stemming from the omission of the "multilateral resistance term". This is further discussed in Chapter 6.

### 5.5 Conclusions

This chapter conducted an analysis of BH's international trade and compared it with that of other Western Balkan countries. Then the theory of trade integration is reviewed (selectively) and practice of gravity modelling considered to set the scene for the empirical analysis in Chapter 6.

The euro area and the other WB countries present the most important trading partners for BH. The large share of BH's trade with other WB countries reflects predominantly trade with Serbia and Croatia. The strong orientation of BH trade to these two countries raises the question as to whether, even before the impact of CEFTA has been fully felt, the trade structure of BH is too heavily oriented towards these two particular countries. This question will be invstigated in Chapter 6 by estimating the effects of a new CEFTA using gravity modelling.

In terms of trade deficit sustainability in Western Balkan countries, there is no authoritative empirical evidence available. The review of key recent studies using gravity models suggested that participating in a FTA generally has a significant and positive effect on trade flows between member countries. Yet, whether formation of a FTA had a significant impact on a country's trade deficit reduction has not been empirically investigated. For WB countries, free trade agreements may be an important part of achieving a smoother transition and accession to the EU. Theoretically the introduction of a free trade area can contribute to economic development and improved regional cooperation. What seems to be missing in the trade literature is research identifying which countries, and under what circumstances, should enter into a FTA. In order to assess whether forming an FTA was a good policy decision for all Western Balkan country members an ex-post empirical analysis will be required. The analysis presented in the next chapter will take into account findings from this review in order to develop an empirical analysis of BH's trade potential to assess the likely impact of CEFTA on its trade deficit sustainability.

# Chapter 6: The influence of CEFTA on the sustainability of trade deficits in the Western Balkan countries



## 6.1 Introduction

The analysis presented in Chapter 5 established two main findings. *First*, in terms of the trade deficit sustainability in the Western Balkans it was found that there is no empirical work available. *Second*, in order to assess whether forming an FTA was a good policy decision for BH an ex post empirical analysis is required. The structure of this chapter is organised in order to address these two findings. Hence three key areas are developed in this chapter. The first is an estimation of the effects of a new CEFTA using gravity equations; the second is calculation of Bosnia and Herzegovina's trade potential; and the third is a discussion of the effects of the new CEFTA on the trade deficit sustainability in BH.

In general, the approach taken by Bussière et al. (2005) is used as a base reference to develop the model of BH trade potential. Since Bussière et al. (2005) are focused on

Central and Eastern European countries, the focus of this chapter is more into the free trade agreement between WB countries, some modification to their work will have to be made in order to make this gravity model more appropriate for Bosnia and Herzegovina. The work by Caporale et al. (2008) on the application of a gravity model of bilateral trade effects to free trade agreements in EU15 and Central Eastern Europe is also used as a starting point, particularly for the application of the fixed effect vector decomposition technique. This technique is suggested to be the most suitable for small samples. This is relevant for model estimation due to the availability of only a small sample data (the data is from 2003 to 2008 for twenty countries).

This chapter is organised in six sections. After this introduction, section 6.2 starts with an examination of the empirical considerations for gravity equations. The theoretical foundations of the gravity equations' application to model trade flows was discussed in section 5.3.3; hence section 6.2 proceeds with the empirical considerations for the gravity model estimation. Section, 6.3 starts with the explanation of the estimation procedure for three models of BH trade flows. The first model refers to the country as a whole, while the other two models are developed for BH's entities (Federation of Bosnia and Herzegovina and Republika Srpska). After the estimation procedure and results discussion of all three BH trade flow models, section 6.4 presents the estimation procedure for assessing BH's trade potential and discuss the estimation results. Section 6.5 will assess the effect of CEFTA on trade deficit sustainability in BH, with the conclusions of this chapter being presented in section 6.6.

## 6.2 Empirical considerations

Some important issues should be considered before commencing an empirical assessment of a FTA's influence on trade flows. Based on discussion in section 5.4, estimating a gravity equation and assessing the trade patterns based on the empirical results has its econometric challenges. These are discussed next.

### 6.2.1 Empirical considerations for a gravity model with panel data

As already learned from section 5.4, the more recent empirical work on trade using gravity models is based on panel data (Bussière et al., 2005; Bun 2006; Baier et al., 2007; Caporale et al., 2008). According to Baltagi (2008), panel data enable controlling for unobserved heterogeneity in either individual country effects or time effects or even both, although the technical nature of the approach to unobserved heterogeneity varies according to whether fixed or random effects estimation is adopted. A fixed effects approach would be appropriate if it is assumed that some or all explanatory variables are correlated with the error term; while a random effects approach would be appropriate if all explanatory variables are assumed not correlated with the error-term (Mundlak, 1978). For example, Bier and Bergstrand (2007) suggest that fixed effects estimation is preferable to random effects, since rejection of the null hypothesis of no correlation between the error term and explanatory variable is less plausible when a FTA is considered as endogenous.

This section further considers some important issues before commencing an empirical assessment of how the new CEFTA has influenced BH trade flows. These considerations cover: techniques that can account for unobservable factors such as multilateral resistance; FTA treatment (whether the FTA membership is modelled as endogenous or exogenous), and variable selection based on a theoretical framework. These are now discussed, together with their likely implications for the empirical estimation.

*Multilateral resistance*

The term multilateral resistance was discussed in the analysis of the theoretical foundations of gravity equations in section 5.3.3. However, it was not discussed how it can be empirically accounted for. Anderson and van Wincoop (2003) argue that the gravity literature does not typically include multilateral resistance, or if it is included then it is in the form of an atheoretic variable related to distance. They refer to the persistence of price differentials as indicating multilateral resistance, explaining that prices differ between locations as a result of trade costs (like information costs, design costs, various legal costs, etc). All these costs are not directly observable, though ignoring price differences can result in omitted variable bias. Bussière et al. (2005) use a country pair fixed effects model to account for these unobservable factors, arguing that these specifications fully utilise the panel dimensions of trade flows between countries. Also Baldwin and Taglioni (2007) show that consistent estimation of the gravity model can be achieved by using panel data and estimating with country pair fixed effects (i.e., treating each bilateral flow as a cross-section group). The technique they applied is basically a standard one-way fixed effects estimator (Baltagi, 2008). This gives consistency in two senses. The first between the theoretically derived form of the gravity model and its empirical specification (in effect the Anderson and van Wincoop, 2003 multilateral resistance effects are modelled as unobservable influences to be captured by the fixed effects). The second is that since multilateral resistance effects are captured by fixed effects, the empirical gravity equation no longer suffers from omitted variable bias, hence consistent estimation is possible. However with the standard fixed effect method the inclusion of the fixed effects does not allow estimation of the time-invariant variables, like distance. Hence Baldwin and Taglioni (2007) recommend applying a *two step procedure*, which was developed by Cheng and Wall (2005). According to this procedure, in the *first step* the standard fixed effect is estimated, where the country-pair individual effect cover all unobservable factors related to trade resistance. As they are collinear with the country-pair individual effects, the estimation of coefficients on distance and other dummy variables is not possible. Yet, by simply running the *second step* regression, these unobservable factors are filtered out (Cheng and Wall, 2005). In the *second step*, the fixed effects from the *first step* regression are obtained and then they are regressed on all dummy variables except FTA in order to filter out the importance of these variables in the fixed effect. The FTA variable is already introduced in the *first step*, since it was already in existence or expanded during the period analysed, and thus varies during the sample period analysed.

Caporale et al. (2008) applied a similar procedure but extended it to three steps. Their procedure is called “the fixed effect vector decomposition technique” initially developed by Plümper and Troeger (2004). The detailed steps of both estimation procedures are presented in section 6.2.3. The main difference between the two procedures is obviously the *third step.* Caporale et al. (2008) obtained the residuals from the *second step* and then they repeated the first step regression including the residuals of the *second step*, together with all other explanatory variables and all dummy variables. In order to estimate whether CEFTA had an effect on the BH trade flows in the observed time period the estimation approach of Caporale et al.'s (2008) is applied and Bussière et al. (2005) in order to calculate BH's trade potential.

In the existing literature, one important issue that remains with gravity estimation based on fixed effect techniques is the failure to report diagnostic tests in all recent studies. It seems that in these estimation procedures diagnostic tests reports are simply forgotten. Studies by: Plümper and Troeger (2004); Bussière et al. (2005); Cheng and Wall (2005); Baldwin and Taglioni (2007); Rault et al. (2008) and Caporale et al. (2008) all fail to report diagnostic tests. Caporale et al. (2008) do report variance inflation factors (VIF), although this is a checking procedure for (near) multicolinearity rather than a formal diagnostic testing procedure. Plümper and Troeger (2004) reported only the Jarque-Bera test statistic, which was used in order to test whether the residuals from the second step are normally distributed. However, formal diagnostic tests like the Ramsey Reset test intended for omitted variable and functional form diagnosis or the Breusch-Pagan test of heteroskedasticity are not reported (or even referred to). The failure to report such tests, in particular some standard test for the presence of residual autocorrelation, means that there is little confidence in the statistical validity of the models used and, hence, little confidence in the estimates obtained or in the associated statistical inference (t and F statistics etc).

*Treatment of Free Trade Agreement*

Another consideration that is important to address is that of endogeneity. Since, in the estimation, CEFTA is the variable of interest in the gravity method estimation, an important consideration for empirical estimation is how it is treated, whether the membership is modelled as endogenous or exogenous. Section 5.4.1 stressed that unobserved determinants of trade are usually correlated with observed explanatory variables, for example due to an omitted policy variable which can be an important determinant of a country's decision to enter into a FTA. In the model CEFTA is treated as endogenous, since it represents a BH government decision to enter.

Bun and Klaassen (2002) argued that endogeneity is usually ignored in the literature, though recent empirical studies have addressed whether FTA membership should be modelled as endogenous or exogenous (Baier and Bergstand, 2002; Baier et. al., 2007; Alba et. al 2008; Caporale et al., 2008). However, Caporale et al. (2008) argue that there is still no uniformity in the empirical analysis of the effects of a FTA. These studies use different methods in their empirical implementation, so it is not surprising that their treatment of FTA's is not consistent. The choice of the estimation method should be determined by economic and econometric considerations. However, as learned in section 5.4.1 the majority of studies' empirical evidence is tainted by potential endogeneity bias. The more recent studies use fixed effects approaches to deal with this issue. Chapter 6 will apply the one-way fixed effects approach with time dummies and the vector error decomposition technique following Caporale et al. (2008). Including the time dummies in fixed effect estimation, according to Baldwin and Taglioni (2007), should completely eliminate the bias stemming from the omission of the "multilateral resistance term".

*Variable selection*

The appropriate selection of variables for inclusion in the gravity model is mainly dependent on the question of interest. For example, Bun and Klaassen (2002) in order to assess whether trade is a dynamic process include only the core explanatory variables. As learned in section 5.3.3, the core explanatory variables are measures of economic size (GDP) and distance between countries. Additional variables are often included: notably, population size; common border; common language; and FTAs, customs unions and other regional arrangements to promote economic integration. The selection of these additional variables should always depend on a clear theoretical framework that is related to the research question.

Since the main interest is to estimate whether CEFTA had an effect on BH trade, four additional explanatory variables are introduced in the BH model. These additional explanatory variables are: CEFTA membership; common border; common country (whether in the last twenty years countries were a part of common country); and GDP per capita. The inclusion of CEFTA is important since the main interest is to analyse whether it has already had an effect on the trade flows. With the addition of "common border" and "previously part of a common country", there is also control for the possibility that more trade will occur when these criteria apply. Section 5.2.2 discussed the proposition that countries with the similar levels of demand seems to develop similar industries. With the inclusion of the difference in GDP per capita between country pairs (i) and (j) it is accounted for whether this effect is significant for BH. This effect is also known as the "Linder effect" but the estimated coefficient on the difference in GDP per capita can be either positive or negative. According to Carillo and Li (2002), if the estimated coefficient is positive then the bigger the difference in per capita GDP the greater the trade, which suggests the dominance of inter-industry trade. Conversely, a countries with similar per capita income and correspondingly similar tastes, produce similar but differentiated products and trade more among themselves, which is consistent with the dominance of intra-industry trade.

One more important issue that has to be addressed is that of the dependant variable. For example, in the model of Bussière et al. (2005) an average of exports and imports was used as the dependent variable, but the reason for this choice was not clearly explained. The only explanation provided is that this was standard in the literature. However, Baldwin and Taglioni (2007) do provide a discussion of the averaging of the bilateral trade flows. They stress that it is alright to average the two trade flows, as long as the averaging is geometric (sum of the logs) not arithmetic (log of the sums). Yet Baldwin and Taglioni (2007) also stress that the theory asserts that the gravity model holds for each and every uni-directional trade flow; since it is a modified CES expenditure function "it explains the value of spending by one nation on the goods produced by another nation" (2007:795). Caporale et al. (2008) specify trade flows as exports from one country to another, which seems to be the new standard practice in the literature (Fenestra, 2002; Carillo and Li, 2002; Christie's, 2002; Baire and Bergstand, 2005; Cheng and Wall, 2005; Rault et al., 2008; Caporale et al., 2008).

Since the interest is to calculate the effect of CEFTA on BH trade flows and then to calculate BH's trade potential, this gravity model is estimated separately for export and imports. This is important in order to clearly distinguish whether CEFTA membership has had a different effect on exports than on imports and whether exports were above their potential or imports under their potential in this period of time or the other way around. It is also important to estimate both due to the intention to assess future BH current account sustainability. The empirical estimation of BH's trade flows is discussed next.

### 6.3 Data, model and estimation procedure for Bosnia and Herzegovina trade flows

This section first discuss data availability for BH's trade flows estimation, and then introduces the specific gravity model that is going to be applied, together with the estimation procedure.

#### 6.3.1 Data

Two datasets were collected. The first dataset is rather small and includes annual data on export flows (or import flows) from BH to each of its twenty main trading partner countries[45], including other Western Balkan countries. The data is available for the period from 2003 to 2008. The second dataset is bigger and includes annual data on export flows from all Western Balkan countries to their largest twenty-two trading partners. This dataset does not include data for Moldova since they were not available. The bigger dataset is intended to calculate the trade flows between Western Balkan countries and later on, in section 6.4, for the estimation of potential trade. The decision was to introduce the bigger dataset, since only estimating BH trade flows could be problematic given the lack of variation in the data, given that BH's GDP is the same in all country pairs of the same data. Total BH export value is calculated according to the fob parity[46] and they are taken from the Central Bank of Bosnia and Herzegovina (CBBH) database, which is

[45] Croatia, Italy, Germany, Slovenia, Serbia, Montenegro, Austria, Switzerland, Hungary, USA, France, Poland, UK, Romania, Czech, Holland, Macedonia, Lithuania, Belgium, Spain and Moldova.

[46] FOB parity stands for Free on Board, which means that invoice value is decreased for the transportation costs and other costs from the BH border to the place of delivery abroad if delivery is contracted abroad. If delivery is contracted in BH then the invoice value is increased by the amount of costs from the place of delivery to the BH border.

available through its web site. In its statistical notes it is indicated that CBBH has collected these data from the BH Agency for Statistics.

In regards to data availability on export flows from BH to other WB countries, there are several issues. Export flows to Montenegro and Serbia are only available for each country separately since 2007 and for Kosovo since 2006. This presents a constraint on the estimation. Particularly difficult is to determine the values of BH export flows to Serbia and Montenegro, since these two countries declared independence from each other in 2006, but BH continued to register their trade flows under the joint name: Serbia and Montenegro. Since Serbia's and Montenegro's trade data are not clearly separated, it was decided to add them together for the purpose of this estimation. A similar problem is with data availability on trade flows to Kosovo. The data before 2006 were recorded as a part of Serbia's data, and after 2006 they start to be recorded separately. For all these reasons Serbia's, Montenegro's and Kosovo's data are added together and called SMK for the purpose of this estimation. Data on trade flows from BH to Croatia, Albania, and Moldova are all available from 2003.

As already discussed in section 1.1, BH has two entities: the BH Federation and Republika Srpska (RS), where the territorial organisation of each entity is regulated by its own constitution. Trade data for these two entities is different in terms of time-series availability. The BH Federation has export data available from 2005 to 2007 and RS from 2003 to 2007. This chapter is going to estimate three gravity models. The first estimation is for BH as a whole and then for each of its entities. In order to estimate the two models for the BH entities comparable time references are needed and countries in the sample. In order to obtain the missing BH Federation data for 2003 and 2004, it was decided to simply subtracted RS main trade partners' trade data from BH total trade data, except for Kosovo since RS reports trade flows to Kosovo within a group of other countries. Tables 6.1 and 6.2 present an overview of the main BH trading partners.

Table 6.1: Top ten BH export trading partners' share in each BH entity and in total BH exports between 2003 and 2007 (in KM millions).

| Top 10 BH export trading partners | Republika Srpska | Share in total BH exports | BH Federation | Share in total BH exports | BH | Share in total BH exports |
|---|---|---|---|---|---|---|
| Croatia | 313.5 | 3.1% | 1,653.3 | 16.1% | 1,966.9 | 19.2% |
| SMK | 678.0 | 6.6% | 868.3 | 8.5% | 1,569.1 | 15.3% |
| Italy | 428.2 | 4.2% | 1,014.7 | 9.9% | 1,442.9 | 14.1% |
| Germany | 236.1 | 2.3% | 999.9 | 9.8% | 1,236.0 | 12.1% |
| Slovenia | 230.3 | 2.2% | 867.1 | 8.5% | 1,097.4 | 10.7% |
| Austria | 118.6 | 1.2% | 426.0 | 4.2% | 544.5 | 5.3% |
| Switzerland | 98.6 | 1.0% | 204.6 | 2.0% | 303.2 | 3.0% |
| Hungary | 23.8 | 0.2% | 263.3 | 2.6% | 287.2 | 2.8% |
| USA | 225.5 | 2.2% | 35.3 | 0.3% | 260.7 | 2.5% |
| France | 43.4 | 0.4% | 116.9 | 1.1% | 160.3 | 1.6% |
| Total | 2,396.2 | 23.4% | 6449.5 | 63.0% | 8,868.4 | 86.6% |

Note: Data were obtained from the BH Federation Statistic Agency, RS Statistic Agency and CBBH; presented figures are the author's own calculations.

Table 6.2: Top ten BH import trading partners' share in each BH entity and in total BH imports between 2003 and 2007 (in KM millions).

| Top 10 BH import trading partners | Republika Srpska | Share in total BH imports | BH Federation | Share in total BH imports | BH | Share in total BH imports |
|---|---|---|---|---|---|---|
| Croatia | 837.4 | 3.0% | 3,949.6 | 14.3% | 4,787.0 | 17.3% |
| Germany | 626.3 | 2.3% | 2,888.3 | 10.4% | 3,514.7 | 12.7% |
| SMK | 1,830.3 | 6.6% | 875.4 | 3.2% | 2,709.2 | 9.8% |
| Italy | 759.9 | 2.7% | 1,786.3 | 6.5% | 2,546.2 | 9.2% |
| Slovenia | 413.9 | 1.5% | 1,637.2 | 5.9% | 2,051.1 | 7.4% |
| Hungary | 377.1 | 1.4% | 750.2 | 2.7% | 1,127.4 | 4.1% |
| Austria | 304.0 | 1.1% | 840.1 | 3.0% | 1,144.1 | 4.1% |
| Turkey | 130.5 | 0.5% | 793.8 | 2.9% | 924.4 | 3.3% |
| China | 176.1 | 0.6% | 702.5 | 2.5% | 878.6 | 3.2% |
| Russia | 135.7 | 0.5% | 472.9 | 1.7% | 608.6 | 2.2% |
| Total | 5,591.3 | 20.2% | 14696.5 | 53.1% | 20,291.4 | 73.4% |

Note: Data were obtained from the BH Federation Statistic Agency, RS Statistic Agency and CBBH; presented figures are the author's own calculations.

With regards to GDP data they are obtained them from the World Economic Outlook (WEO) October, 2009 on-line data base. Data on population are also collected from the WEO October, 2009 on-line data base. Distance data are measured in kilometres and obtained from Michelin recommended road routes between capital cities, except for the

USA where the circle distance between capital cities (based on latitude and longitude[47]) is used.

### 6.3.2 Model

In order to estimate the impact of CEFTA on BH trade flows approach of Caporale et al. (2008) is followed. They estimated bilateral trade flows between the EU15 and 4 CEEC countries (Bulgaria, Hungary, Poland and Romania). Though in order to make the model more suitable for the estimation of BH trade flows it is necessary to redefine the dependent variable and some of the dummy variables. With regards to the dependent variable six models of trade are estimated using always the same model specification but different dependent variables: imports and exports between on the one hand BH and each of BH's entities (FBH and RS) and on the other each of their main trading partners. Table 6.3 presents the different country samples for the six models. Countries are selected based on their overall participation in trade (BH, FBH and RS) between 2003 and 2008. Twenty one countries are in each model except in models 3 and 6. These models have only twenty countries. The reason is that it was decided not to include Moldova in these two models because there was no trade registered between Moldova and Republika Srpska in the observed time period. With regards to overall participation in trade, each set of trade flows include more then 85% of the total trade (exports or imports). Albania and Moldova are included in all other samples even though they do not belong to the top twenty main trading partners in either model specification. The reason why they are included is that they belong to CEFTA and the intention is to assess whether the new agreement had an influence on BH's trade flows.

[47] http://www.chemical-ecology.net/java/lat-long.htm

Table 6.3: Countries included in data samples for the trade flows models estimation for BH, FBH and RS

| Model: | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|---|---|---|---|---|---|---|
| Dependant variable description | BH imports | FBH imports | RS imports | BH exports | FBH exports | RS exports |
| countries in sample | Croatia | Croatia | Croatia | Croatia | Croatia | Croatia |
| | Italy | Italy | Italy | Italy | Italy | Italy |
| | Germany | Germany | Germany | Germany | Germany | Germany |
| | Slovenia | Slovenia | Slovenia | Slovenia | Slovenia | Slovenia |
| | SMK | SMK | SMK | SMK | SMK | SMK |
| | Austria | Austria | Austria | Austria | Austria | Austria |
| | Switzerland | Switzerland | Switzerland | Switzerland | Switzerland | Switzerland |
| | Hungary | Hungary | Hungary | Hungary | Hungary | Hungary |
| | USA | USA | USA | USA | USA | USA |
| | France | France | France | France | France | France |
| | Poland | Poland | Poland | Poland | Poland | Poland |
| | Turkey | Turkey | Turkey | UK | Luxemburg | UK |
| | Romania | Romania | Romania | Romania | Bulgaria | Romania |
| | Czech | Czech | Czech | Czech | Czech | Czech |
| | Holland | Holland | Holland | Holland | Holland | Holland |
| | Macedonia | Macedonia | Macedonia | Macedonia | Macedonia | Macedonia |
| | China | China | China | Lithuania | Turkey | Lithuania |
| | Russia | Russia | Russia | Belgium | Belgium | Greece |
| | Ukraine | Spain | Ukraine | Spain | Spain | Spain |
| | Albania | Albania | Albania | Albania | Albania | Albania |
| | Moldova | Moldova | | Moldova | Moldova | |

With regards to the definition of dummy variables, Bussière et al. (2005) was followed. In this model there are four dummy variables. *The first* dummy variable is for recent membership of a common territory. This includes the countries of the Western Balkans, which within the past twenty years all belonged to a common country. More specifically, they include the former Yugoslavian countries (BH, Croatia, Macedonia, Serbia, Montenegro and Slovenia). Bussière et al. (2005) considered only Bosnia, Croatia, Macedonia and Slovenia under the former Yugoslavia. *The second* dummy variable refers to the countries that have a common border with BH; namely, Croatia and Serbia and Montenegro. The *third* dummy is BH VAT. The BH VAT dummy variable is equal to 1 in 2006 onwards and zero otherwise. From the previous discussion in Chapters 1 and 4, it is known that this is the year in which VAT was implemented in BH, hence structural changes could also have had a significant impact on both exports and imports trade flows. This cannot be assumed to be captured by unobservable factors, since VAT is not time invariant. VAT was introduced at the same time as CEFTA for BH, which makes its introduction a potential confounding factor; hence, it needs to be controlled for in the analysis of CEFTA effects. The fourth dummy variable is for CEFTA countries. Even though CEFTA and VAT refer to the same year, separate CEFTA and VAT effects can be identified since, although for trade with CEFTA members the CEFTA and VAT dummies are the same, for trade with non-CEFTA members they are not. Hence the CEFTA dummy variable is equal to 1 if country *i* and *j* had concluded a CEFTA agreement in 2006 (onwards), and zero otherwise.

Caporale et al. (2008) used two additional dummy variables, namely: political stability; and landlocked. A dummy variable for political stability is not going to be used, since these data are not available. One possible proxy for political stability could be the EBRD's indicator that measures WB countries' transition progress; however, there is not much variation in this indicator in the data available during the sample period. In Caporale et al. (2008) GDP per capita is introduced as two different variables for each country separately. According to Bussière et al. (2005), introducing GDP per capita into the equation potentially causes high collinearity between the dummy variables and the population, so they do not include GDP per capita in their estimation. This model will include GDP per capita but only as the difference between the two countries GDP per capita, which captures the so-called "Linder effect". The variable for distance is specified in kilometres, as in Bussière et al. (2005) and Caporale et al. (2008), and measures the geographical distance between BH's capital Sarajevo and the capital city of each particular trading partner.

The model is presented next and estimated in order to analyse CEFTA's affect on BH's trade flows. The gravity equations are used with a country pair fixed effect to model unobservable factors since, as already discussed in section 5.4 and 6.2, these specifications fully utilise the panel dimensions of trade flows between countries.

Equation (6.1) is the model and all variables are defined in logarithms (previously being collected in millions of Euros) except for the dummy variables.

$$T_{ijt}=\alpha_0+\alpha_1 fbh_{ijt}+\alpha_2 gdppc_{ijt}+\alpha_3 d_{ij}+\alpha_4 CEFTA_{ijt}+\alpha_5 VAT_{ijt}+\alpha_6 Bor_{ij}+\alpha_7 CC_{ij}+u_{ij}+\theta_t+\varepsilon_{ijt} \qquad (6.1)$$

In this specification the value of some uni-directional bilateral trade flow is the dependent variable. The explanatory variables used are the sum of the nominal GDP of the two partner countries ($fbh_{ijt}$), the difference in GDP per capita of the two partner countries ($gdppc_{ijt}$) and dummy variables for: geographic distance ($d_{ij}$); membership of the Central European Free Trade Agreement ($CEFTA_{ijt}$); BH VAT ($VAT_{ijt}$); border ($Bor_{ij}$) and common country ($CC_{ij}$). The historically close connections between BH, Serbia and Croatia could be a reason why BH is so strongly oriented to trade with these two particular countries (section 5.2.1). Time specific effects ($\theta_t$) are also included, since some period-specific factors may have an effect on trade flows that are very difficult to identify (Bussière et al., 2005). In addition, recent writing on panel analysis has emphasised the importance of controlling for period effects to minimise the potential bias of estimates arising from cross-group correlation of the residuals, such as in this case might arise from similar reactions of countries to external shocks (Sarafidis et al., 2006; Roodman, 2009).

The notation is the following:

- $T_{ijt}$ denotes the trade flows (exports or imports) value of bilateral trade between countries *i* and *j* at the time t with $i \neq j$. The model is estimated six times with different dependent variables, hence: exports and imports (of BH and each of it entities).
- $\alpha_0$ is the intercept
- $fbh_{ijt}$ represent the sum of nominal GDP of country *i* and *j*.
- $gdppc_{ijt}$ represent the GDP per capita difference between country *i* and *j*.
- $d_{ij}$ represents the distance between country *i* and *j* in kilometres.
- $CEFTA_{ijt}$ is a dummy variable that is equal to 1 if country *i* and *j* have concluded a CEFTA agreement by time t (2007 onwards) and zero otherwise.

- $VAT_{ijt}$ is a dummy variable that is equal to 1 only if BH is either country *i* or *j* at time t (2006 onwards), and zero otherwise.
- $Bor_{ij}$ is a dummy variable that is equal to 1 if country *i* and *j* share a land border.
- $CC_{ij}$ is a common country dummy variable that is equal 1 if country *i* and *j* in the last twenty years were part of Yugoslavia
- $u_{ij}$ is a country-pair fixed effect
- $\theta_t$ is a time specific effect
- $\varepsilon_{ijt}$ is the disturbance term

Theoretically it is anticipated that the higher the joint GDP the higher the trade flows and the greater the distance between the countries the lower the trade. The expected signs on common country and common border dummy variables and CEFTA dummy variables is positive, while on the difference in income per capita is generally expected to be positive. The latter is included as an additional regressor in order to proxy the "Linder effect". In the literature the difference in per capita income is also used to proxy the difference in factor endowments (Bussière et al., 2005; Caproale et al., 2008). Rault et al. (2008) suggests that the Heckscher-Ohlin assumptions are confirmed if the sign on the difference in GDP per capita is positive. In contrast, if the new theory of trade is supported then the expected sign is negative, which suggests the predominance of intra-industry trade in total trade flows. They do not advance any explanation for these statements, except for citing comparative advantage. Their explanation is that countries which are different in factor endowments would exchange more, suggesting that this should involve an increase in trade flows. Next the focus is on the estimation procedure and discussion of the results.

### 6.3.3 Estimation procedure

A three step procedure is applied. This procedure was developed by Plümper and Troeger (2004) and also applied by Caporale et al. (2008). In the model CEFTA is considered endogenous. Potential bias can result from not considering this variable as endogenous, since potentially omitted variables can be correlated with the regional agreement variable. Plümper and Troeger's (2004) procedure is based on the unit fixed effects estimation. The unit fixed effects are a vector of the mean effect of omitted variables, which include the effect of all unobserved time-invariant variables (Plümper and Troeger, 2004; Caporale et al., 2008). The whole procedure is explained through three steps and in the model of Caporale et al. (2008): national income; transportation costs and regional agreements are the basic determinants of trade. Plümper and Troeger (2004) suggest this procedure as the most suitable for small samples[48].

*Estimation procedure for unit fixed effects estimation:*

The approach of Caporale et al. (2008) is known as "the fixed effect vector decomposition technique". This is an ingenious method to include time invariant effects that otherwise are excluded from fixed effects estimation (because the former are necessarily collinear with the group-level fixed effects): The 1st step estimation of the gravity model yields a vector of estimated fixed effects. In the 2nd step, this vector of fixed effects is regressed on the excluded time invariant variables which, in effect, decompose each fixed effect into an observed component (the effects of the time invariant dummy variables) and an unobserved component (the Step 2 residuals). Finally, in the 3rd step, the gravity model is reestimated with the fixed effects fully substituted by these observed and unobserved components. These three steps are now explained in detail.

**The First step:** is based on the estimation of a standard fixed effect model, hence the main model equation (6.1) is estimated but without dummy variables. Cheng and Wall (2005) stress that "the country-pair intercept includes the effects of all omitted variables that are cross-sectionally specific but remain constant over time, such as distance" (2005:54). The main reason why dummy variables are excluded is that the country-pair individual effect covers all unobservable factors related to trade resistance. As they are collinear with the country-pair individual effects, estimation of coefficients on distance and other dummy variables is not possible. Hence the following equation (6.2) is estimated:

$$T_{ijt}=\alpha_0+\alpha_1 fbh_{ijt}+\alpha_2 gdppc_{ijt}+\alpha_3 CEFTA_{ijt} +\alpha_4 VAT_{ijt} +u_{ij}+\theta_t+\varepsilon_{ijt} \qquad (6.2)$$

[48] They are interested in small sample properties (i.e. $n \leq 100$) and hence propose additional degrees of freedom to avoid potential undestimation of the standard errors. We have not used this correction because our sample has more than 500 observations.

The **second step** is performed on the estimated fixed effects ($u_{ij}$) from equation (6.2). The fixed effects ($u_{ij}$) are the country-pair effects from the fixed effect model. Hence, in this second step fixed effects ($u_{ij}$) from (6.2) are regressed on all the excluded dummy variables in order to filter out the importance of these variables from the fixed effect. Cheng and Wall (2005) stress that by running the second step regression the "unobservable factors" are filtered out. Hence the following estimation:

$$u_{ij}=\alpha_0+\alpha_1 d_{ij}+\alpha_2 Bor_{ij}+\alpha_3 CC_{ij}+w_{ij} \qquad (6.3)$$

where:

- $\alpha_0$ is the intercept
- $w_{ij}$ is the error term, i.e. the unobservable, hence unexplained part of the unit effects

In the **third step** the so called decomposed unit fixed effect ($w_{ij}$) (Caporale et al., 2008) is obtained from equation (6.3) (this is the residual from 6.3). The unit fixed effects are a vector of the mean effects of the omitted time invariant variables (Plümper and Troger, 2004; Caporale et al., 2008). Then the full model (6.4) is estimated as the third step. This is equation (6.1) modified to include the decomposed unit fixed effect ($w_{ij}$) and the observed time invariant variables. Together, these fully substitute for the country-pair fixed effects ($u_{ij}$) estimated by 6.2. Since the unit fixed effect is, by construction, not correlated with time-invariant variables pooled OLS, can now be applied. Hence, the following model (6.4) yields unbiased pooled OLS estimates (Plümper and Troger, 2004)

$$T_{ijt}=\alpha_0+\alpha_1 fbh_{ijt}+\alpha_2 gdppc_{ijt}+\alpha_3 d_{ij}+\alpha_4 CEFTA_{ijt}+\alpha_5 VAT_{ijt} +\alpha_6 Bor_{ij}+\alpha_7 CC_{ij}+\theta_t+\alpha_7 w_{ij}+\varepsilon_{ijt} \qquad (6.4)$$

As a robustness check the unit fixed effect model of Caporale et al. (2008) is compared with that of the two step model of Bussière et al. (2005). In both estimations the method of fixed effects with time dummies is applied. These dummies according to Baldwin and Taglioni (2007) should completely eliminate the bias stemming from the omission of the "multilateral resistance term".

The next section discuss the estimation results of CEFTA effect on BH trade flows for BH as a whole and its two entities.

### 6.3.4 The estimation results of a Central European FreeTrade Agreement effect on Bosnia and Herzegovina's trade flows

This section summarises the estimation results of the BH trade flow model following the estimation procedure described above. Gravity equations are used by applying the fixed effects vector decomposition technique with time dummy variables. The literature suggests that this technique eliminates endogeneity bias (Plümper and Troeger, 2004; Bussière et al., 2005; Caproale et al., 2008). Endogeneity bias could distort the results if pooled OLS were simply applied and, thereby not accounted for the unobservable factors that are otherwise captured by the residuals. Hence the preferred, at this stage, model is a fixed effect vector decomposition (FEVD) with the time dummies (equation 6.4). However, there is a problem with this estimation procedure. This problem arises from the two sets of criteria that any method of estimation must satisfy: namely: *statistical validity* (i.e., are the assumptions of the econometric model as a statistical generating mechanism supported by the data - for example, no serial correlation in the error terms); and *economic validity* (i.e., is the econometric model consistent with economic theory). It seems that in order to satisfy economic validity the recent empirical studies (Plümper and Troeger, 2004; Cheng and Wall, 2005; Bussière et al., 2005; Baldwin and Taglioni, 2007; Caproale et al., 2008) neglect to investigate the statistical validity of their models. As discussed in section 6.2.1, the failure to report diagnostic tests in all recent studies means that there is little confidence in the statistical validity of the models used and, hence, in the estimates obtained or in the associated statistical inferences (t and F statistics etc). Next to overcome this obstacle some improvements to the estimation procedure are discussed.

*Fixed effect vector decomposition model improvements:*

***A first improvement*** is to check the model diagnostics after running the **first step estimation** by applying the Wooldridge test for autocorrelation in panel data;

***A second improvement***, especially if serial correlation in the residuals has been detected, is to check whether the common factor restrictions (CFR) hold. This proceeds via the following steps:

1. Specify and estimate a dynamic linear regression model of order one.
2. Test for the CFR on each continuous variable.
3. If the CFRs hold then estimate an unobserved components model, since under this condition "pure" serial correlation in the residuals can be assumed.

In the text box 6.1 the CFR (Spanos, 1986; McGuirk and Spanos, 2004) is explained.

***Text Box 6.1: Common factor restrictions***

***A first improvement*** to the FEVD model is to check the model's diagnostics after running the **first step estimation** by applying a standard set of diagnostic tests. If serial correlation is detected the typical response is to estimate a dynamic model (by either difference or systems GMM). Yet one cannot assume that to be an appropriate strategy, since it is possible that in a small model the dynamics are unobservable and therefore contained within the residuals.

***Hence a dynamic linear regression model of order one should*** be specified and estimated and tested for the common factor restrictions (CFR) on each continuous variable.

Using only the continuous variables from the main model (6.1) one can assume the following:

$$T_{ijt} = \alpha + \alpha_2 fbh_{ijt} + \alpha_3 gdppc_{ijt} + \varepsilon_{ijt} \quad (1)$$

where, $\varepsilon_{ijt} = \rho\varepsilon_{ijt-1} + v_{ijt}$ (2)

- $T_{ijt}$ denotes the trade flows (exports or imports) value of bilateral trade between countries $i$ and $j$ at the time t with $i \neq j$.
- $\alpha$ is the intercept
- $fbh_{ijt}$ represent the sum of nominal GDP of country $i$ and $j$.
- $gdppc_{ijt}$ represent the GDP per capita difference between country $i$ and $j$.
- $\varepsilon_{ijt}$ is the disturbance term, with $v_{ijt}$ as the white noise component.

*First step*: lag (1) once:

$$T_{ijt-1} = \alpha + \alpha_2 \, fbh_{ijt-1} + \alpha_3 gdppc_{ijt-1} + \varepsilon_{ijt-1} \qquad (3)$$

*Second step*: solve for $\varepsilon_{ijt-1}$

$$\varepsilon_{ijt-1} = T_{ijt-1} - \alpha - \alpha_2 fbh_{ijt-1} - \alpha_3 gdppc_{ijt-1} \qquad (4)$$

*Third step*: substitute (4) into (2)

$$\varepsilon_{ijt} = \rho(T_{ijt-1} - \alpha - \alpha_2 fbh_{ijt-1} - \alpha_3 gdppc_{ijt-1}) + v_{ijt} \qquad (5)$$

$$\varepsilon_{ijt} = \rho T_{ijt-1} - \rho\alpha - \rho\alpha_2 fbh_{ijt-1} - \rho\alpha_3 gdppc_{ijt-1} + v_{ijt} \qquad (6)$$

*Fourth step*: substitute (6) into (1)

$$T_{ijt} = \alpha + \alpha_2 \, fbh_{ijt} + \alpha_3 gdppc_{ijt} + \rho T_{ijt-1} - \rho\alpha - \rho\alpha_2 fbh_{ijt-1} - \rho\alpha_3 gdppc_{ijt-1} + v_{ijt} \qquad (7)$$

*Fifth step*: collect terms, hence

$$T_{ijt} = (1-\rho)\alpha + \alpha_2 \, fbh_{ijt} + \alpha_3 gdppc_{ijt} + \rho T_{ijt-1} - \rho\alpha_2 fbh_{ijt-1} - \rho\alpha_3 gdppc_{ijt-1} + v_{ijt} \qquad (8)$$

Ignoring the constant term $(\alpha)$ equation (8) has three coefficients: $\rho, \alpha_2$ and $\alpha_3$

It is now shown that this is a restricted version of dynamic linear regression model (9), which has five coefficients $\alpha_1, \alpha_2, \alpha_3, \alpha_4$ and $\alpha_5$ (ignoring the constant term):

$$T_{ijt} = \alpha + \alpha_1 T_{ijt-1} + \alpha_2 \, fbh_{ijt} + \alpha_3 gdppc_{ijt} + \alpha_4 \, fbh_{ijt-1} + \alpha_5 gdppc_{ijt-1} + \varepsilon_{ijt} \qquad (9)$$

comparing the dynamic linear regression model (9), i.e. the unrestricted model. The following can be noticed:

- in both (8) and (9), there is one coefficient on $T_{ijt-1}$, which is $\rho$ from (8) and $\alpha_1$ from (9).
- in (8) the coefficient on $fbh_{ijt-1}$ is $-\rho\alpha_2$ and the coefficient on $gdppc_{ijt-1}$ is $-\rho\alpha_3$
- in (9) the coefficient on $fbh_{ijt-1}$ is $\alpha_4$ and the coefficient on $gdppc_{ijt-1}$ is $\alpha_5$

Hence, $-\rho\alpha_2$ is the negative of the product of the coefficients on $T_{ijt-1}$ and $fbh_{ijt-1}$, and

$-\rho\alpha_3$ is the negative of the product of the coefficients on $T_{ijt-1}$ and $gdppc_{ijt-1}$.

Now the dynamic linear regression model (9) can be transformed into (8), if and only if in the dynamic linear regression model (9) the following restrictions hold: $-\alpha_4 = \alpha_1 * \alpha_2$ and $-\alpha_5 = \alpha_1 * \alpha_3$

These are the common factor restrictions.

***To summarise, the above procedure suggests that it should*** be specified and estimated a dynamic linear regression model of order one and tested for the common factor restrictions (CFR) on each continuous variable. If it is found that the CFRs hold then one should specify an unobserved components model, since under this condition "pure" serial correlation in the residuals can be assumed.

Basically the CFR suggests that something may be missing in the specification, and that this is most likely to be a variable with an autoregressive structure (an AR(1) process). In Appendix 6.1 provide the Stata10 >do< file with all these improvements applied in the model estimation with the Stata10 syntax used. In general, it should not be surprising if it is found that CFR is not rejected, since only a small model has been used. Consequently, there may be dynamics in the model but it is not known where they are coming from. If they are not accounted for in the model then they are in the residual, in which case *if the CFRs are not rejected* then the unobserved components model estimated by AR(1) correction is the appropriate strategy.

The dynamic linear model is misspecified in the panel context. Accordingly, two approaches are used to estimate the first order dynamic panel model and are used to test the CFRs: OLS, in which the coefficient on the lagged dependent variable is subject to maximum *upward* bias; and fixed effects estimation, in which the coefficient on the lagged dependant variable is subject to maximum *downward* bias. In doing so, the whole range of possible dynamic misspecification is encompassed (Bond, 2002).[49] By checking the consistency of the tests for the CFRs across both OLS and fixed effects estimation, confidence is gained in the results.

[49] Moreover, pooled OLS and fixed effects are the estimators used in the three-stage approach to estimating the gravity model. We do not estimate a difference or system GMM model and then apply the CFRs, because these are random effects estimators with a composed error term, containing both the usual idiosyncratic element (subscripted *it*) and a group-specific element (subscripted *i*), which implies a model different from the AR(1) model of the residual required by Equation 2 in Box 6.1.

***A third improvement*** corresponds to the **second step** estimation. If in the first step regression serial correlation has been detected, and the CFRs cannot be rejected, then apply an estimator with "AR(1) correction" and save the fixed effects from that estimation. The second step is to estimate equation 6.3, save the residuals ($w_{ij}$) from that estimation and proceed with the **third step** (estimation of 6.4).

***A fourth improvement*** refers to the estimated equation 6.4. At this point check again for the statistical validity of estimated results. This is simply done by applying a standard set of diagnostic tests and checks, including: the Ramsey Reset test intended for omitted variable and functional form diagnosis; the Wooldridge test for autocorrelation in panel data; Cameron and Trivedi's decomposition of IM-test (for normal distribution and homoskedasticity); and variance inflation analysis, to check for (near) multicolinearity. The next step is to check once again whether the CFRs hold and, if the CFR cannot be rejected, estimate 6.4 by, again, applying the Prais-Winsten AR(1) estimator which takes into account panel structure of a data. This estimation method is the preferred method, since it estimates the parameters in a linear regression model by taking into account the serial correlation in the errors. The errors are assumed to follow a first order autoregressive process and this method also reports the iterated estimates of the autoregressive coefficient (rho).

Taking into account all the above suggested improvements this approach to the estimation is called, the fixed effect vector decomposition augmented (FEVDA) procedure.

### 6.3.5 Estimation results for the Western Balkans:

This section summarises the results from the estimation of the main gravity modelling approach (equations 6.1 to 6.4) with the improvements discussed in the previous section. These results are obtained from the "large" dataset, which includes the trade flows of all countries in the Western Balkans. Appendix 6.2 summarises the results that are obtained from the “small” dataset, which includes only Bosnian trade flows. These results are presented to provide a comparison with the results obtained from the larger dataset.

This section estimates a gravity model between the WB countries and their main trading partners. In total there are 22 countries in the data sample. The only country that is not included in the data set is Moldova, since the data on its trade flows with other WB countries was not available. In this estimation WB country dummy variables are introduced, since some specific country effects might be important for WB trade flows. Here the notation and variable definition is the following:

- D_BH is a dummy variable that is equal to 1 if either country in the pair is Bosnia and Herzegovina at time t, and zero otherwise.
- D_CRO is a dummy variable that is equal to 1 if either country in the pair is Croatia at time t, and zero otherwise.
- D_SMK is a dummy variable that is equal to 1 if either country in the pair is SMK at time t, and zero otherwise.
- D_ALB is a dummy variable that is equal to 1 if either country in the pair is Albania at time t, and zero otherwise.
- D_MACE is a dummy variable that is equal to 1 if either country in the pair is Macedonia at time t, and zero otherwise.

This data set will also be used to assess whether CEFTA has had an impact on Western Balkans imports and exports in the observed time period (2003 to 2008). Each country in the sample is presented in Table 6.4 together with its corresponding weight in WB countries exports and imports in 2008.

Table 6.4: Trade partners share in Western Balkan countries imports and exports in 2008

| countries | BH | | Croatia | | SMK | | Macedonia | | Albania | |
|---|---|---|---|---|---|---|---|---|---|---|
| | exports | imports | exports | imports | exports | imports | exports | imports | exports | imports |
| SMK | 18.6% | 10.9% | 6.8% | 1.4% | n/a | n/a | 24.5% | 7.8% | 2.1% | 0.2% |
| CROATIA | 17.2% | 17.1% | n/a | n/a | 4.0% | 2.4% | 5.8% | 2.0% | 0.2% | 1.0% |
| GERMANY | 13.6% | 11.8% | 10.8% | 13.4% | 10.4% | 11.8% | 14.2% | 9.5% | 2.6% | 6.0% |
| ITALY | 12.6% | 9.3% | 19.1% | 17.1% | 10.3% | 9.5% | 8.1% | 5.6% | 61.7% | 26.5% |
| SLOVENIA | 9.2% | 5.9% | 7.8% | 5.6% | 4.6% | 2.7% | 1.6% | 3.0% | 0.4% | 0.9% |
| AUSTRIA | 6.2% | 3.7% | 5.8% | 4.9% | 4.2% | 2.5% | 0.6% | 1.7% | 0.7% | 1.3% |
| HUNGARY | 3.0% | 4.4% | 2.4% | 3.2% | 3.0% | 3.6% | 0.2% | 1.2% | 0.0% | 1.4% |
| SWIZERLAND | 2.7% | 1.2% | 0.9% | 1.4% | 0.9% | 1.1% | 0.4% | 4.3% | 0.4% | 3.0% |
| UNITED STATES | 2.2% | 3.2% | 2.5% | 2.0% | 0.6% | 2.2% | 0.3% | 1.4% | 0.4% | 1.1% |
| MACEDONIA | 1.0% | 0.9% | 1.0% | 0.9% | 4.5% | 1.7% | n/a | n/a | 2.9% | 2.2% |
| FRANCE | 1.5% | 2.2% | 2.1% | 3.3% | 3.2% | 3.2% | 0.6% | 1.8% | 0.9% | 1.2% |
| ROMANIA | 1.3% | 0.9% | 0.6% | 0.6% | 3.6% | 2.8% | 0.8% | 1.7% | 0.2% | 0.5% |
| NETHERLAND | 1.1% | 1.1% | 1.3% | 1.7% | 1.7% | 1.5% | 1.8% | 1.4% | 1.4% | 0.5% |
| UNITED KINGDOM | 0.9% | 0.6% | 2.4% | 1.9% | 1.4% | 1.2% | 1.8% | 1.0% | 0.1% | 1.0% |
| SWEDEN | 0.7% | 0.7% | 0.5% | 1.1% | 0.4% | 1.1% | 0.2% | 0.8% | 0.4% | 0.3% |
| BELGIUM | 0.6% | 0.6% | 0.6% | 1.0% | 1.1% | 1.1% | 2.7% | 0.6% | 0.0% | 0.3% |
| SPAIN | 0.5% | 0.7% | 0.6% | 1.5% | 0.5% | 1.0% | 1.9% | 0.8% | 0.2% | 1.4% |
| BULGARIA | 0.5% | 0.5% | 0.6% | 0.6% | 2.3% | 3.3% | 9.5% | 4.8% | 0.7% | 1.9% |
| TURKEY | 0.3% | 5.3% | 0.6% | 1.6% | 0.4% | 1.9% | 0.8% | 3.9% | 1.9% | 6.0% |
| ALBANIA | 0.2% | 0.0% | 0.3% | 0.0% | 0.7% | 0.1% | 2.7% | 0.5% | n/a | n/a |
| DENMARK | 0.1% | 0.3% | 0.3% | 0.8% | 10.4% | 11.8% | 0.3% | 0.3% | 0.0% | 0.1% |
| GREECE | 0.1% | 0.7% | 0.3% | 0.8% | 1.9% | 1.3% | 13.4% | 7.5% | 8.8% | 14.7% |
| BOSNIA-HERZEGOVINA | n/a | n/a | 15.4% | 2.7% | 12.2% | 2.8% | 2.6% | 0.8% | 0.2% | 0.3% |
| % of total | 94.2% | 82.0% | 82.7% | 67.5% | 82.1% | 70.6% | 94.8% | 62.3% | 86.2% | 72.0% |

Note: Data were obtained from the CBBH, National Bank of Serbia, Bank of Albania, Croatian National Statistics Office, Statistical Agency for BH and National Bank of Macedonia; presented figures are the author's own calculations.

As can be seen from Table 6.4, these 22 sample countries share more than 62% of each WB country's imports and more than 82% of each of WB country's exports. The data suggests that Albania's main trading partner is Italy. The other WB countries have mainly EU countries as their main trading partners and also ex-Yugoslavian countries (Table 6.4). Since the EU seems to be an important trading partner of WB countries, another dummy variable is introduced in the model in order to assess whether being an EU country had an additional effect on WB trade flows. The results of the estimation are presented in Table 6.5 and 6.6 for both export and import flows of WB countries. These tables present only the final results from stage 3 for both the FEVD and FEVDA procedures. However, the results from all stages of the analysis are presented in full in Appendices 6.9 and 6.10 (respectively, for imports and exports).

As suggested in section 6.3.4 first check is whether the CFR holds for each continuous variable.

Imports:

From pooled OLS estimation of the dynamic linear regression model of order one:

```
_b[L_imports]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]
               chi2(1) =        0.03
           Prob > chi2 =        0.8602


_b[L_imports]*_b[ gdppc] = -_b[ L_gdppc]
               chi2(1) =        0.00
           Prob > chi2 =        0.9640
```

From FE estimation of the dynamic linear regression model of order one:

```
_b[L_imports]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]
             F(1, 427) =        0.19
              Prob > F =        0.6606


_b[L_imports]*_b[ gdppc] = -_b[ L_gdppc]
             F(1, 427) =        0.50
              Prob > F =        0.4812
```

Exports:

From pooled OLS estimation of the dynamic linear regression model of order one:

```
_b[L_export]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]
               chi2(1) =        5.46
           Prob > chi2 =        0.0194


_b[L_export]*_b[ gdppc] = -_b[ L_gdppc]
               chi2(1) =        0.00
           Prob > chi2 =        0.9749
```

From FE estimation of the dynamic linear regression model of order one:

```
_b[L_export]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]
             F(1, 427) =        1.29
              Prob > F =        0.2566


_b[L_export]*_b[ gdppc] = -_b[ L_gdppc]
             F(1, 427) =        2.15
              Prob > F =        0.1432
```

Since it was found that the CFRs cannot in the main be rejected, and not at all in the case of FE estimation, an unobserved components model is estimated as the preferred empirical strategy.

The reported test diagnostics (Table 6.5) for the WB gravity equations indicate that FEVDA is the preferred model for both WB imports and WB exports gravity estimation. The Ramsey test reveals that the augmented approach better satisfies the assumption of a linear relationship in the data, whereas the systematic evidence of residual serial correlation, together with non-rejection of the CFRs, strongly suggests the importance of taking into account unobserved dynamics in the modelling strategy. For each third-stage regression the leverage plots are also produced which indicate that no observations are associated with unduly high leverage (typically not exceeding 0.16; see Appendix 6.9 for WB imports and Appendix 6.10 for WB exports).

Table 6.5: Western Balkans import and export test diagnostics flows with FEVD and FEVDA procedure

| Estimation technique: | | FEVD | FEVDA | FEVD | FEVDA |
|---|---|---|---|---|---|
| Hypothesis | Diagnostic tests: | WB imports | WB imports | WB exports | WB exports |
| | | 1 | 2 | 3 | 4 |
| Ho: constant variance | Breusch-Pagan/ Cook-Weinsberg Prob>Chi sqr. | 0.00 | 0.00 | 0.00 | 0.00 |
| Ho: normal distribution | Cameron & Trivedi's IM-test | | | | |
| | Heteroscedasticity | 0.12 | 0.00 | 0.61 | 0.60 |
| | Skewness | 0.76 | 0.82 | 0.46 | 0.76 |
| | Kurtosis | 0.18 | 0.08 | 0.08 | 0.08 |
| Ho: model has no omitted variables | Ramsey RESET Prob>F | 0.00 | 0.06 | 0.17 | 0.55 |
| Ho: no first-order autocorrelation | Wooldridge test Prob>F | 0.00 | 0.00 | 0.00 | 0.03 |
| | Mean VIF | 2.51 | 2.75 | 2.62 | 2.37 |
| R-squared | | 0.97 | 0.97 | 0.95 | 0.96 |
| observations | | 660 | 550 | 660 | 550 |

The diagnostic tests for first-order serial correlation in the residuals uniformly suggest that taking into account the AR structure of the residuals should improve the estimation results significantly. Otherwise, there is no evidence of major specification error, apart from omitted variables (non-linear functional form) in the FEDV import model (Column 1) and heteroscedasticity in the FEDVA import model (Column 2). While a solution to former problem is not found, the latter problem is addressed by applying the Prais-Winston estimator with computed robust standard errors, which means that heteroscedasticity is taken into account when conducting statistical inference.

Table 6.6: Western Balkans import and export flows with FEVD and FEVDA procedure

| Estimation technique: | | FE | FEVD | FEVDA | FE | FEVD | FEVDA |
|---|---|---|---|---|---|---|---|
| Descripiton | Variables | WB imports | WB imports | WB imports | WB exports | WB exports | WB exports |
| | | a | 1 | 2 | b | 3 | 4 |
| Income | log(fbh_gdp) | 1.22 *** (0.30) | 1.22 *** (0.02) | 1.12 *** (0.02) | 2.03 *** (0.49) | 2.03 *** (0.03) | 1.01 *** (0.03) |
| Linder | log(gdppc) | -0.41 ** (0.23) | -0.41 *** (0.03) | -0.84 *** (0.03) | -0.23 (0.37) | -0.23 *** (0.04) | 0.02 (0.03) |
| Distance | log(distance) | n/a | -1.82 *** (0.03) | -1.41 *** (0.03) | n/a | -3.21 *** (0.05) | -1.72 *** (0.05) |
| Common country | d_cc | n/a | 0.34 *** (0.02) | 0.19 *** (0.02) | n/a | 1.03 *** (0.03) | 0.61 *** (0.02) |
| Border | d_bor | n/a | -0.18 *** (0.02) | -0.23 *** (0.02) | n/a | 0.16 *** (0.02) | 0.35 *** (0.02) |
| CEFTA | cefta06 | 0.14 *** (0.03) | 0.14 *** (0.03) | 0.14 *** (0.03) | -0.03 (0.03) | -0.03 (0.03) | 0.06 ** (0.03) |
| VAT | vat_bh | -0.00 (0.03) | -0.00 (0.02) | -0.02 (0.02) | 0.12 ** (0.05) | 0.12 *** (0.04) | 0.06 ** (0.03) |
| Unit effect | unit effect | n/a | 1.00 *** (0.02) | 1.01 *** (0.02) | n/a | 1.00 *** (0.02) | 0.98 *** (0.02) |
| BH dummy | d_bh | n/a | 0.32 *** (0.02) | 0.34 *** (0.02) | n/a | 0.89 *** (0.03) | 1.03 *** (0.03) |
| Interaction term | d_bhcefta | -0.04 (0.05) | -0.04 (0.04) | -0.06 (0.04) | -0.14 (0.11) | -0.14 *** (0.04) | -0.13 *** (0.03) |
| Croatia dummy | d_cro | n/a | 0.28 *** (0.02) | 0.08 *** (0.02) | n/a | 0.96 *** (0.03) | 1.38 *** (0.03) |
| SMK dummy | d_smk | n/a | 0.46 *** (0.02) | 0.46 *** (0.02) | n/a | 1.07 *** (0.03) | 1.29 *** (0.03) |
| Albania dummy | d_alb | n/a | n/a | n/a | n/a | n/a | n/a |
| Macedonia dummy | d_mace | n/a | 0.19 *** (0.02) | 0.19 *** (0.02) | n/a | 1.04 *** (0.03) | 1.06 *** (0.03) |
| EU dummy | d_eu | -0.16 *** (0.04) | -0.16 *** (0.02) | -0.19 *** (0.02) | 0.04 (0.02) | 0.04 * (0.02) | 0.01 (0.02) |
| time effect | 2004 | 0.04 * (0.02) | 0.04 ** (0.02) | 0.07 *** (0.02) | 0.02 (0.03) | 0.02 (0.03) | 0.10 *** (0.03) |
| time effect | 2005 | 0.06 ** (0.03) | 0.06 *** (0.02) | -0.04 ** (0.02) | 0.09 ** (0.05) | 0.09 *** (0.03) | 0.16 *** (0.03) |
| time effect | 2006 | 0.05 (0.04) | 0.05 *** (0.02) | -0.05 *** (0.02) | 0.12 ** (0.06) | 0.12 *** (0.03) | 0.20 *** (0.03) |
| time effect | 2007 | 0.08 * (0.05) | 0.08 *** (0.02) | -0.02 (0.02) | 0.11 (0.08) | 0.11 *** (0.03) | 0.24 *** (0.03) |
| time effect | 2008 | 0.11 * (0.06) | 0.11 *** (0.02) | | 0.13 (0.10) | 0.12 *** (0.04) | |
| constant | _cons | -4.37 *** (1.48) | 0.93 *** (0.08) | 0.70 *** (0.10) | -9.51 *** (2.44) | -0.69 *** (0.14) | -0.01 (0.13) |

Note: *** significant at 1%; ** significant at 5%; * significant at 10%; robust standard errors are in parenthesis.

A Prais-Winsten AR(1) regression is applied as preferred estimate. The estimated parameters in the FEVDA models (Columns 2 and 4 in Table 6.6) are preferred over the

FEVD estimates (Columns 1 and 3), since the assumed AR1 process in the errors is taken into account in estimating the coefficients.

In Table 6.6 (Columns a and b) results from the panel data fixed effect (FE) estimation are reported to compare with the results from FEVD. One obvious difference between FE and FEVD is that coefficients on time-invariant variables (i.e. country dummies, distance, common country and common border) cannot be estimated since they are collinear with the country-pair individual effects, hence the sign 'n/a' and one claimed advantage of FEVD technique. Some caveats with respect to the FEVD technique remain and they concern the different standard errors for some variables. As suggested in Breusch et al. (2010) and Greene (2010) there are often problems with variances in staged estimation unless standard errors are corrected. The main issue that remains with the FEVD technique is the above problem with variances in stage estimation. Since the FEVD technique is still developing and is currently contested in the literature the contribution is in adopting the AR(1) regression as the preferred estimate. Hence the structure of the residual is used as a part of the estimator. The AR parameter is estimated jointly with the beta coefficients and therefore, both the slope coefficients and the standard errors are adjusted. Comparing what is expected based on the Chapter 5 discussion on CEFTA and looking at the results obtained from FEVDA, the estimates are in agreement. For example, the estimated FEVDA coefficient on "income" (Column 4, Table 6.6) is half that of the FE estimate (Column b, Table 6.6). Given what is known about the BH supply side and its relatively slow export performance, the FEVDA result seem to be sensible, i.e. a proportionate response of exports to income. Considering the fact that the main interest is in the effect of CEFTA and the dummy and the interaction term are time-varying, FE would be a suitable method for estimation, but the judgment is that both qualitatively and quantitatively the results would be a bit weaker.

Looking at the reported coefficients of WB imports model (Table 6.6, column two) and based on the preferred FEVDA estimation it can be concluded that:

1. All core variables - income, the Linder effect and distance - have the expected signs and are statistically significant at the 1% level.

2. Time dummies for 2004, 2005 and 2006 are also significant and all country individual effects are also significant and positive. Albania is excluded to avoid the dummy variable trap.
3. Plümper and Troeger (2004:9) stress that the coefficient on the unit effect "is either 1.0 or at least close to 1.0 (by accounting for serial correlation or panel heteroscedasticity) in stage 3. In the FEVDA results there are small departures from 1.0; however, even though the unit coefficients are estimated with a very high degree of precision, in each case the theoretically predicted value is easily within the 95% confidence interval of the estimated value.
4. According to the estimation results, it was found that VAT had a negative but insignificant effect on BH's imports in the observed time period. According to BH's Indirect Taxation Office (Oma Bulletin number 6, 2006) the announcement of VAT introduction had a positive effect on imports in the year prior to the VAT implementation and, consistent with this claim, it was found that the year dummy for BH in 2005 in the import equation was always positive and significant (Appendix 6.9, stage three estimation of FEVDA). BH's Indirect Taxation Office stress that this is what happened in Serbia and Croatia as well. The announcement of VAT caused an increase in the stocks of imported goods a couple of months prior to VAT implementation, while in the year after the introduction, the situation in foreign trade consolidated. In BH VAT is calculated on imported goods and for the supplies of goods and services within the BH. The VAT system also requires calculation and payment of VAT in every phase of sales, including imports and production. This requires funds necessary to finance the VAT. Hence importers in order to get the refund or deduction of input VAT paid on imports need to fill the VAT declaration. So first VAT encourages suppliers to register their business; and, second, stimulates purchases from domestic suppliers who can arrange better payment deadlines. In BH sales tax was collected before the VAT. Sales tax was calculated based on different rates, where some products were even exempt from sales tax (i.e. reproduction materials, raw materials, equipment, spare parts, food, medicines) and some taxed at a 20% rate (i.e. oil and oil derivatives). Overall it can be argued that the negative albeit insignificant effect of VAT on BH imports is basically due to the new tax regime, which is more

expensive for BH firms. Still it is hard to predict the extent to which there is a "switching" or substitution effect. Hence it would be expected that BH firms would try to find those domestic suppliers who can offer better conditions (i.e. better payment deadlines). One other possibility is that BH firms are also "switching" to the less expensive products of CEFTA countries.

5. Looking at the EU dummy it seems that according to the estimation results WB imports from EU are lower by 17.3%[50] than might be expected from countries with the characteristics (income etc) otherwise measured in the regression (Table 6.6, column 2).

According to the estimation results, CEFTA membership increased imports between CEFTA members by around 15.8 percent in the observed time period (Table 6.6, column 2). At first sight, this appears to be inconsistent with the estimated impact on the exports of CEFTA members, which is an increase of around 6 percent (Column 4). However, two arguments suggest that this need not be the case.

1. Given the definition of the CEFTA indicator, a positive coefficient indicates that, ceteris paribus, the trade flow between two countries is estimated to be higher because they are both members. Moreover, in *absolute* terms increased imports by CEFTA countries from other CEFTA countries should be matched by increased exports by CEFTA countries to other CEFTA countries. However, for each of the WB countries, the dataset contains a higher proportion of total exports than total imports (see Table 6.4), so that *percentage* effects measured by the estimated coefficients should not be expected to be identical.
2. Comparison of the 95 percent confidence intervals (CIs) reveals that the two estimates overlap: the CI around the import coefficient ranges from 9 to 20 percent (Appendix 6.9) while the CI around the export coefficient ranges from 0.4 to 12 percent (Appendix 6.10).

Hence, there is no reason to regard the import and export estimates as inconsistent.

In order to assess whether Bosnian membership of CEFTA - modelled by d_BHCEFTA (the interaction term for BH and CEFTA) - had an affect on BH imports the combined

[50] (exp(0.19)-1=17.3%)

coefficient are computed – i.e., the sum of the CEFTA dummy and of the BH-CEFTA interaction - and the corresponding standard errors, t-statistics and p-values. Table 6.7 reports the findings.

Table 6.7: Combined coefficient for BH CEFTA

FEVD

| imports | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. Interval] | |
|---|---|---|---|---|---|---|
| (1) | .0981877 | .0330738 | 2.97 | 0.003 | .0332413 | .1631341 |

(1) d_cefta06 + d_bhcefta06 = 0

FEVDA

| imports | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. Interval] | |
|---|---|---|---|---|---|---|
| (1) | .0852816 | .0328227 | 2.60 | 0.010 | -.0208034 | .1497599 |

( 1) d_cefta06 + d_bhcefta06 = 0

Based on the results from Table 6.7, in both cases the null hypothesis that the combined coefficient is insignificantly different from zero is rejected. According to the results, evidence is found that in the observed time period the formation of CEFTA had a positive effect on BH imports. Hence, CEFTA membership increased BH's imports from CEFTA members by 8.1%[51] in the observed time period. These results on the estimated effect of CEFTA differ from the findings from the BH imports model with the small data base (see Appendix 6.2, Table: A6.2). Hence using a larger data base and then modelling the variable of interest as an interaction term is highly recommended.

Now looking at the estimation results from the WB exports model, it can be concluded that (Table 6.6, column 4):

1. All core variables have the expected sign and are statistically significant at the 1% level, except for the "Linder effect" in the FEVDA model (Column 4, Table 6.6). One noteworthy difference between the FEVD and the FEDVA results is the estimated coefficient on "income"; namely, the latter (Column 4, Table 6.6) is half that of the former (Column 3, Table 6.6). Given what is known about the BH supply side and its relatively sluggish export performance, the FEVDA result

[51] (exp(0.085)-1=8.1%)

seems to be sensible (i.e., a proportionate response of exports to income). Conversely, the doubling of exports in response to income variations could be seen as less plausible.

2. Time dummies are also significant over time, increasing and positive, which suggests a small otherwise un-modelled effect in exports. All individual country effects are also significant and positive except EU dummy which is insignificant in the FEVDA model (Column 4). Albania is excluded to avoid the dummy variable trap.
3. This estimation suggests that VAT had a positive and significant effect on BH's exports. This is expected, since in BH VAT is not calculated on exports. Hence, the cost of production for export markets is in effect lower than the cost of production for the domestic market. The logic of this is that producers respond to the incentive to switch capacity from domestic markets into export markets which, in turn, promotes exports. It was found that VAT had increased BH exports by 5.8%[52] (Table 6.6, column 4).
4. According to this estimation results, CEFTA membership increased exports between CEFTA members by 5.8% in the observed time period.

The same procedure as for imports had to be applied in order to assess whether CEFTA membership had an affect on BH exports. To this end, the combined coefficient on CEFTA and BHCEFTA (the interaction term for BH and CEFTA) together with the corresponding standard errors, t-statistics and p-values are computed. The findings are reported in Table 6.8.

Table 6.8: Combined coefficient for BH CEFTA

FEVD

```
------------------------------------------------------------------------------
     Exports |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         (1) |  -.1684342    .0368284    -4.57   0.000    -.2407532   .0961151
------------------------------------------------------------------------------
(1)  d_cefta06 + d_bhcefta06 = 0
```

FEVDA

```
------------------------------------------------------------------------------
     Exports |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
```

[52] (exp(0.06)-1=5.8%)

```
-------------+----------------------------------------------------------------
         (1) |   -.0688665   .0350176    -1.97   0.050   -.1376564  -.0000765
------------------------------------------------------------------------------
 (1)  d_cefta06 + d_bhcefta06 = 0
```

Based on the results from Table 6.8, it is again rejected the null hypothesis that the above two combined coefficients are insignificantly different from zero. According to this results  it was found that in the observed time period the formation of CEFTA had a negative effect on BH's exports. Hence, CEFTA membership decreased exports from BH to CEFTA members by 6.6%[53] in the observed time period. In this case, the result is also different from the findings from the BH exports model, which suggested that CEFTA did not have an effect on BH exports.

A brief comparison of the FEVD and FEVDA results leaves an impression that they are similar. However, given the diagnostics, especially the evidence of AR(1) dynamics in the residuals, the FEVDA estimates have a claim to be the more valid. Moreover, where the FEVD and FEVDA results vary, as with respect to the estimated coefficient on income, the FEVDA results seem the more plausible. Overall, the results suggest that BH exporters still do not fully exploit the opportunities of the free trade agreement among WB countries, which is consistent with the "income" result. It can be argued that this could be the consequence of the still undeveloped product mix that BH companies have to offer, as well as weak institutions that do not create opportunities for local business to benefit from freer trade.

The next section extracts information from the estimated heterogeneity of WB countries in order to discuss the degree of integration of WB countries. In particular, it will estimate the BH and WB "potential" level of trade. The intention is also to assess whether BH and the other WB countries are currently above or below their potential level of trade.

## 6.4 Potential trade calculation for Bosnia and Herzegovina and the Western Balkans

As already discussed in section 5.4.1, Bussière et al. (2005) estimate the potential trade of Central and Eastern European countries by proposing a new measure of trade integration

[53] (exp(-0.068)-1=6.6%)

called the “trade condition indicator”. This indicator is calculated from country-pair specific effects after controlling for the levels of the time-invariant variables, like distance. This is essentially the second step estimation of the FEVDA technique outlined in section 6.3.4. Bussière et al. (2005) suggest that aggregating the country pair specific effects for a country over all partner countries should provide an insight into the countries’ average degree of integration into the world economy. Since the interest is in WB trade integration, the focus will be first to calculate the average degree of WB countries’ integration within the region and then to calculate the potential trade level of WB countries with the EU countries.

In order to calculate the “trade condition indicator” several steps will be required. Bussière et al. (2005) do not provide details for all of these steps but section 6.4.1 below does. In the next two sections the estimation procedure is introduced and then the findings are discussed.

### 6.4.1 Estimation procedure for the trade potential calculation

The estimation procedure can be described through the following steps:

*The first step*: estimates the fixed effects model by applying an improved procedure for the panel data fixed effect vector decomposition technique (FEVDA). This is essentially the model from equation (6.1), which excludes the time-invariant explanatory variables.

In *the second step*: the fixed effects from equation (6.2) are saved. Then in equation (6.3) the unit effects (the $u_{ij}$ from 6.2) are regressed on all time-invariant variables in order to obtain approximate estimates for the time invariant variables. Hence, essentially the first two steps of the estimation procedure discussed in section 6.3.3 and modified in 6.3.4 are repeated.

*In the third step*: according to Bussière et al. (2005) the residuals from equation (6.2) are aggregated for country *h* into a simple “trade condition indicator”, $TCI_h$ where:

$$TCI_h = \frac{1}{2(N-1)}\left[\sum_{i=1}^{N-1}\hat{w}_{ih} + \sum_{j=1}^{N-1}\hat{w}_{hj}\right] \quad (6.5)$$

N is the number of countries (any of the WB countries)

i is the country of origin where i=1....N

j is the country of destination where j=1....N

$\hat{w}_{ih}$ is the residual from equation (6.2) between country *i* and *h* (i.e. country pair Bosnia and Croatia; Bosnia and Serbia; Bosnia and Macedonia etc).

$\hat{w}_{hj}$ is the residual from equation (6.2) between country *h* and *j* (i.e. country pair Croatia and Bosnia; Serbia and Bosnia; Macedonia and Bosnia etc)

The $TCI_h$ indicator represents the average residual of the second step estimation ($w_{ij}$), which is actually the part of the fixed effect that is not explained by the time-invariant variables used in the second step estimation. Hence the result is derived from country-pair specific effect after controlling for the levels of the time-invariant variables from step two. According to Bussière et al. (2005) a high fixed effect for the country corresponds to high bilateral trade openness. A high TCI would indicate that this country *h* has on average strong trade links with the rest of the world, controlling for the core variables. In this case, since exports and imports are observed separately, a positive TCI on exports would indicate that the particular country is exporting above the regions' average; and negative below. Since the interest is in the WB region, the TCI is calculated for each country in WB region. The sample is an unbalanced panel. For example, there is data on trade flows between BH and Croatia and also trade flows from Croatia to BH; however, although data on trade flows from BH to Austria is available, what is not available is trade flows from Austria to BH. Still the residuals (the unexplained part of the fixed effect, $u_{it}$, from equation 6.2) correspond to both country pairs from the EU and to country pairs where one country is from the WB region and the other country is from the EU. Since the trade condition indicator is actually an average country pair specific effect, a positive TCI on imports would indicate that the particular WB country is importing more than the WB region average and negative that is importing less then the WB region average controlling for the core variables.

*In the fourth step*: potential trade is estimated. This estimation according to Bussière et al. (2005) requires re-estimation of equation (6.1) and then the $TCI_h$ indicator is subtracted from the fitted values of (6.1). The obtained values provide insight into the potential trade of the relevant countries.

Bussière et al. (2005) also suggested an alternative way to analyse "normal" trade levels, based on fitted values of the estimated equations. They calculate from the third step (6.4 in this case) the ratio of the sums of actual and fitted values of trade flows for each Central and Eastern European Country (CEEC) and South Eastern European Country (SEEC), all denoted by $m$, with twelve euro area countries (denoted by $n$), as follows:

$$ratio1_m = \ln\left[\frac{\sum_{n=1}^{12} \exp(T_{mnt})}{\sum_{n=1}^{12} \exp(\hat{T}_{mnt})}\right] \qquad (6.6)$$

where:

$T_{mnt}$ – actual trade flow (e.g. exports) from country $m$ (CEEC or SEEC country) to country $n$ in time $t$ (a subset of twelve euro area countries from the OECD sample)

$\hat{T}_{mnt}$ - estimated trade flow (e.g. exports) from country $m$ (CEEC or SEEC country) to country $n$ in time $t$ (a subset of twelve euro area countries from the OECD sample)

$\text{ratio1}_m$ – the sum of all the actual trade flows divided by the sum of all the estimated trade flows for country $m$.

Regarding estimated $T_{mnt}$ (in the denominator of equation 6.6) it is interpreted as a trade potential estimator, but based on fitted values of equation 6.2 and also for all twelve euro area countries. Hence $\text{ratio1}_m$ is the sum of all the actual trade flows divided by the sum of all the estimated trade flows for country $m$. The intuition for this interpretation is developed based on the suggested alternative methodology explained at the end of the Bussière et al. (2005) paper through the $\text{ratio2}_m$ calculation, which is presented in equation 6.7.

$$ratio2_m = \ln\left[\frac{\sum_{n=1}^{12}\exp(T_{mnt})}{\sum_{n=1}^{12}\exp(\theta_t + \hat{\beta}_1 y_{nmt} + \hat{\beta}_2 d_{nm} + \hat{\beta}_3 q_{nt} + \hat{\beta}_4 q_{mt} + \sum_{k=1}^{K}\hat{y}_k Z_{nm} + tci_n)}\right] \quad (6.7)$$

Where:

1. The numerator is exactly the same as in (6.6) (i.e., the sum of the actual individual trade flows (e.g. exports) from country *m* (CEEC or SEEC country) to country *n*) and
2. the denominator presents estimated trade flows from each euro area country to the other euro area countries plus the term $tci_n$ capturing the average country-pair fixed effect, hence the unobserved influences[54] that are not explained by the core variables. Here the subscript on *tci* is "*n*" because it captures the sum of 12 economies' *tci* terms.

Bussière et al. (2005) did not simplify the equation (6.7); however, it can be written more succinctly as:

$$ratio2_m = \ln\left[\frac{\sum_{n=1}^{12}\exp(T_{mnt})}{\sum_{n=1}^{12}\exp(\hat{T}_{mnt} + tci_n)}\right] \quad (6.8)$$

According to Bussière et al. (2005) applying the (6.6) calculation suggested that some countries had exceeded their "normal" level of trade with the euro area, like Albania; while other countries like Bosnia and Herzegovina were well below their potential. Bussière et al. (2005) argue that the problem might be methodological, since in a transition process some countries quickly improved their performance with the euro area, while some were lagging behind so that their "normal" trade is well below potential trade. In order to calculate a more appropriate trade potential they suggested using (6.7) or, equivalently, (6.8) with the coefficient estimates from the OECD sample and, as an

[54] $tci_n$ term is calculated using equation 6.5

improvement, to also add the trade condition indicator for each euro area country. All this assumes that in the medium-term each of the CEES and SEEC countries will be facing largely comparable conditions: i.e., those of the "*average euro-area trading partners*". Hence, the logic of economic convergence suggests that there is a problem with the denominator specification in equation (6.7). In the way equation (6.7) is written, it seems that Bussière et al. (2005) are actually suggesting adding all twelve euro-area trading partners, whereas what they meant was the "*average euro-area trading partners*". If an attempt is made to calculate the potential trade as suggested in equation (6.7) then each country in the sample would be far below the EU potential trade, even an EU member country; text box 6.2 gives an example of just this effect.

Text box 6.2: An example: Austria

Calculating the potential trade as suggested in equation (6.7) indicates that each country in the sample is well below its EU potential trade. The example of Austria, an EU member country, will be used to demonstrate the above.

Calculation is based on the following:

1. First the numerator of (6.7) is calculated.
2. Then (6.2) and (6.3) are estimated in order to calculate potential trade flows from Austria to the other EU countries. Appendix 6.10 provids the estimated imports and exports model of the WB and the EU12 countries and the actual values of the residuals obtained from the second estimation step (equation 6.3).
3. By applying equation (6.5) the "trade condition indicator" for Austria's imports and exports are calculated, which are aggregated for country $h$ (i.e. in this example Austria) into a simple "trade condition indicator", $TCI_h$. In equation (6.7) the denominator presents estimated trade flows from each euro area country to the other euro area countries plus the term $tci_n$ capturing the average country-pair fixed effect, hence the unobserved influences that are not explained by the core variables. The term "$tci_n$" is used because it captures the sum of 12 economies' $tci$. $TCI_h$ refers to a single economy in this example, that is Austria.

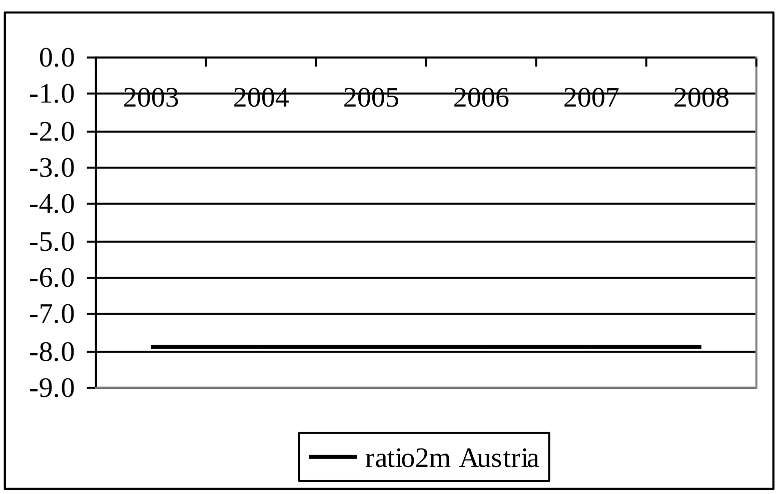
4. Then by applying equation (6.7), the ratio of actual to potential exports and imports for Austria are calculated. The ratio is calculated for each year for which data is available (2003 through 2008).

Hence by applying (6.7) or as suggested by Bussière et al.'s (2005) Austria's trade potential should be calculated as:

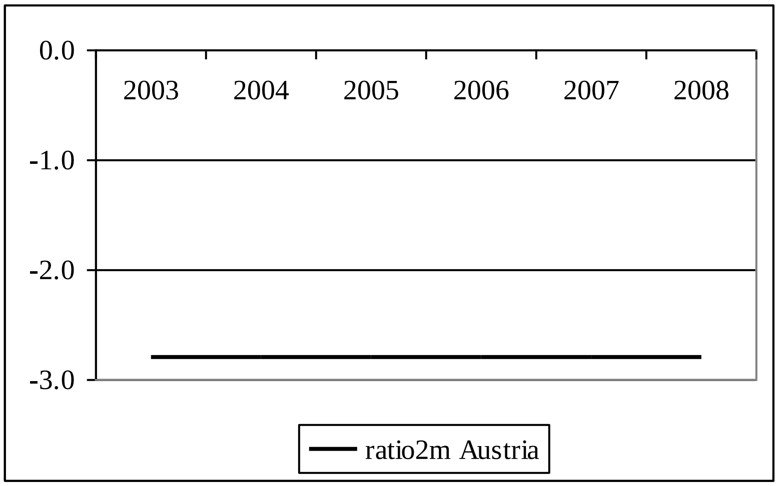
$$ratio2_m = \ln\left[\frac{\sum_{n=1}^{12} \exp(T_{mnt})}{\sum_{n=1}^{12} \exp(\theta_t + \hat{\beta}_1 y_{nmt} + \hat{\beta}_2 d_{nm} + \hat{\beta}_3 q_{nt} + \hat{\beta}_4 q_{mt} + \sum_{k=1}^{K} \hat{y}_k Z_{nm} + tci_n)}\right]$$

The obtained result based on (6.7) and the above outlined calculation seems to be well below the EU12 countries' potential. This is not likely, since Austria's "normal" trade should be at the "average euro-area trading partners". The results are below what seems to be the normal or, in this case, zero rate. The results are presented in Graph 1 for Austria's import and Graph 2 for Austria's export potential.

**Graph 1: Natural logarithm of the ratio of actual imports to potential imports of Austria with the euro area countries, as suggested in the literature**



**Graph 2: Natural logarithm of the ratio of actual exports to potential exports of Austria with the euro area countries, as suggested in the literature**

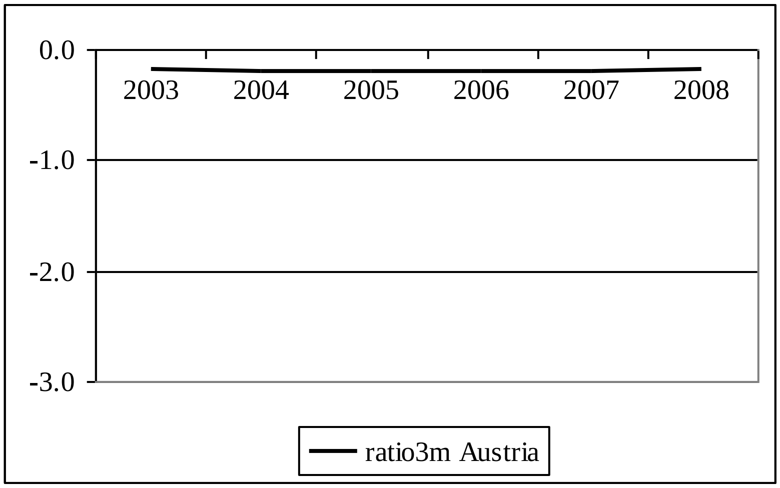



The above graphs suggest that Austria is substantially below its import and export potential with respect to the rest of the EU. This is due to the problem with the denominator specification in equation (6.7). As explained in the text, instead of adding all twelve EU countries in the denominator what needs to be done is to take the EU12 average estimated trade flows and not the sum of EU12 countries estimated trade flows. This is corrected in the modified $\text{ratio3}_m$ which is presented in equation 6.9 and here:

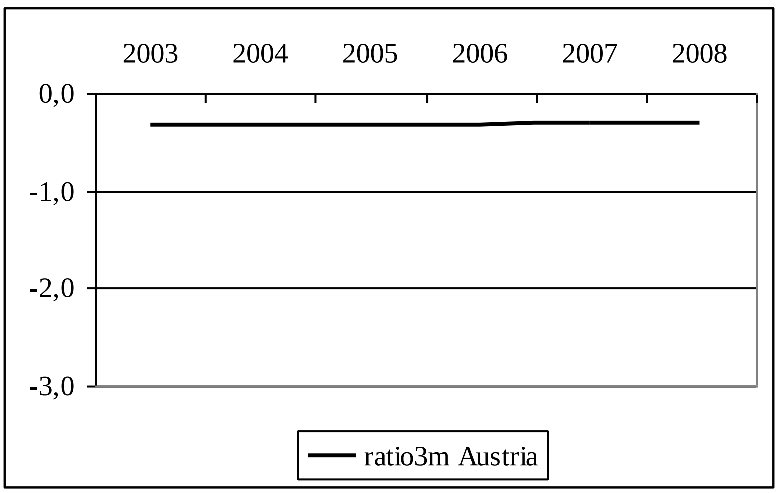
$$ration3_m = \ln\left[\frac{\sum_{n=1}^{12}\exp(T_{mnt})}{\frac{1}{n}\sum_{n=1}^{12}\exp(\hat{T}_{mnt}+tci_n)}\right] \tag{6.9}$$

Next by applying the improved $\text{ratio3}_m$ in Graph 3 Austria's import potential; and in Graph 4 Austria's export potential are presented.

**Graph 3: Natural logarithm of the ratio of actual imports to potential imports of Austria with the euro area countries, modified procedure**




**Graph 4: Natural logarithm of the ratio of actual exports to potential exports of Austria with the euro area countries, modified procedure**




Based on Graphs 3 and 4 it will be noticed that Austria is now only slightly below (0.5 percentage) its import and export potential with the euro area in the observed time period. Comparing with Graphs 1 and 2, the message is completely different: the former suggest that Austria still has substantial potential for raising its imports and exports with other member states; the latter do not. Given that Austria is a long-standing developed economy member of the EU, and before that had a long-standing high level of integration with the German economy, this is not likely. Hence it was decided to apply the corrected ratio$3_m$ in all calculations on WB trade potential.

It was decided to follow Bussière et al.'s (2005) suggestion to calculate the second "more realistic trade potential formula" (6.7 or simplified 6.8), but instead of adding all twelve EU countries estimated trade flows in the denominator it was decided to take their average trade flows. Hence through the corrected $ratio2_m$ calculation (it is called $ratio3_m$), which is presented in equation 6.9.

$$ratio3_m = \ln\left[\frac{\sum_{n=1}^{12}\exp(T_{mnt})}{\frac{1}{n}\sum_{n=1}^{12}\exp(\hat{T}_{mnt} + tci_n)}\right] \qquad (6.9)$$

In order to calculate $ratio3_m$ the following was performed:

1. The data sample was increased with the additional countries of the euro-area for which data was available;
2. The numerator of equation (6.9) was calculated;
3. Equations (6.2) and (6.3) were then estimated in order to calculate the potential trade flows from each EU12 country to the EU12 countries; and
4.The trade condition indicator was calculated based on equation (6.5), for each year for which data was available (2003 through 2008).

Overall in order to calculate the trade condition indicator and to calculate BH's potential trade the data base was increased with the following countries: Denmark, Spain, Italy, France, Greece, Slovenia, UK, Germany, Sweden, Netherlands, Austria and Belgium. Their participation in WB's trade can be seen in Table 6.5 above.

### 6.4.2 Trade potential results and discussion

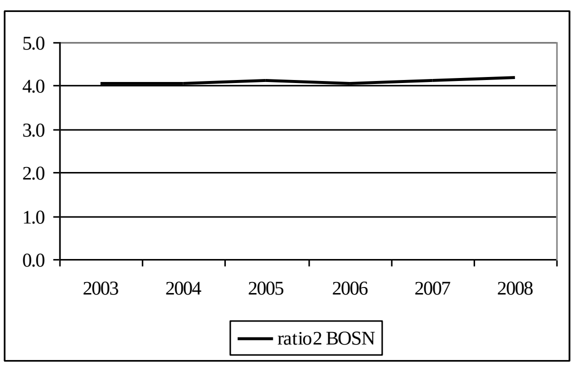
First by estimating equation (6.2) the country-pair fixed effects ($u_{ij}$) were obtained, then the country-pair fixed effects ($u_{ij}$) were regressed on all excluded dummy variables in order to obtain the "unobservable factors" ($w_{ij}$) necessary to calculate the "trade condition indicator" (*tci*) for each WB country's imports and exports. Second, by calculating (6.9), a ratio of actual to potential exports and imports for each WB country was obtained. Appendix 6.11 provides the estimated import and export models together with the actual values of the residuals obtained from the second estimation step that are actually aggregated for country *h* (i.e. for any of the WB countries) into a simple "trade condition indicator”, $tci_h$. So the results presented below are $tci_h$, where $h$ indexes Bosnia, Croatia, SMK, Macedonia and Albania. Each calculated TCI includes only WB countries, not those of the other EU12 countries that are in the model. The result is derived from the country-pair specific effects after decomposition into the observed time-invariant variables (distance etc) and the unobserved time-invariant influences ($w_{ij}$) from step two (equation 6.3). This means that the results presented below account for both observable and unobservable influences on the WB trade flows.

Potential trade calculation

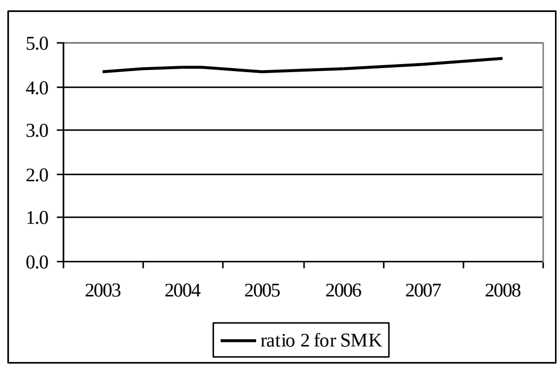
Turning to equation (6.7) and potential trade calculation the findings suggests that all WB countries are actually above their potential import trade intensity with the EU. The results are presented in Graphs 6.1 for the imports and in the Graph 6.2 for the exports.

Graph 6.1: Natural logarithm of the ratio of actual imports to potential imports of WB countries with the euro area countries

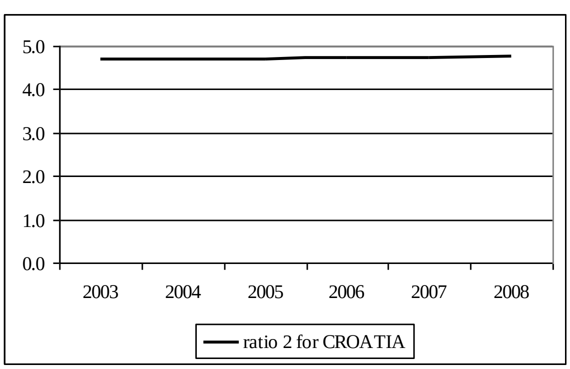
(a) Bosnia and Herzegovina



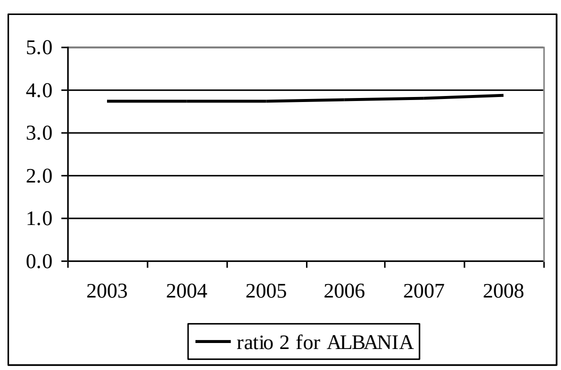

(b) SMK



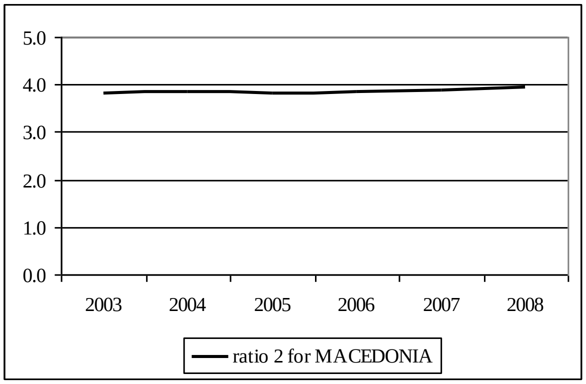

(c) Croatia




(d) Albania



(c) Macedonia

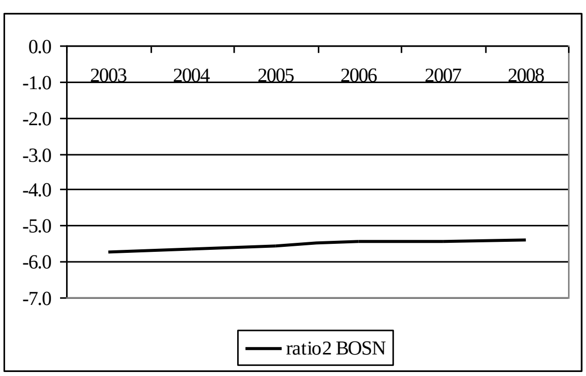



Note: Although these graphs are derived from calculations for each year, there is not much variation over the sample period.

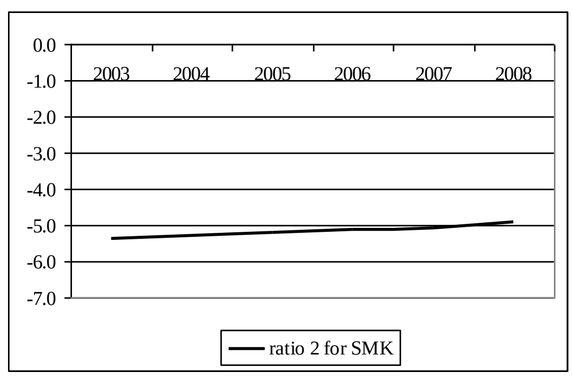
Based on the above graphs of the actual to potential imports ratio, it can be seen that all WB countries display actual imports typically around four percent above their potential level of imports from the euro area in the observed time period. The model suggests that WB countries' imports from the euro area actually exceeded its potential level. These results also suggest that all WB countries have more than exhausted the possibilities associated with catch-up to their potential level of imports from the euro area. The opposite behaviour is apparent in the ratio of actual to potential exports (Graph 6.2).

Graph 6.2: Natural logarithm of the ratio of actual exports to potential exports of WB countries with the euro area countries

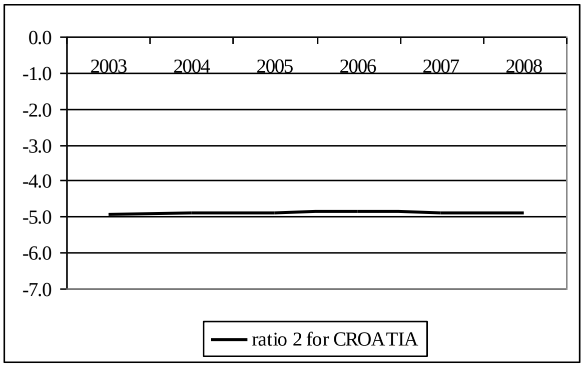
(a) Bosnia and Herzegovina



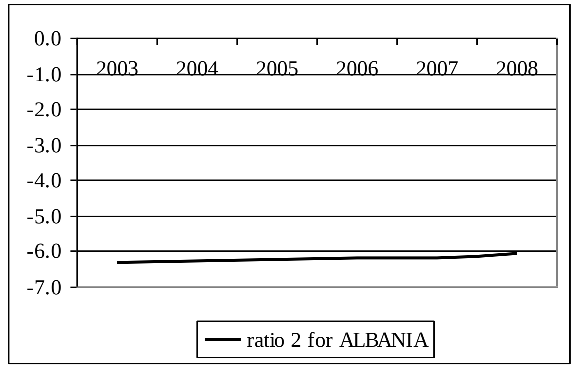

(b) SMK



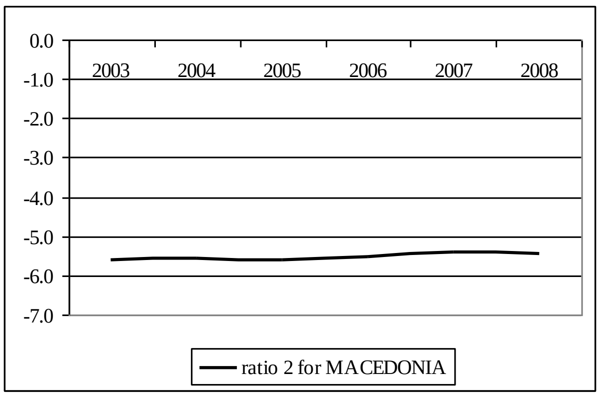
(c) Croatia




(d) Albania




(e) Macedonia




Note: Although these graphs are derived from calculations for each year, there is not much variation over the sample period.

The results suggest that during the sample period the WB countries made only slow progress towards their potential level of exports to the euro area. The ratio of actual to potential exports seems to vary only slightly among WB countries: i.e. for Macedonia and BH it is around 5.5%; Croatia and SMK, 5.0%; and Albania around 6.0% under its export potential to the euro area. These calculations suggest that all WB countries are still below their potential level of exports to the euro area.

Graphs 6.2 (a) to (e) also suggest that country-specific time dummies could be important in explaining export behaviour. This is not surprising since in all the previous estimations in section 6.3.4 on WB trade flows, time dummies are found to be positive and significant at the 1% level. Looking particularly at BH's actual to potential exports ratio the year 2006 seems to be important. From the previous discussion, in section 6.3.2, it is known that this is the year in which VAT was implemented in BH, hence structural changes could also have had a significant impact on both exports and imports trade flows.

## 6.5 Trade deficit sustainability

Theoretically the introduction of a free trade area can contribute to economic development and improved regional cooperation. For WB countries, CEFTA may also be an important part of achieving a smoother transition and accession to the EU. We noted in Chapter 5 that previous research has not considered whether formation of a FTA impacts on a country's trade deficit reduction. Since the effect of CEFTA on BH's trade flows has been estimated together with BH's trade potential, the analysis can now consider, whether CEFTA influenced the trade deficit in BH.

### 6.5.1 Central European Free Trade Agreement and trade deficit sustainability of BH

In order to assess the future BH trade deficit it is important to clearly distinguish between import and export trade flows, instead of conducting estimation on their aggregate. This is important for two reasons: *first* estimating the gravity model separately for exports and imports enables us to see that CEFTA had a different effect on imports and exports in BH. Based on the results from section 6.3.5, it was found that during the sample period the formation of CEFTA increased BH imports by 8.1% and decreased BH exports by 6.6%. This finding suggests that BH trade flows in the period between 2006 and 2008 were affected by the CEFTA agreement; and, moreover, in such a way as to contribute to a further widening of the trade deficit in BH. This interpretation is supported by a comparison of the 95 percent confidence intervals (CIs). These reveal that the two estimates do not overlap: the CI around the import coefficient ranges from 2 to 15 percent (Appendix 6.9) while the CI around the export coefficient ranges from - 14 to 0 percent (Appendix 6.10).

*Second* the calculation of trade potential by clearly distinguishing between import and export flows enabled us to assess whether imports and exports were above their potential or under their potential in the observed period. What was found is that in each WB country imports are persistently above their potential level with the EU, while exports are below and only slowly approaching their potential level. These results suggest that even as BH moves towards its potential trade levels the problem of trade deficit will remain, albeit at a diminishing level. Most probably this is a result of failure to enact structural and institutional changes in BH. It is interesting that time dummies were found to be significant at the 1% level. Looking particularly at Graph 6.1(a) the year 2006 seems to be important for BH. As previously discussed, this is the year when VAT was implemented in BH. VAT had a positive and significant effect on BH exports, while it had a negative but insignificant effect on BH imports. Hence structural and institutional changes could have a significant impact on trade flows. Further trade deficit reduction can be achieved by a supportive policy mix together with further structural reforms and their implementation. However, it will be difficult to achieve full export potential without further structural and institutional changes. Without structural changes and with an undeveloped product mix, as well as weak institutions that do not create opportunities for local business to benefit from freer trade, BH would, according to the analysis in this chapter, still maintain a deficit.

## 6.6 Conclusions

The analysis presented in Chapter 5 suggested that CEFTA could bring member countries closer together and help them towards more integrated trading relations and hence smoothing transition to EU membership. It is reasonable to expect to see CEFTA countries as becoming integrated economies, not least because all these countries are potential candidates for EU membership. The EU is continually working on the development of its economic union, as well as working towards the establishment of unified fiscal system and a common foreign economic policy. According to economic integration theory the final stage of an economic union is full integration of the member countries. Overall consistency is found with the above and Chapter 6 findings. In order to answer to the above question of whether CEFTA could bring WB countries close together and help in their changes towards more integrated trading relations three key areas are analysed in this chapter. The first is the estimation of the effects of the new CEFTA using the gravity approach; the second is calculation of Bosnia and Herzegovina's trade potential; and the third is a discussion of the effects of a new CEFTA on trade deficit sustainability in BH.

The estimation based on gravity models suggested that participating in a CEFTA had a significant and positive effect on trade flows for WB imports and WB exports. The model suggests that all WB countries are basically approaching their potential level of exports, while imports are above their potential level with the euro area. With respect to trade deficit sustainability, it can be concluded that, as long as the current slow speed of fundamental structural and institutional change persists then, even if BH moves towards its potential trade level, the problem of a trade deficit is also likely to persist.

# Chapter 7: Conclusions and policy implications for Bosnia and Herzegovina



## 7.1 Introduction

The central research question addressed in this thesis concerns whether the persistent current account deficit in Bosnia and Herzegovina is sustainable. In order to find the answer to this research question, the initial objectives were:

- To critically explore theories of current account sustainability in the context of transition in the Western Balkans.
- To conduct an analysis of Bosnia and Herzegovina's international trade and to compare it with that of other Western Balkan countries.
- To develop an empirical model to assess current account sustainability in Bosnia and Herzegovina.
- To estimate the influence of the Central European Free Trade Agreement (CEFTA) on the sustainability of trade deficits in Western Balkan countries.
- To evaluate the policy implications for Bosnia and Herzegovina of the above analyses.

The first four objectives have been addressed in the previous chapters and the role of this final chapter is to bring together the overall findings and to discuss their policy implications. Hence, this chapter is organised in four sections. After this introduction, section 7.2 provides an overall summary of the findings, identifying the main contribution to knowledge. In section 7.3 based on this research findings the policy implications are discussed for Bosnia and Herzegovina, while in section 7.4 the main limitations of the analysis are recorded. Finally, in section 7.5 areas for further research are identified.

### 7.2 An overall summary of the thesis

The central research question concerns whether the persistent current account deficit in Bosnia and Herzegovina is sustainable; hence particular attention has been devoted to an analysis of why Bosnia and Herzegovina runs a relatively high current account deficit and to an assessment of the structural and policy factors that are affecting its sustainability. Specifically, the discussion around recent macroeconomic trends briefly explained that BH had passed through several transition phases: i.e. socialist country; war-peace and the restructuring of the economy. The country's progress was examined further on the basis of the available main economic indicators and compared with those of the other Western Balkan economies. This led the research into a more detailed discussion of BH's macroeconomic imbalances. In particular in 2008 the trade deficit was around 35% of GDP and remained large during the whole observed time period. Since a high and persistent trade deficit is seen as a possible threat to a country's current account sustainability, an initial analysis was undertaken. In this analysis the trade deficit was identified as the only component of the BH current account deficit that persisted over the whole observed time period. All the other components of the current account were found to have a surplus. As part of this initial analysis a trade-churning index was calculated for BH (no studies have previously attempted to calculate the BH churning of trade before this research). This calculation revealed the very low diversification of BH's exports and imports, as well as its low overall churning of trade. It was found that out of 1254 subheadings (HS4 classification) just 9 subheadings accounted for 34.5% of BH's total exports in 2009 and 15 subheadings explained 27.8% of its imports.

The initial investigation also revealed that no forward-looking assessment of current account deficit sustainability was available for BH. Hence, the next step was to investigate the meaning of "sustainability" and the concept of "current account sustainability”. Here it was stressed that it is necessary to define what sustainable is or might be, in order to practice it; after all, how can something be achieved if it is not known what it is.

After exploring the intertemporal approach to current account sustainability, the issue of policy reversals and the framework of willingness to pay and willingness to lend, led us to the conclusion that in order to determine the ability of an economy to sustain current account deficits, it is necessary to identify the underlying structural factors causing the deficit. A detailed analysis of structural factors and macroeconomic policies seemed to be critical in assessing the ability of a transition economy to sustain current account deficits. It was found that studies of transition economies in late 1990s usually applied only descriptive statistics in their analysis due to the small sample of data available. It was found that such an approach was unable to identify which set of indicators may help signal the probability of a major policy shift that could lead to difficulties in current account deficit financing. A unique algorithm does not exist and the descriptive approach was unable to provide a clear empirical rationale as to why a particular value of a specific structural indicator would indicate sustainability. Hence it was decided to develop a more rigorous empirical analysis that was theory informed. This assessment of current account sustainability was conducted by refining the concepts of a stationary condition and the mean reversion proposition. It was argued that this condition presents a minimum requirement for current account sustainability assessment based on less strict intertemporal solvency conditions. BH’s current account deficit to GDP ratio was found to be stationary, but at a rather high level. The empirical literature generally finds a stationary current account to GDP ratio consistent with a finite external debt to GDP ratio (Wu, 2000; Lau and Baharumshah, 2005). It was found that four out of five WB countries have a stationary current account to GDP ratio and therefore met the minimum requirement for sustainability based on this less strict intertemporal solvency condition. According to Nelson and Plosser (1982) most macroeconomic variables are non-stationary in levels, but stationary in first differences, hence these results are consistent with this observation.

In order to develop an empirical model to assess current account sustainability in Bosnia and Herzegovina the FEER was estimated. Several studies suggested that a change in the real exchange rate is also an important indicator of sustainability. Two views about the variability of exchange rates were examined, the fundamental and misalignment views, this research was extended by investigating further the connection between current account sustainability and exchange rate misalignment. The fundamental equilibrium exchange rate approach was applied in order to test whether a movement in the real exchange rate represented a misalignment or whether the equilibrium real exchange rate itself has shifted because of changes in the economic fundamentals. Based on a sample of quarterly data the long-run behaviour of the FEER can be taken as indicative of the existence of fluctuations in openness, government consumption, terms of trade and productivity. It was found that REER misalignment is not an immediate threat to BH's current account sustainability. BH's high and persistent current account deficits do not appear to have been caused by a real exchange rate appreciation. The main finding is that BH's current account sustainability does not appear to be threatened by exchange rate misalignment, thus there is no need to adjust the peg. Even though sufficient evidence was found to confirm that BH's real effective exchange rate is not threatened by exchange rate misalignment, still the question remains as to the cause of the high current account deficit and its sustainability in BH.

Since the initial analysis had shown that BH's current account deficit was mainly driven by a trade deficit, it was sensible to compare BH with its main trading partner countries. The euro area and the other WB countries are the most important trading partners for BH. The large share of BH's trade with other WB countries reflects predominantly trade with Serbia and Croatia. The strong orientation of BH trade to these two countries raises the question as to whether, even before the impact of CEFTA has been fully felt, the trade structure of BH was too heavily oriented towards these two countries. Therefore, the effects of CEFTA on regional trade were estimated in order to investigate the future sustainability of trade deficits in the Western Balkans, one of the main research aims. The review of key recent studies using gravity models suggested that participation in a free trade area typically had a significant and positive effect on trade flows between member countries. In terms of trade deficit sustainability in Western Balkan countries, a free trade agreement may also be an important part of achieving a smooth transition and accession to the EU. It was found that whether formation of an FTA had a significant impact on a country's trade deficit reduction has not been empirically investigated previously. Theoretically, the introduction of a free trade area can contribute to economic development and improved regional cooperation. In the absence of previous analysis of trade deficit sustainability in the Western Balkans, research sought to assess whether forming an FTA was a good policy decision for BH by undertaking an ex post empirical analysis. To that end, the research programme evaluated the impact of the CEFTA on BH's trade deficit. Three key areas were developed. The first was an estimation of the effects of the CEFTA using gravity equations; the second was a calculation of Bosnia and Herzegovina's trade potential; and the third a discussion of the effects of CEFTA on the trade deficit sustainability in BH. What was found in order to assess future BH trade deficits was the importance to separate import and export flows instead of conducting estimations based upon their aggregate. This is important for two reasons: *first* by estimating the gravity model separately for export and imports it actually enables us to see whether CEFTA had a different effect on BH's imports and exports. The estimation based on gravity models suggested that during the sample period the formation of CEFTA increased BH imports by 8.1% and decreased BH's exports by 6.6%. This finding suggests that BH trade flows in the period between 2006 and 2008 were affected by the CEFTA agreement; and, moreover, in such a way as to contribute to a further widening of the trade deficit in BH. The finding of a decline in BH's exports is particularly surprising, one possibility is that freer trade increased competition in BH's export markets at a time when BH's slow pace of structural and institutional reforms rendered BH firms less able to compete. *Second* the calculation of trade potential by clearly distinguishing between import and export flows enabled us to assess whether imports and exports were above or below their potential in the observed period. What was found was that in each WB country imports are persistently above their potential level with the EU, while exports are below and only slowly approaching their potential level. These results suggest that even if BH moves towards its potential trade levels the problem of a trade deficit will remain, albeit at a diminishing level. Most probably this is a result of its failure to enact the required structural and institutional changes. With respect to trade deficit sustainability, it was concluded that, as long as the current slow speed of fundamental structural and institutional change persists then, even if BH moves towards its potential trade level, the problem of a trade deficit is also likely to persist.

Overall, it was concluded from this research programme that current account sustainability analysis must be based on understanding the reasons why countries run external imbalances. More specifically, the answers which emerged to the initial four research questions are now summarised. The first question was whether a current account deficit can be sustainable in the context of transition in the Western Balkans. It was found that a current account deficit can be sustained if the economy receives sufficient capital inflows and maintain sound macroeconomic policy. The second question was why BH's runs a persistent trade deficit. To address this question a first consideration was whether the cause was macroeconomic. Hence the third question was whether the current account deficit in BH was a result of real exchange rate appreciation. The analysis summarised above suggested that BH's high and persistent current account deficits do not appear to have been caused by a real exchange rate appreciation, thus there is no need to adjust the current peg. It was concluded that exchange rate misalignment was not the cause. Instead the likely reasons are to be found in real economy deficiencies and the lack of an adequate policy response to address these: a largely destroyed and distorted economy (as a consequence of the war 1992-1995) with a slow speed of fundamental structural and institutional change; a low diversification of BH exports; the absence of any systematic strategy for export specialisation in terms of destination markets; and the absence of a clear trade strategy for deficit reduction. The fourth question was whether the CEFTA had an impact on BH trade deficit sustainability. It was found that BH trade flows were affected by the CEFTA agreement, though in such a way as to contribute to a further widening of the trade deficit in BH. It was argued that this could be the consequence of the still undeveloped product mix that BH companies have to offer and the lack of adequate policy response to address these.

The fifth question concerns the policy implications of these findings for BH. Section 7.3 provides the answer to this question. Before then the main contributions to knowledge of this research programme are summarised.

### 7.2.1 Main contributions to knowledge

This research contributes to knowledge by: refining the concept of sustainable current account deficits, particularly in demonstrating that a stationary condition could be used to check whether a current account can be considered as sustainable. Another contribution to knowledge is the development of a method to relate structural factor fundamentals to the REER. This estimation enables investigation of whether fundamental changes, or the lack of them, in BH's economy are potential threats to its current account sustainability. Estimation of the equilibrium exchange rate offers the prospects of major advances in the empirical measurement of real exchange rate misalignment, particularly for developing countries that lack long time series data and the ability to construct a small structural model. Instead, what can be applied is a single equation approach to identify misalignment. The fundamental equilibrium exchange rate is an approach to estimating and also operationalising this concept. Misalignment, if detected, would confirm that there are macroeconomic problems in BH's economy. Chapter 3, established that a descriptive approach can only suggest that there is misalignment. In contrast, the approach taken in this research programme suggests that misalignment is not an immediate threat to BH's current account sustainability. The high and persistent current account deficit does not appear to have been caused by a real exchange rate appreciation.

The next contribution to knowledge is the modification of the fixed effect vector decomposition (FEVD) estimation procedure. Modification was necessary to address a problem that arises from the two sets of criteria that any method of estimation must satisfy: namely: *statistical validity* (i.e., the assumptions of the econometric model as a statistical generating mechanism are supported by the data; for example, no serial correlation in the error terms); and *economic validity* (i.e., the econometric model is consistent with economic theory). Some recent empirical studies (Plümper and Troeger, 2004; Cheng and Wall, 2005; Bussière et al., 2005; Baldwin and Taglioni, 2007; Caproale et al., 2008) concentrate solely on economic validity and fail to investigate the statistical validity of their models. In order to overcome this obstacle improvements are made to the conventional estimation procedure. This approach to estimation is called the fixed effect vector decomposition augmented (FEVDA) procedure. Appendix 6.1 provide the Stata10 >do< file containing these improvements which were applied in the model estimation.

Another contribution to knowledge is related to the estimation of trade potential. In order to forecast future current account balances, it was argued that it is important to clearly distinguish between potential import and export flows instead of just conducting an estimation of their net aggregate, which is common practice (Christie's, 2002; Vujcic and Sosic's, 2004; Bussière et al., 2005). By estimating the gravity model separately for exports and imports it can be assessed whether entry into a FTA had a different effect on imports and exports in a particular country. This calculation of trade potential enabled us to separately assess whether imports and exports were above or below their potential level.

Taken together, these contributions to knowledge provide a comprehensive empirical analysis of the sustainability of persistent trade deficits in Bosnia and Herzegovina. The findings collectively suggested that in the short-run BH's deficit is likely to be sustainable. However, without achieving successful structural and institutional change, sustainability in the long-run may be problematic. The next section address the nature of structural and institutional changes necessary to promote long-run sustainability.

## 7.3 Policy implications

The analysis undertaken in Chapters 3 and 4 have generated direct evidence that the cause of persistent trade deficits in BH is not amenable to solution through adjusting macroeconomic policy. The likely underlying reason for persistent trade deficits is the underlying weakness of the real sector economy. In particular, the low diversification of exports, the lack of an adequate policy response to address the largely destroyed and distorted economy and absence of any systematic strategy for deficit reduction. Therefore attention is directed at the supply-side and the need to develop effective supply-side policies.

Policy-makers should focus on the design and implementation of proactive policies and institutions that aim to address export promotion and trade finance; institutions that foster innovation, quality and standards; foreign direct investment etc. All this is necessary in order for BH to generate an industrial structure that is more supportive of balanced trade and economic development. In BH, for example, criteria have not been derived to identify which products BH should target for export. This is not surprising since BH lacks a national trade strategy. An additional difficulty also arises from the continuing slow speed of fundamental structural and institutional change, which limit the country's future perspectives. The current pattern of public sector employment seems to reflect this lack of support for structural development. Table 7.1 provides data on the total number of BH employees in state institutions.

Table 7.1: Bosnia and Herzegovina employees in state institutions

| No. | Institution | Number of employees | Expected number of employees[1] | Number of employees |
|---|---|---|---|---|
| | | 30.6.2009 | 31.12.2009 | 31.12.2010 |
| 1 | BH Parliament Assembly | 197 | 207 | 210 |
| 2 | BH Presidency | 91 | 91 | 124 |
| 3 | BH Ministry of Defence | 10452 | 10382 | 9818 |
| 4 | High Judicial and Prosecutorial Court of BH | 80 | 82 | 85 |
| 5 | Constitutional Court of BH | 94 | 94 | 94 |
| 6 | Court of BH | 179 | 190 | 223 |
| 7 | The Prosecutor's Office of BH | 147 | 149 | 173 |
| 8 | Office of Attorney General of Bosnia and Herzegovina | 16 | 23 | 24 |
| 9 | The Institution of Human Rights Ombudsmen of BH | 37 | 46 | 56 |
| 10 | General Secretariat of Council of Ministers of BH | 57 | 57 | 61 |
| 11 | Directorate for European Integrations | 72 | 85 | 92 |
| 12 | BH Ministry of Foreign Affairs | 498 | 495 | 520 |
| 13 | BH Ministry of Foreign Trade and economic relations of BH | 154 | 157 | 173 |
| 14 | Foreign Investment Promotion Agency of BH | 28 | 32 | 32 |
| 15 | Veterinary Office of BH | 67 | 70 | 76 |
| 16 | Srebrenica-Potočari Memorial and Cemetery for the Victims of the 1995 Genocide | 21 | 25 | 25 |
| 17 | BH Council of Competition | 27 | 28 | 28 |
| 18 | BH Ministry of Communication and Transport | 98 | 110 | 118 |
| 19 | BH Directorate of Civil Aviation | 53 | 56 | 56 |
| 20 | Communications Regulatory Agency | 111 | 116 | 126 |
| 21 | BH Ministry of Finance and Treasury | 138 | 147 | 178 |
| 22 | BH Indirect Taxation Authority | 2315 | 2480 | 2505 |
| 23 | Ministry of Human Rights and Refugees | 92 | 100 | 112 |
| 24 | Commission for Real Property Claims of Displaced persons and Refugees | | | |

| | | | | |
|---|---|---|---|---|
| 25 | Ministry of Justice | 209 | 227 | 238 |
| 26 | Ministry of Security | 164 | 185 | 215 |
| 27 | State Investigation and Protection Agency | 1312 | 1468 | 1629 |
| 28 | BH Border Police | 2222 | 2235 | 2355 |
| 29 | Ministry of Civil Affairs | 122 | 130 | 150 |
| 30 | Agency for identification documents, registers and data exchange | 100 | 143 | 155 |
| 31 | BH Centre for Demining BHMAC | 182 | 189 | 189 |
| 32 | Service for Common Affairs of the Institutions of BH | 341 | 364 | 398 |
| 33 | Audit Office of the Institutions of BH | 40 | 42 | 48 |
| 34 | Central Election Commission of Bosnia and Herzegovina | 76 | 78 | 114 |
| 35 | BH Commission to Preserve National Monuments | 22 | 22 | 25 |
| 36 | Civil Service Agency of BH | 20 | 21 | 24 |
| 37 | Agency for Statistics of BH | 68 | 74 | 94 |
| 38 | Institute for standardization of BH | 32 | 37 | 39 |
| 39 | Institute of Metrology of BH | 45 | 45 | 53 |
| 40 | Institute of Intellectual Property of BH | 41 | 44 | 51 |
| 41 | Institute for Accreditation of BH | 13 | 16 | 18 |
| 42 | Archives of BH | 16 | 16 | 19 |
| 43 | Intelligence and Security Agency of Bosnia and Herzegovina | 699 | 713 | 722 |
| 44 | Administration for Plant Health Protection | 15 | 18 | 22 |
| 45 | Market surveillance Agency of BH | 17 | 17 | 21 |
| 46 | Food Safety Agency of BH | 27 | 36 | 41 |
| 47 | The Return Fond of BH | 13 | 13 | 15 |
| 48 | Labour and Employment Agency of BH | 28 | 30 | 30 |
| 49 | BH State Electricity Regulatory Commission | | | |
| 50 | Service for Foreigners Affairs in Bosnia and Herzegovina | 185 | 215 | 227 |
| 51 | Civil Service Board for Complains | 6 | 6 | 6 |
| 52 | BH Commission for Concessions | 13 | 15 | 15 |
| 53 | Legislative Office | 14 | 16 | 22 |
| 54 | Public Procurement Agency of BH | 18 | 18 | 23 |
| 55 | Procurement Review Body | 11 | 17 | 17 |
| 56 | Missing Persons Institute of BH | 51 | 55 | 55 |
| 57 | Insurance Agency of BH | 10 | 11 | 11 |
| 58 | BH Directorate for Economic Planning | 25 | 28 | 33 |
| 59 | The Institution of Consumer Protection Ombudsmen of BH | 6 | 6 | 7 |
| 60 | Coordinator Office for Public Reform | 35 | 38 | 38 |
| 61 | Agency for Postal Traffic of BH | 9 | 9 | 17 |
| 62 | Agency for Development of Higher Education of Quality Assurance | 7 | 12 | 20 |
| 63 | Agency for Education in Preschools, Elementary and Secondary Schools | 14 | 17 | 27 |
| 64 | Agency for Personal Data Protection | 14 | 16 | 25 |
| 65 | Information Centre for verification of documents from the field of Higher Education | 1 | 6 | 14 |
| 66 | State Regulatory Agency for Nuclear Safety in BH | 1 | 11 | 19 |
| 67 | Agency for Medicines and Medical Devices | 45 | 94 | 104 |
| 68 | Police Support Agency | 2 | 15 | 37 |
| 69 | Agency for Antidoping Control | 2 | 6 | 9 |

| | | | | |
|---|---|---|---|---|
| 70 | Agency for Forensic research and analysis | 2 | 15 | 32 |
| 71 | Agency for Education and Training of civil servants | 1 | 12 | 46 |
| | **TOTAL** | **21320** | **22023** | **22378** |

Source: Official Gazette No 103/09

[1] Final number of the employees will be available by the end of 2010. The above data is taken from the Official Gazette published in 2009.

From the data presented in Table 7.1 it can be seen that the largest number of state employees are concentrated in institutions that are dedicated to security and public safety (i.e. defence, police, investigation and intelligence), in total around 72% of all government employees. The Indirect Taxation Authority has around 11% of state employees, while institutions that aim to address export promotion and trade finance, employ about only 1.5% of all government employees. The key aim of a government should be achieve faster economic growth, and it is argued below that this requires design and implementation of an effective trade policy. To the best knowledge of the author there is no commonly shared policy or policies for export development in BH. Key issues including new product development, productivity improvement, reduction of transportation costs, employment generation etc. are simply not addressed in a single strategy. All this suggests that a lot of challenges are facing the 1.5% of total government employees who are working on economic development.

Persistent current account deficits are an important indicator of a country's economic performance. The analysis has shown that BH's current account deficit is mainly driven by a trade deficit and transition towards more balanced trade cannot be achieved without difficulties. For various historical and political reasons, BH suffers from a slow speed of fundamental structural and institutional change (section 1.2). Chapter 5 stressed that countries with solid export bases (more diversified) tend to perform better than those without, and that economies with more sophisticated exports (new and higher-value exports) tend to grow faster. In the absence of a more diversified export sector and innovation to produce, new higher-value added product varieties, even if BH moves towards its potential trade level, the problem of the trade deficit is also likely to persist. To assess sustainability by just providing descriptive analysis without support from appropriate econometric modelling, as is usually the case in BH (i.e. by the EU Enlargement Commissioner, BH Directorate for Economic Planning and CBBH), is not enough, though it is partly understandable if the country does not have longer time-series data and lacks research capacity. Hence the policy recommendations are two fold: first in regards to statistics; and second in regards to addressing current account deficit sustainability in BH.

In regards to statistics, BH should first start to work on the creation of a comprehensive macroeconomic database. Second, research departments within leading BH economic institutions should be focused more on macro-econometric model development for policy analysis and research. The main advantage of a macro-econometric model is that it can help the process of government decision-making and also the understanding of current economic phenomena. If the model and its forecasts were made publicly available then this will also increase the transparency of government policy making and, perhaps more importantly, over time, its credibility. This is important for strengthening BH's institutions and its future economic and political integration with the EU.

From BH's perspective, EU membership can be seen as a means toward greater political and economic stability. The Maastricht criteria, with a focus on nominal and macroeconomic convergence, represent an important precondition that BH will have to comply with. Persistent and large current account deficits in BH raise questions about its ability to achieve these criteria. Based on the convergence speed estimations and steady state rate calculations, it was concluded that there were questions about BH's external sustainability and the consistency of its recent policies with nominal and real convergence. Based on these findings, this research suggests that BH should further develop its economic development strategies (i.e. through structural adjustment programs of the IMF, IPA funding and World Bank) in order to promote the achievement of external balance. Wong (2002:11) stresses, "external balance depends on two fundamental variables – the level of real domestic demand and the real exchange rate." The analysis presented in Chapter 5 suggested that the main factor underlying BH's trade deficit is its strong demand for imported goods and supply-side weaknesses. Based on the discussion in Chapter 4 of BH's obsolete and insufficient capital stock, it can be argued that the country does not yet have the capacity to produce and export goods of sufficient value to eliminate or even greatly reduce its trade deficit.  It can be argued that relying only on capital inflows from the abroad, without development based on domestic production increases BH's vulnerability to external and internal financial crises. This also suggests that this economy may endure potentially unsustainable deficits in the future.

In regards to current account deficit sustainability, it is argued next that an emphasis upon import substitution and export-led growth may be the most suitable strategy to significantly reduce BH's trade deficit in the medium-term.

### 7.3.1 Import substitution and export-led growth

The policy of import substitution prevailed in many developing countries during the 1950s and early 1960s, while export-led growth policy originated in the 1970s. Although both policies seek to remove balance of payments constraints on growth, their target, design and implementation are likely to be very different. An import substitution policy targets the replacement of imported goods and services by locally produced goods and services, while the focus of export-led growth is on domestic production for international markets. Thirlwall (2002) argues that many countries have constrained growth due to balance of payments difficulties. It can be argued that this may also happen to BH given its currency board arrangement. Thirlwall (2002:66) stresses that in the case of a fixed exchange rate regime "at a theoretical level, it can be stated as a fundamental proposition that no country can grow faster than rate consistent with balance of payments equilibrium on current account unless it can finance ever-growing deficits, which, in general, it cannot". Since balance of payment must be balanced, then according to Thirlwall (2002) every country must have a growth rate consistent with its overall balance of payments. To derive this condition he started with the balance of payment equilibrium equation. Then the export and import demand functions were specified and a final step was to solve the growth of income consistent with balance of payment equilibrium. The rate of growth is formally[55] expressed as:

$$Y_B = \frac{\varepsilon(z)}{\pi} \qquad (7.1)$$

Where,

$Y_B$ - represent the growth rate of income consistent with balance of payments equilibrium

[55] Derivation taken from Thirlwall (1982, 1994, 2002)

$\varepsilon$ - is the growth rate in all other countries

$z$ – is the income elasticity of demand for exports, hence

$\varepsilon(z)$ - gives the growth rate of exports and

$\pi$ - is the income elasticity of demand for imports

Equation (7.1) suggests that one country's growth rate depends positively on its rate of growth of exports and inversely on its income elasticity of demand for imports. To address the balance of payments constraint on its growth, the diversification of BH's exports therefore needs to target both products with high income elasticity of demand for exports and markets with high future growth. Thirlwall argues that income elasticity of demand for exports depends on the type of goods produced within a certain product range and hence the growth of export can be modelled as a function of product quality, reliability, marketing etc. As showed in Chapter 1's analysis and Chapter 6's findings, weak export supply side seems to be the problem for BH. It can be argued on the lines of Thirlwall that if the balance of payment constraint on growth is to be removed then the concentration of policy must be on the supply side. The adoption of a Currency Board Arrangement (CBA) in BH reflected the primacy of stabilising the price levels. Thirlwall (2002) suggests that "there is no conflict between balance of payment equilibrium and stable prices" arguing that balance of payments difficulties originate from supply side and non-price factors. In that case trade policy must be directed at raising the rate of growth of exports by non-price means. The emphasis upon non-price adjustments is particularly important for BH due to its commitment to a currency board arrangement. In the absence of such an arrangement, an exchange rate depreciation could be used to reduce the imbalance. This is not an option for BH to offset the faster rise in its domestic export prices relative to foreign prices since in the absence of sufficient supply elasticity, the result might be merely a temporary boost to the profitability of exporting firms rather than the investment and restructuring necessary for sustained improvement in export performance. If the non-price factors are improved (e.g: quality, reliability, delivery, design etc.) then the balance of payment constraint on growth may be removed.

At the heart of both import substitution and export-led growth policies is the development of competitive domestic production, but these policies follow different strategies. In the case of import substitution competitive domestic production at first would be used to replace imports of non-durable goods. According to Thirlwall (2002) non-durable goods require little protection and are domestically available, for example clothing and footwear. The next step would require substitution of durable goods. A problem at this stage is that durable goods substitution may require more protection in a short term and it may be costly if capital intensive sectors are favoured. It also needs to be taken into consideration that the production of durables is typically subject to substantial economies of scale so that unit costs are high if output is low (Thirlwall, 2002). Based on the above it can be argued that import substitution is trying to find a way around competitive advantage, while export-led growth is taking competitive advantage as a tool to reverse patterns of trade. According to Thirlwall (2002) the focus should be on raising income elasticity of demand for exports which may reduce the income elasticity of demand for imports if the goods produced for export also compete with imports. It can be argued on the lines of Thirlwall that if BH applies both a policy introducing selective subsidies to export activities with growth potential, while at the same time producing goods with higher income elasticity of demand, over time this should produce an improvement in BH's current account deficit.

Many empirical studies have been conducted to assess the role of exports in growth and the main conclusion seems to support the hypothesis that increasing the value of exports assists economic growth (Ram, 1987; Balassa, 1978; Balassa, 1985; Medina-Smith, 2001) Adoption of either an import substitution or export-led growth strategy requires a country to identify suitable goods and services in which to specialise. If that is, for example, the manufacturing sector then probably the most likely scenario would be to expect initially a worsening of the deficit, as more raw materials and machinery are imported to strengthen the manufacturing sector. If on the other hand, the country lacks a clear trade strategy and cannot take advantage of economies of scale and/or scope in manufacturing, then a persistent deficit is likely to become unsustainable in the long-run. This requires BH policy-makers to take this problem seriously. It can be argued that an important part of a new trade strategy should be an analysis of income elasticity of demand for BH exports in world markets. The focus should be to assess, based on sector specific analysis, what commodities BH has a competitive advantage to trade. Then it is necessary to make export promotion an important component of a country's economic policy. It was interesting to notice that in 2009 both BH's imports and exports were significantly reduced compared to previous years as the result of overall slowdown in global and domestic economic activity. The global economic crisis may act as a warning for BH given its low diversification of exports. A financial crisis is particularly threatening to BH, which increased its borrowing in 2009 in order to meet it financial obligations, but at the same time maintained a high current account deficit. It was learned from Chapter 1 that five countries explained 80% of almost all trade in BH's top exporting and importing commodities. Hence, in the near future, over-dependence on only a narrow set of commodity groups for exports as well as its small foreign market share could cause a difficulty for BH's current account financing. For BH it would be highly recommended to use product sector criteria (ECB, 2005) to identify which products BH should target as products for export.

## 7.4 Limitations of the research programme

There are three main limitations of the analysis presented in this thesis. These are: data availability; the treatment of sustainability; and the absence of a coherent sector-specific strategy to inform policy-making. These three limitations are something that can be addressed in future research.

This study produced strong and direct evidence confirming that the current account deficit is not caused by exchange rate misalignment and is thus not amenable to a macroeconomic solution. By default, therefore, attention is directed to the supply-side and to supply-side policy. However, this research does not provide direct evidence on supply-side weaknesses and corresponding policy responses and that is limitation that can be overcome by future research.

The issue of the quality and quantity of data is a problem that persists in many transition economies. Data quality and its availability will require continuous work on improving the production of statistical information in BH. Achieving these improvements is of importance for good-decision making, improved monitoring and better research, but to achieve these objectives significant further institutional reforms are necessary. The

Higher Representative imposed a new State Law on Statistics in October 2002 in order to provide a legal basis, and to strengthen the capacity, for creation of consistent statistics for the whole territory of BH. Implementation of this legislation has been slow. This is something that BH has to improve to be able to undertake advanced empirical analyses in order to understand future sustainability of current account deficit in BH economy. For example, BH has only recently started to build data on its national accounts (BH Agency for Statistics, 2008). Four years ago when the research reported in this thesis started, data on GDP by expenditure and income approach were not available. The Agency for Statistics has undertaken coordination of the heterogeneous sources of information on the BH territory to improve BH data. GDP by expenditure approach is published in 2008 for the period 2006 to 2008 (Bosnia and Herzegovina Agency for Statistics, 2008) and by income approach in 2010 for the period 2008 to 2009. Hence, when longer time-series data on BH national accounts become available it will create opportunities for additional empirical work.

In regards to sustainability it was found to be a very broad concept that lacks a uniform definition. This finding also questions whether it is possible to operationalise the concept. In line with recent research, the approach taken was to investigate the meaning of "sustainability" and the concept of "current account sustainability". Persistent current account deficit above 5% of GDP have generally been considered unsustainable, however it was found that no clear empirical rationale why there should be such a certain threshold on the current account as a percentage of GDP. To that end, current account sustainability seems to present a conceptual, theoretical and empirical problem. The only way around this circularity seems to be to find a common understanding of the meaning of "sustainability". Until then it can only be suggested that sustainability will continue to incorporate each author's own vision of what sustainable actually means.

The absence of a coherent sector-specific strategy is a problem since availability of such a strategy would assist decision-making and improve monitoring. A sector-specific strategy is necessary in order to inform policymaking of the likely outcome of changes in different sectors of the economy. This type of the analysis is outside the range of this thesis. Moreover, it is very demanding on data and should be co-ordinated with the national trade strategy.

### 7.5 Further research

The finding that the problem of BH's trade deficit is likely to persist as long as the current slow speed of fundamental structural and institutional change persists creates opportunities for future research. One area would be to evaluate the formulation of a national trade strategy (NTS) for BH. This could provide policy-makers with a practical diagnostic tool through applying a national trade strategy check list[56], identifying institutional aspects of foreign trade needing improvement.

This study is concluded by noting that BH's negotiations to become a part of WTO started on 15 July 1999 and, eleven years later, BH is still not a member. As long as the current slow speed of fundamental structural and institutional change persists, the problem of current account deficit is also likely to persist. In recent years, privatisation receipts and capital inflows have funded BH's current account deficits. In the future, it is anticipated that it might be difficult to sustain the current account deficit if BH starts to increase its external debt whilst maintaining only slow progress in reforms. To achieve longer-term sustainability BH policy-makers will need to create an environment supportive of private sector development. Hence both micro and macroeconomic conditions have to be created by policy-makers in order to improve its future trading position. Future work should be focused on achieving a further diversification of BH exports sector and on identifying and promoting targeted products for export.

[56] A practical guide to assist in the National Trade Strategy formulation implementation and review process. Developed by International Trade Centre UNCTAD/WTO.

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APPENDIX 1.0: Professional development

**Working experience:**

- December 2010 – present– Division chief for Modeling and Forecasting Unit at the Central Bank of Bosnia and Herzegovina
- January 2003 – November 2010 – Economic analyst at the Central Bank of Bosnia and Herzegovina
- 2005 – present – Member of the Economic Research Council for Central Bank of Bosnia and Herzegovina

**Courses attended:**

- Duisenberg School of Finance Program for Central Bankers and Regulators on an up-to date set of tools and models in *monetary economics and financial regulation, organised* in collaboration between Duisenberg School of Finance and De Nederland's Bank, Amsterdam, 11-15 January 2010
- Panel data linear analysis, Microeconometric Summer School of Barcelona, Spain, with professor Badi Baltagi, 2009.
- Macroeconomics, First Semester 2007/2008, Staffordshire University, with professors Nick Adnett and Geoffrey Pugh
- Research Methods in Economics 1, First Semester 2007/2008, Staffordshire University, with professors: Jean Mangan and Geoffrey Pugh
- Postgraduate Certificate in Research Methods, Staffordshire University (Course held in November 2007) complete in January 2008;

**Publications in journals and conference proceedings:**

- Hlivnjak, Sandra (2009) "Nominal and Real Effective Exchange Rate for Bosnia and Herzegovina", *International Journal of Economic Policy in Emerging Economies*, Vol.2, No.1 pp.41-49.
- Hlivnjak, Sandra (2009) "Assessing Current Account Sustainability: the case of Bosnia and Herzegovina", CICIM conference on 20 Years of Transition in Central and Eastern Europe: Money, Banking and Financial Markets, London Metropolitan University, UK, proceedings, available at:

http://www.londonmet.ac.uk/londonmet/fms/MRSite/acad/lmbs/RESEARCH%20CENTRES/CICM/CICM%20CONFERENCE%20PAPERS/International%20Economics%20%20Foreign%20Exchange/Assessing%20Current%20Account%20sustainability,%20The%20case%20of%20Bosnia%20and%20Herzegovina%20-%20Sandra,%20H.pdf

- Hlivnjak, Sandra (2009) "Current Account Convergence to the long-run steady state for Bosnia and Herzegovina and Western Balkans", XII Scientific conference, Perugia, Italy, proceedings, available at: http://www.stat.unipg.it/aissec2009/English/program_eng.html#2d

- Hlivnjak, Sandra (2008) "Assessing Current Account Sustainability: the case of Bosnia and Herzegovina", International Trade Conference, Stoke-on-Trent, UK, proceedings, available at: http://www.staffs.ac.uk/about_us/news_and_events/event_calendar/itc.jsp

**Conferences attended:**

- Participant: Macroeconomic Modeling and Forecasting in Bank of Italy, Rome, Italy, 20-24 July 2010

**Skills acquired:**

- Stata 8.0 and 10.0 (Statistic/Data Analysis)

- E-views 4.0, 5.0 and 6.0

- Microfit 4.0

- Proficient in Microsoft Office 98, 2000 and XP

## APPENDIX 1.1: Bosnia and Herzegovina main comodities for exports and improts

Table: A1.1: Structure of BH commodity export with main trading partners in 2006

| HS code Exports HS10 | Commodity | Total value of exports | Top five BH export destinations 1 | | 2 | | 3 | | 4 | | 5 | | Coverage of five export countries 2006 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7601201000 | Aluminum Alloys | 476,676,032.47 | Croatia | 38.8% | Italy | 25.0% | Austria | 21.2% | Slovenia | 4.8% | Poland | 3.1% | 92.8% |
| 8409990000 | Parts of Compression-ignition Internal Combustion Piston Engines | 313,420,420.61 | Hungary | 39.5% | Slovenija | 39.2% | Germany | 20.8% | Croatia | 0.1% | Serbia | 0.1% | 99.7% |
| 2716000000 | Electrical Energy | 252,027,032.13 | Croatia | 45.8% | Switzerland | 27.8% | Slovenia | 13.8% | Czech. R | 7.5% | Germany | 4.4% | 99.2% |
| 2818200000 | Other Aluminium Oxide | 195,785,699.67 | USA | 84.9% | Poland | 9.3% | Romenia | 4.6% | Slovenia | 0.7% | Serbia | 0.0% | 99.6% |
| 9401908000 | Parts of Seats Other than Dentists' | 160,491,132.69 | Germany | 51.2% | France | 12.8% | Slovenia | 5.2% | Hungary | 1.2% | Serbia | 0.1% | 70.6% |
| 7214200000 | Concrete reinforcing bars and rods, Hot-rolled, Hot-drawn, Hot-extruded | 149,396,336.41 | Slovenia | 43.8% | Croatia | 33.9% | Serbia | 20.9% | Hungary | 0.9% | Italy | 0.0% | 99.5% |
| 2601110000 | Iron Ores and Concentrates (Non-agglomerated) | 118,438,666.27 | Romania | 41.2% | Poland | 36.6% | Czech. R | 15.7% | Italy | 6.5% | USA | 0.0% | 100.0% |
| 2704001900 | Coke, Semi-coke of Coal, of Lignite, of Peat; Retort Carbon | 109,376,070.02 | Serbia | 67.8% | Croatia | 2.1% | Macedonia | 0.8% | Italy | 0.4% | Slovenija | 0.3% | 71.4% |
| 4407109800 | Coniferous | 93,390,529.62 | Serbia | 57.3% | Macedonia | 3.5% | Austria | 3.2% | Italy | 0.9% | Slovenia | 0.2% | 65.1% |
| 7213911000 | Bars and Rods Of circular cross section measuring less than 14 mm (0.55 inch) in diameter | 91,479,122.33 | Serbia | 42.1% | Slovenia | 30.0% | Croatia | 14.0% | Italy | 8.9% | Macedonia | 0.8% | 95.8% |
| 4407920000 | Of beech (Fagus spp) | 84,085,035.87 | Croatia | 21.4% | Italy | 18.3% | Slovenia | 16.7% | Austria | 9.7% | Germany | 9.6% | 75.6% |
| 6406101100 | Uppers and Parts Thereof, Other than Stiffeners | 62,123,145.81 | Germany | 31.8% | Italy | 29.6% | Slovenia | 18.7% | Austria | 15.3% | Croatia | 0.7% | 96.1% |
| 9401610000 | Seats, With Wooden Frames, Upholstered | 62,053,049.47 | Germany | 43.9% | Croatia | 21.2% | Italy | 11.9% | Austria | 5.1% | Serbia | 4.9% | 87.0% |
| 7308909900 | Other Structures and Parts of Structures, of Iron or Steel | 57,117,100.90 | Croatia | 46.2% | Serbia | 13.0% | Germany | 12.1% | Slovenia | 8.2% | Austria | 4.7% | 84.3% |
| 9403601000 | Other Wooden Furniture | 52,077,835.09 | Germany | 36.7% | Croatia | 18.9% | Serbia | 18.1% | France | 6.2% | Slovenia | 5.2% | 85.0% |

Source: Bosnia and Herzegovina Indirect Taxation Agency and author’s own calculation

## Table A1.2: Structure of BH commodity export with main trading partners in 2007

| HS code Exports HS10 | Commodity | Total value of exports | Top five BH export destinations | | | | | | | | | | Coverage of five export countries | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1 | | 2 | | 3 | | 4 | | 5 | | 2007 | 2006 |
| 7601201000 | Aluminum Alloys | 494,192,606.90 | Croatia | 38.7% | Italy | 28.0% | Austria | 18.2% | Hungary | 8.9% | France | 2.8% | 96.6% | 92.8% |
| 8409990000 | Parts of Compression-ignition Internal Combustion Piston Engines | 323,635,513.70 | Slovenia | 45.5% | Hungary | 36.6% | Germany | 17.5% | Serbia | 0.2% | Croatia | 0.1% | 99.8% | 99.7% |
| 2716000000 | Electrical Energy | 225,468,282.30 | Croatia | 34.4% | Switzerland | 33.0% | Serbia | 8.7% | Slovenia | 2.3% | Czech. R | 2.3% | 80.7% | 99.2% |
| 2704001900 | Coke, Semi-coke of Coal, of Lignite, of Peat; Retort Carbon | 187,800,849.70 | Serbia | 69.6% | Macedonia | 1.5% | Croatia | 0.6% | Turkey | 0.4% | Italy | 0.3% | 72.5% | 71.4% |
| 7214200000 | Concrete reinforcing bars and rods, Hot-rolled, Hot-drawn, Hot-extruded | 163,795,444.10 | Serbia | 29.6% | Croatia | 24.5% | Slovenia | 24.5% | Hungary | 2.9% | Macedonia | 0.8% | 82.2% | 99.5% |
| 9401908000 | Parts of Seats Other than Dentists' | 158,236,245.20 | Germany | 62.6% | France | 5.9% | Hungary | 3.1% | Czech. R | 0.8% | Serbia | 0.1% | 72.6% | 70.6% |
| 2818200000 | Other Aluminium Oxide | 133,837,555.30 | USA | 96.7% | Slovenia | 2.5% | Poland | 0.3% | Hungary | 0.3% | Austria | 0.1% | 100.0% | 99.6% |
| 4407920000 | Of beech (Fagus spp) | 111,228,718.70 | Croatia | 23.6% | Italy | 16.5% | Austria | 13.8% | Germany | 13.0% | Serbia | 1.9% | 68.9% | 75.6% |
| 2601110000 | Iron Ores and Concentrates (Non-agglomerated) | 102,862,335.80 | Romania | 38.0% | Poland | 35.8% | Czech. R | 26.1% | Croatia | 0.1% | Serbia | 0.0% | 100.0% | 100.0% |
| 7308909900 | Other Structures and Parts of Structures, of Iron or Steel | 98,424,897.91 | Croatia | 37.4% | Germany | 14.4% | Serbia | 11.9% | Austria | 7.0% | Slovenia | 6.3% | 77.0% | 84.3% |
| 7213911000 | Bars and Rods Of circular cross section measuring less than 14 mm (0.55 inch) in diameter | 92,855,691.54 | Serbia | 59.4% | Croatia | 23.1% | Slovenia | 7.4% | Macedonia | 0.7% | Hungary | 0.2% | 90.8% | 95.8% |
| 4407109800 | Coniferous | 90,590,310.50 | Serbia | 54.5% | Croatia | 29.3% | Macedonia | 5.2% | Austria | 2.9% | Germany | 1.5% | 93.4% | 65.1% |
| 9401610000 | Seats, With Wooden Frames, Upholstered | 82,491,050.91 | Germany | 41.1% | Croatia | 22.4% | Serbia | 4.4% | USA | 3.7% | Austria | 3.6% | 75.2% | 87.0% |
| 6406101100 | Uppers and Parts Thereof, Other than Stiffeners | 77,817,324.06 | Italy | 32.2% | Germany | 31.0% | Slovenia | 18.0% | Austria | 14.4% | Croatia | 2.2% | 97.7% | 96.1% |
| 9403601000 | Other Wooden Furniture | 58,384,972.93 | Germany | 36.8% | Croatia | 17.5% | Serbia | 11.2% | France | 5.1% | Holand | 3.4% | 74.0% | 85.0% |

Source: Bosnia and Herzegovina Indirect Taxation Agency and author’s own calculation

Table A1.3: Structure of BH commodity import with main trading partners in 2006

| HS code Imports HS06 | Commodity | Total value of imports | Top five BH import countries 1 | | 2 | | 3 | | 4 | | 5 | | Coverage of five import countries 2006 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 271019 | Other oils | 896,137,203.39 | Croatia | 59.3% | Slovenia | 15.4% | Hungary | 7.3% | Austria | 6.4% | Serbia MN | 5.3% | 93.7% |
| 271011 | Petroleum Oils, Oils Obtained from Bituminous Minerals | 310,951,343.56 | Croatia | 65.0% | Slovenia | 14.5% | Hungary | 11.2% | Serbia MN | 4.6% | Austria | 3.3% | 98.6% |
| 840999 | Parts of Compression-ignition Internal Combustion Piston Engines | 203,338,340.88 | Germany | 97.5% | Serbia MN | 0.6% | Italy | 0.3% | Switzerland | 0.3% | Slovenia | 0.2% | 99.0% |
| 870332 | Other Vehicles, Spark-ignition Engine Of a cylinder capacity exceeding 1,500 cc but not exceeding 2,500 cc | 196,150,326.60 | Germany | 40.0% | Czech. R | 16.8% | Slovenia | 5.0% | Austria | 4.2% | Slovakia | 3.8% | 69.7% |
| 271121 | Natural Gas | 145,512,021.87 | Russia | 100.0% | n/a | n/a | | n/a | | n/a | | n/a | 100.0% |
| 300490 | Other Medicaments | 145,134,757.56 | Slovenia | 22.1% | Croatia | 17.6% | Serbia MN | 17.5% | Switzerland | 6.0% | Macedonia | 5.2% | 68.5% |
| 281820 | Other Aluminium Oxide | 130,459,666.04 | Switzerland | 99.6% | Germany | 0.4% | Slovenia | 0.0% | Italy | 0.0% | Holland | 0.0% | 100.0% |
| 270112 | Bituminous Coal | 123,612,472.27 | Czech R. | 42.3% | UK | 27.5% | USA | 26.0% | Russia | 1.5% | Croatia | 0.3% | 97.6% |
| 240220 | Cigarettes (Containing Tobacco) | 119,212,684.46 | Croatia | 66.7% | Switzerland | 12.8% | Germany | 7.2% | Austria | 5.7% | Macedonia | 3.0% | 95.3% |
| 220300 | Beer Made from Malt | 111,723,042.79 | Serbia MN | 50.2% | Croatia | 43.1% | Slovenia | 6.4% | Austria | 0.1% | Germany | 0.1% | 99.7% |
| 271600 | Electrical Energy | 107,658,661.90 | Switzerland | 50.6% | Slovakia | 26.9% | Czech. R | 19.8% | Serbia MN | 1.2% | Croatia | 1.1% | 99.7% |
| 870322 | Other Vehicles, Spark-ignition Engine Of a cylinder capacity exceeding 1,000 cc but not exceeding 1,500 cc | 100,002,206.77 | Czech R. | 43.8% | Germany | 15.7% | Croatia | 13.7% | Italy | 7.3% | Slovenia | 4.8% | 85.3% |
| 841490 | Parts of Air or Vacuum Pumps | 86,170,429.56 | Austria | 44.9% | Germany | 23.6% | France | 12.5% | Slovenia | 11.7% | Hungary | 3.1% | 95.8% |
| 100190 | Seed, White, Other | 77,980,437.48 | Hungary | 75.6% | Croatia | 16.5% | Serbia MN | 7.2% | Austria | 0.4% | USA | 0.2% | 99.9% |
| 210690 | Other Food Preparations | 75,862,455.80 | Slovenia | 27.7% | Croatia | 26.9% | Germany | 6.8% | Hungary | 5.3% | Italy | 5.2% | 72.0% |

Source: Bosnia and Herzegovina Indirect Taxation Agency and author’s own calculation

## Table A1.4: Structure of BH commodity import with main trading partners in 2007

| HS code Imports HS06 | Commodity | Total value of imports | Top five BH import countries: 1 | | 2 | | 3 | | 4 | | 5 | | Coverage of five import countries: 2007 | 2006 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 271019 | Other oils | 934,979,884.11 | Croatia | 51.2% | Slovenia | 16.8% | Austria | 9.4% | UK | 7.6% | Hungary | 7.2% | 92.3% | 93.7% |
| 271011 | Petroleum Oils, Oils Obtained from Bituminous Minerals | 319,490,851.12 | Germany | 67.5% | Slovenia | 12.1% | Austria | 8.8% | Hungary | 7.2% | UK | 3.7% | 99.2% | 98.6% |
| 870332 | Other Vehicles, Spark-ignition Engine Of a cylinder capacity exceeding 1,500 cc but not exceeding 2,500 cc | 266,905,455.26 | Germany | 40.4% | Czech. R | 13.8% | Italy | 9.5% | Austria | 5.0% | Slovenia | 3.3% | 72.0% | 69.7% |
| 271600 | Electrical Energy | 189,136,982.10 | Switzerland | 24.7% | Croatia | 22.1% | Czech. R | 21.4% | Serbia | 3.3% | Germany | 1.7% | 73.1% | 99.7% |
| 270112 | Bituminous Coal | 174,772,704.46 | UK | 46.8% | USA | 35.0% | Czech. R | 15.8% | Russia | 0.9% | Poland | 0.7% | 98.4% | 97.6% |
| 840999 | Parts of Compression-ignition Internal Combustion Piston Engines | 169,662,838.14 | Germany | 96.5% | Serbia | 0.8% | Italy | 0.5% | Switzerland | 0.4% | Croatia | 0.4% | 98.5% | 99.0% |
| 281820 | Other Aluminium Oxide | 140,015,558.08 | Switzerland | 99.6% | Germany | 0.3% | Serbia | 0.0% | France | 0.0% | Slovenia | 0.0% | 100.0% | 100.0% |
| 100190 | Seed, White, Other | 137,519,917.25 | Croatia | 57.0% | Hungary | 29.2% | Serbia | 11.4% | Austria | 1.9% | Switzerland | 0.1% | 99.5% | 99.9% |
| 300490 | Other Medicaments | 137,410,869.13 | Slovenia | 24.0% | Serbia | 21.2% | Croatia | 16.9% | Switzerland | 7.4% | Macedonia | 7.2% | 76.6% | 68.5% |
| 271121 | Natural Gas | 134,571,615.78 | Russia | 100.0% | Austria | 0.0% | | n/a | | n/a | | n/a | 100.0% | 100.0% |
| 720449 | Other Ferrous Waste and Scrap | 127,974,515.75 | Serbia | 27.6% | Croatia | 26.8% | Germany | 13.1% | Switzerland | 13.0% | Macedonia | 9.9% | 90.4% | 96.6% |
| 240220 | Cigarettes (Containing Tobacco) | 123,790,815.41 | Croatia | 68.6% | Austria | 9.0% | Switzerlan | 8.8% | Germany | 5.8% | Macedonia | 2.6% | 94.8% | 95.3% |
| 220300 | Beer Made from Malt | 122,795,308.17 | Serbia | 53.0% | Croatia | 40.4% | Slovenia | 4.8% | Holland | 0.1% | Turkey | 0.0% | 98.4% | 99.7% |
| 841490 | Parts of Air or Vacuum Pumps | 103,143,644.17 | Austria | 50.0% | Germany | 19.6% | Slovenia | 8.5% | Hungary | 5.7% | Italy | 3.6% | 87.4% | 95.8% |
| 210690 | Other Food Preparations | 94,761,791.67 | Slovenia | 28.1% | Croatia | 28.0% | Italy | 7.5% | Serbia | 6.3% | Germany | 6.2% | 76.1% | 72.0% |

Source: Bosnia and Herzegovina Indirect Taxation Agency and author’s own calculation

# APPENDIX 3.1: Methodology for the economic and financial risk assessment

## Methodology for the economic and financial risk assessment

The "International country risk guide methodology" (ICRGM) developed by the PRS Group Inc. is comprised of twenty two variables. Variables are divided into three subcategories. These are political, financial and economic subcategories. The first subcategory is composed of twelve variables and is very demanding on the data. Economic and financial subcategories are composed of five variables each. Their procedure is following. Variables in each subcategory are first calculated. Then all variable's values are converted to US dollars in order to work with a common currency. If a particular variable is calculated in some other currency than US dollars then that is indicated. Each variable has risk points assigned. Those points are defined by the PRS Group, Inc. Whether higher points of risk mean less or more risk is not explained, however their reported test statistics on composite risk-rating suggests that a higher number indicates overall lower risk. In the following subsections we will explain how each variable is calculated. We will introduce the economic subcomponent risk variables first and then the financial ones. The composite risk rating calculation is presented last.

## Economic components of risk

This methodology measures potential risks of undertaking international business and investments in 140 countries. This part relates to economic components of the risk. The PRS Group Inc. identifies five economic components of risk. Those are: *GDP per head, real GDP growth change, annual inflation rate, budget balance as a percentage of GDP and current account balance as a percentage of GDP*. Next we explain each briefly.

*GDP per head*

The GDP per head for a given year is expressed as a percentage of the average of the total GDP of all Western Balkan countries. The risk points are then assigned according to the following scale of ICRGM:

Table A3.1: GDP per head: points assigned

| GDP per head % of average | Points assigned |
|---|---|
| 250.0 plus | 5.0 |
| 200.0 to 249.9 | 4.5 |
| 150.0 to 199.9 | 4.0 |
| 100.0 to 149.9 | 3.5 |
| 75.0 to 99.9 | 3.0 |
| 50.0 to 74.9 | 2.5 |
| 40.0 to 49.9 | 2.0 |
| 30.0 to 39.9 | 1.5 |
| 20.0 to 29.9 | 1.0 |
| 10.0 to 19.9 | 0.5 |
| Up to 9.9 | 0.0 |

Source: The PRS Group, Inc.

*Real GDP growth change*

Real GDP growth change is calculated based on the annual change in the real GDP of a given country. The risk points are then assigned according to the following scale of ICRGM:

Table A3.2: Real GDP growth change: points assigned

| Real GDP growth change | Points assigned |
|---|---|
| 6.0 plus | 10.0 |
| 5.0 to 5.9 | 9.5 |
| 4.0 to 4.9 | 9.0 |
| 3.0 to 3.9 | 8.5 |
| 2.5 to 2.9 | 8.0 |
| 2.0 to 2.4 | 7.5 |
| 1.5 to1.9 | 7.0 |
| 1.0 to 1.4 | 6.5 |
| 0.5 to 0.9 | 6.0 |
| 0.0 to 0.4 | 5.5 |
| -0.1 to-0.4 | 5.0 |
| -0.5 to -0.9 | 4.5 |
| -1.0 to -1.4 | 4.0 |
| -1.5 to -1.9 | 3.5 |
| -2.0 to -2.4 | 3.0 |
| -2.5 to -2.9 | 2.5 |
| -3.0 to -3.4 | 2.0 |
| -4.0 to -4.9 | 1.0 |

| | |
|---|---|
| -5.0 to -5.9 | 0.5 |
| -6.0 plus | 0.0 |

Source: The PRS Group, Inc.

*Annual inflation rate*

The annual inflation rate is calculated as a percentage change. The risk points are then assigned according to the following scale of ICRGM:

Table A3.3: Annual inflation rate: points assigned

| Annual inflation rate change | Points assigned |
|---|---|
| 0.0 to 1.9 | 10.0 |
| 2.0 to 2.9 | 9.5 |
| 3.0 to 3.9 | 9.0 |
| 4.0 to 5.9 | 8.5 |
| 6.0 to 7.9 | 8.0 |
| 8.0 to 9.9 | 7.5 |
| 10.0 to 11.9 | 7.0 |
| 12.0 to 13.9 | 6.5 |
| 14.0 to 15.9 | 6.0 |
| 16.0 to 18.9 | 5.5 |
| 19.0 to 21.9 | 5.0 |
| 22.0 to24.9 | 4.5 |
| 25.0 to 30.9 | 4.0 |
| 31.0 to 40.9 | 3.5 |
| 41.0 to 50.9 | 3.0 |
| 51.0 to 65.9 | 2.5 |
| 66.0 to 80.9 | 2.0 |
| 81.0 to 95.9 | 1.5 |
| 96.0 to 110.9 | 1.0 |
| 111.0 to 129.9 | 0.5 |
| 130.0 plus | 0.0 |

Source: The PRS Group, Inc.

*Budget balance as a percentage of GDP*

The general government budget balance for a given year in the national currency is expressed as a percentage of nominal GDP for that year in national currency. The risk points are then assigned according to the following scale of ICRGM:

Table A3.4: Budget balance: points assigned

| Budget balance as GDP% | Points assigned |
|---|---|
| 4.0 plus | 10.0 |

| | |
|---|---|
| 3.0 to 3.9 | 9.5 |
| 2.0 to 2.9 | 9.0 |
| 1.0 to 1.9 | 8.5 |
| 0.0 to 0.9 | 8.0 |
| -0.1 to-0.9 | 7.5 |
| -1.0 to -1.9 | 7.0 |
| -2.0 to -2.9 | 6.5 |
| -3.0 to -3.9 | 6.0 |
| -4.0 to -4.9 | 5.5 |
| -5.0 to -5.9 | 5.0 |
| -6.0 to -6.9 | 4.5 |
| -7.0 to -7.9 | 4.0 |
| -8.0 to -8.9 | 3.5 |
| -9.0 to -9.9 | 3.0 |
| -10.0 to -11.9 | 2.5 |
| -12.0 to -14.9 | 2.0 |
| -15.0 to -19.9 | 1.5 |
| -20.0 to -24.9 | 1.0 |
| -25.0 to -29.9 | 0.5 |
| -30.0 plus | 0.0 |

Source: The PRS Group, Inc.

*Current account as a percentage of GDP*

The current account balance is taken from the balance of payments of the particular country for a given year. Central bank's data were used. Then current account is expressed as percentage of GDP for that particular year. The risk points are then assigned according to the following scale of ICRGM:

Table A3.5: Current account balance: points assigned

| Current account balance as GDP% | Points assigned |
|---|---|
| 10.0 plus | 15.0 |
| 8.0 to 9.9 | 14.5 |
| 6.0 to 7.9 | 14.0 |
| 4.0 to 5.9 | 13.5 |
| 2.0 to 3.9 | 13.0 |
| 1.0 to 1.9 | 12.5 |
| 0.0 to 0.9 | 12.0 |
| -0.1 to -0.9 | 11.5 |
| -1.0 to -1.9 | 11.0 |
| -2.0 to -3.9 | 10.5 |
| -4.0 to -5.9 | 10.0 |
| -6.0 to -7.9 | 9.5 |

| | |
|---|---|
| -8.0 to -9.9 | 9.0 |
| -10.0 to -11.9 | 8.5 |
| -12.0 to -13.9 | 8.0 |
| -14.0 to -15.9 | 7.5 |
| -16.0 to -16.9 | 7.0 |
| -17.0 to -17.9 | 6.5 |
| -18.0 to -18.9 | 6.0 |
| -19.0 to -19.9 | 5.5 |
| -20.0 to -20.9 | 5.0 |
| -21.0 to -21.9 | 4.5 |
| -22.0 to -22.9 | 4.0 |
| -23.0 to -23.9 | 3.5 |
| -24.0 to -24.9 | 3.0 |
| -25.0 to -26.9 | 2.5 |
| -27.0 to -29.9 | 2.0 |
| -30.0 to -32.5 | 1.5 |
| -32.5 to -34.9 | 1.0 |
| -35.0 to -39.0 | 0.5 |
| -40.0 plus | 0.0 |

Source: The PRS Group, Inc.

**Financial components of risk**

The PRS Group, Inc. also identifies five financial components of risks. Those are: *foreign debt as percentage of GDP, foreign debt service as a percentage of exports of goods and services, current account as a percentage of export of goods and services, international reserves in the months of import coverage and exchange rate stability.* Next we explain each briefly.

*Foreign debt as percentage of GDP*

Total foreign debt in a given year is expressed as a percentage of the GDP rate for that year. The risk points are then assessed according to the following scale of ICRGM:

Table A3.6: Foreign debt: points assigned

| Foreign debt as GDP % | Points assigned |
|---|---|
| 0.0 to 4.9 | 10.0 |
| 5.0 to 9.9 | 9.5 |
| 10.0 to 14.9 | 9.0 |
| 15.0 to 19.9 | 8.5 |
| 20.0 to 24.9 | 8.0 |

| | |
|---|---|
| 25.0 to 29.9 | 7.5 |
| 30.0 to 34.9 | 7.0 |
| 35.0 to 39.9 | 6.5 |
| 40.0 to 44.9 | 6.0 |
| 45.0 to 49.9 | 5.5 |
| 50.0 to 59.9 | 5.0 |
| 60.0 to 69.0 | 4.5 |
| 70.0 to 79.9 | 4.0 |
| 80.0 to 89.9 | 3.5 |
| 90.0 to 99.9 | 3.0 |
| 100.0 to 109.9 | 2.5 |
| 110.0 to 119.9 | 2.0 |
| 120.0 to 129.9 | 1.5 |
| 130.0 to 149.9 | 1.0 |
| 150.0 to199.9 | 0.5 |
| 200.0 plus | 0.0 |

Source: The PRS Group, Inc.

*Foreign debt service as a percentage of exports of goods and services*

Then foreign debt service is expressed as a percentage of the sum of total exports of goods and services. The risk points are then assessed according to the following scale of ICRGM:

Table A3.7: Foreign debt service: points assigned

| Foreign debt service in percentage of the sum of exports and imports | Points assigned |
|---|---|
| 0.0 to 4.9 | 10.0 |
| 5.0 to 8.9 | 9.5 |
| 9.0 to 12.9 | 9.0 |
| 13.0 to 16.9 | 8.5 |
| 17.0 to 20.9 | 8.0 |
| 21.0 to 24.9 | 7.5 |
| 25.0 to28.9 | 7.0 |
| 29.0 to 32.9 | 6.5 |
| 33.0 to 36.9 | 6.0 |
| 37.0 to 40.9 | 5.5 |
| 41.0 to 44.9 | 5.0 |
| 45.0 to 48.9 | 4.5 |
| 49.0 to 52.9 | 4.0 |
| 53.0 to 56.9 | 3.5 |
| 57.0 to 60.9 | 3.0 |
| 61.0 to 65.9 | 2.5 |
| 66.0 to 70.9 | 2.0 |

| | |
|---|---|
| 71.0 to 75.9 | 1.5 |
| 76.0 to 79.9 | 1.0 |
| 80.0 to 84.9 | 0.5 |
| 85.0 plus | 0.0 |

Source: The PRS Group, Inc.

*Current account as a percentage of export of goods and services*

Current account is expressed as a percentage of the sum of the total export of goods and services for that year. The risk points are then assigned according to the following scale of ICRGM:

Table A3.8: Current account in % of exports of goods and service: points assigned

| Current account as a percentage of exports of goods and services | Points assigned |
|---|---|
| 25.0 plus | 15.0 |
| 20.0 to 24.9 | 14.5 |
| 15.0 to 19.9 | 14.0 |
| 10.0 to 14.9 | 13.5 |
| 5.0 to 9.9 | 13.0 |
| 0.0 to 4.9 | 12.5 |
| -0.1 to -4.9 | 12.0 |
| -5.0 to -9.9 | 11.5 |
| -10.0 to -14.9 | 11.0 |
| -15.0 to -19.9 | 10.5 |
| -20.0 to -24.9 | 10.0 |
| -25.0 to -29.9 | 9.5 |
| -30.0 to -34.9 | 9.0 |
| -35.0 to -39.9 | 8.5 |
| -40.0 to -44.9 | 8.0 |
| -45.0 to -49.9 | 7.5 |
| -50.0 to -54.9 | 7.0 |
| -55.0 to 59.9 | 6.5 |
| -60.0 to 64.9 | 6.0 |
| -65.0 to 69.9 | 5.5 |
| -70.0 to -74.9 | 5.0 |
| -75.0 to -79.9 | 4.5 |
| -80.0 to 84.9 | 4.0 |
| -85.0 to 89.9 | 3.5 |
| -90.0 to -94.9 | 3.0 |
| -95.0 to -99.9 | 2.5 |
| -100.0 to -104.9 | 2.0 |
| -105.0 to -109.9 | 1.5 |
| -110.0 to 114.9 | 1.0 |

| | |
|---|---|
| -115.0 to -119.9 | 0.5 |
| Below -120.0 | 0.0 |

Source: The PRS Group, Inc.

*International reserves in the months of import coverage*

The official reserves for a given year are divided by the average monthly merchandise imports. The risk points are then assigned according to the following scale of ICRGM:

Table A3.9: International reserves: points assigned

| International reserves in the months of import coverage | Points assigned |
|---|---|
| 15.0 plus | 5.0 |
| 12.0 to 14.9 | 4.5 |
| 9.0 to 11.9 | 4.0 |
| 6.0 to 8.9 | 3.5 |
| 5.0 to 5.9 | 3.0 |
| 4.0 to 4.9 | 2.5 |
| 3.0 to 3.9 | 2.0 |
| 2.0 to 2.9 | 1.5 |
| 1.0 to 1.9 | 1.0 |
| 0.6 to 0.9 | 0.5 |
| 0.0 to 0.5 | 0.0 |

Source: The PRS Group, Inc.

*Exchange rate stability*

Is calculated as a percentage of appreciation or depreciation of a countries currency with regards to US dollar over the calendar year, hence direct approach is applied. The risk points are then assigned according to the following scale of ICRGM:

Table A3.10: Appreciation and depreciation: points assigned

| Appreciation change | Depreciation change | Points |
|---|---|---|
| 0.0 to 9.9 | -0.1 to -4.9 | 10.0 |
| 10.0 to 14.9 | -5.0 to -7.4 | 9.5 |
| 14.5 to 19.9 | -7.5 to -9.9 | 9.0 |
| 20.0 to 22.4 | -10.0 to -12.4 | 8.5 |
| 22.5 to 24.9 | -12.5 to -14.9 | 8.0 |
| 24.9 to 27.4 | -15.0 to -17.4 | 7.5 |
| 27.5 to 29.9 | -17.5 to -19.9 | 7.0 |
| 30.0 to 34.9 | -20.0 to -22.4 | 6.5 |
| 35.0 to 39.9 | -22.5 to -24.9 | 6.0 |
| 40.0 to 49.9 | -25.0 to -29.9 | 5.5 |
| 50 plus | -30.0 to -34.9 | 5.0 |

| | | |
|---|---|---|
| | -35.0 to -39.9 | 4.5 |
| | -40.0 to -44.9 | 4.0 |
| | -45.0 to -49.9 | 3.5 |
| | -50.0 to -54.9 | 3.0 |
| | -55.0 to -59.9 | 2.5 |
| | -60.0 to -69.9 | 2.0 |
| | -70.0 to -79.9 | 1.5 |
| | -80.0 to -89.9 | 1.0 |
| | -90.0 to -99.9 | 0.5 |
| | -100 plus | 0.0 |

Source: The PRS Group, Inc.

**Calculation of composite risk rating**

The tables presented in economic and financial components indicate that each variable has a zero and maximum point assigned Then those points are associated to each variable in respect to its subcategory. After a total number of points per subcategory is summarised risk rate is assigned The PRS Group assigns 50% to political risk, 25% to economic and 25% to the financial risk[57].

The economic and financial risks is then calculated based on the following categorisation

Table A3.11: Economic and financial risk categorisation

| **Ref:** | **Indicates** | **Minimum points** | **Maximum points** |
|---|---|---|---|
| VHR | Very high risk | 0.04% | 24.5% |
| MR | Moderate risk | 25.0% | 29.9% |
| LR | Low risk | 30.0% | 39.9% |
| VLR | Very low risk | 40.0% | and more |

Source: The PRS Group, Inc.

Then the risk evaluation is based on the following criteria:

Table A3.12: Overall risk categorisation

| **Ref:** | **Indicates** | **Minimum points** | **Maximum points** |
|---|---|---|---|
| VHR | Very high risk | 50.0 | 49.5 |

[57] We undertake this exercise and calculate the risk rate. Since political risk rate is very demanding on the data we have calculated only financial and economic risk by assigned to each subcategory equal weights.

| | | | |
|---|---|---|---|
| MR | Moderate risk | 60.0 | 69.5 |
| LR | Low risk | 70.0 | 79.5 |
| VLR | Very low risk | 80.0 | 100 |

Source: The PRS Group, Inc.

**Western Balkans: economic and financial risks**

Next we report our findings base on the above methodology. In Table 3.15 we report economic risks and in Table 3.16 financial risk. In Table 3.17 we report overall risk rating for the period 2003 to 2007 for Western Balkan economies.

Table A3.13: Economic risk rating in period 2003 to 2007

| Economic | 2003 | 2004 | 2005 | 2006 | 2007 | Average | Rating |
|---|---|---|---|---|---|---|---|
| *GDP per head* | | | | | | | |
| Bosnia and Herzegovina | 60% | 60% | 60% | 60% | 70% | 62% | MR |
| Croatia | 80% | 80% | 80% | 80% | 90% | 82% | VLR |
| Macedonia | 50% | 50% | 50% | 50% | 60% | 52% | HR |
| Serbia | 60% | 60% | 60% | 60% | 70% | 62% | MR |
| Albania | 60% | 50% | 50% | 50% | 60% | 54% | HR |
| *Real GDP growth* | | | | | | | |
| Bosnia and Herzegovina | 70% | 65% | 65% | 65% | 65% | 66% | MR |
| Croatia | 95% | 90% | 90% | 90% | 95% | 92% | VLR |
| Macedonia | 80% | 80% | 85% | 90% | 90% | 85% | VLR |
| Serbia | 80% | 100% | 100% | 95% | 100% | 95% | VLR |
| Albania | 95% | 95% | 95% | 95% | 100% | 96% | VLR |
| *Annual inflation* | | | | | | | |
| Bosnia and Herzegovina | 100% | 100% | 90% | 80% | 100% | 94% | VLR |
| Croatia | 100% | 95% | 90% | 90% | 95% | 94% | VLR |
| Macedonia | 100% | 100% | 100% | 100% | 95% | 99% | VLR |
| Serbia | 70% | 70% | 60% | 85% | 85% | 74% | LR |
| Albania | 90% | 95% | 90% | 90% | 90% | 91% | VLR |
| *Balance/GDP* | | | | | | | |
| Bosnia and Herzegovina | 80% | 85% | 90% | 90% | 85% | 86% | VLR |
| Croatia | 40% | 55% | 55% | 60% | 60% | 54% | HR |
| Macedonia | 75% | 80% | 75% | 75% | 75% | 76% | LR |
| Serbia | 95% | 65% | 80% | 70% | 70% | 76% | LR |
| Albania | 55% | 50% | 60% | 55% | 60% | 56% | HR |
| *CA % GDP* | | | | | | | |
| Bosnia and Herzegovina | 37% | 47% | 40% | 60% | 53% | 47% | VHR |
| Croatia | 63% | 67% | 63% | 63% | 60% | 63% | MR |
| Macedonia | 70% | 60% | 63% | 67% | 67% | 65% | MR |
| Serbia | 60% | 53% | 57% | 47% | 77% | 59% | HR |
| Albania | 67% | 70% | 67% | 63% | 67% | 67% | MR |

Source: The PRS Group, Inc.; IMF's PINs: 05/196; 06/17; 08/11; 08/53; 08/122; Countries statistical agencies and Central banks; author's calculations

Table A3.14: Financial risk rating in period 2003 to 2007

| Financial | 2003 | 2004 | 2005 | 2006 | 2007 | Average | Rating |
|---|---|---|---|---|---|---|---|
| *Foreign debt GDP%* | | | | | | | |
| Bosnia and Herzegovina | 75% | 75% | 75% | 80% | 85% | 78% | LR |
| Croatia | 40% | 35% | 35% | 35% | 35% | 36% | VHR |
| Macedonia | 65% | 65% | 60% | 65% | 65% | 64% | MR |
| Serbia | 40% | 35% | 30% | 30% | 35% | 34% | VHR |
| Albania | 80% | 85% | 85% | 85% | 85% | 84% | VLR |
| *Servicing % of export* | | | | | | | |
| Bosnia and Herzegovina | 95% | 100% | 100% | 100% | 100% | 99% | VLR |
| Croatia | 75% | 75% | 70% | 55% | 55% | 66% | MR |
| Macedonia | 80% | 85% | 90% | 80% | 80% | 83% | VLR |
| Serbia | 0% | 0% | 0% | 0% | 0% | 0% | n/a |
| Albania | 95% | 100% | 100% | 100% | 100% | 99% | VLR |
| *CA as % goods and serv.* | | | | | | | |
| Bosnia and Herzegovina | 57% | 57% | 57% | 67% | 60% | 59% | HR |
| Croatia | 20% | 33% | 20% | 13% | 13% | 20% | VHR |
| Macedonia | 70% | 57% | 60% | 63% | 63% | 63% | LR |
| Serbia | 60% | 40% | 47% | 33% | 80% | 52% | HR |
| Albania | 60% | 63% | 60% | 60% | 60% | 61% | MR |
| *Int. reserves in monts of imp.* | | | | | | | |
| Bosnia and Herzegovina | 40% | 50% | 50% | 60% | 60% | 52% | HR |
| Croatia | 60% | 50% | 50% | 50% | 50% | 52% | HR |
| Macedonia | 40% | 30% | 40% | 50% | 50% | 42% | VHR |
| Serbia | 50% | 50% | 70% | 70% | 70% | 62% | MR |
| Albania | 40% | 50% | 50% | 50% | 50% | 48% | VHR |
| *Currency app./depp to USD* | | | | | | | |
| Bosnia and Herzegovina | 90% | 100% | 100% | 100% | 100% | 98% | VLR |
| Croatia | 95% | 100% | 100% | 95% | 95% | 97% | VLR |
| Macedonia | 90% | 100% | 100% | 95% | 95% | 96% | VLR |
| Serbia | 100% | 95% | 90% | 80% | 95% | 92% | VLR |
| Albania | 80% | 90% | 100% | 100% | 90% | 92% | VLR |

Source: The PRS Group, Inc.; IMF's PINs: 05/196; 06/17; 08/11; 08/53; 08/122; Countries statistical agencies and Central banks; author's calculations

Table A3.15: Overall risk rating in period 2003 to 2007

| Overall risk rating | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|
| Bosnia and Herzegovina | LR | LR | LR | LR | LR |
| Croatia | MR | MR | MR | MR | MR |
| Macedonia | LR | LR | LR | LR | LR |
| Serbia | MR | HR | HR | HR | MR |
| Albania | LR | LR | LR | LR | LR |

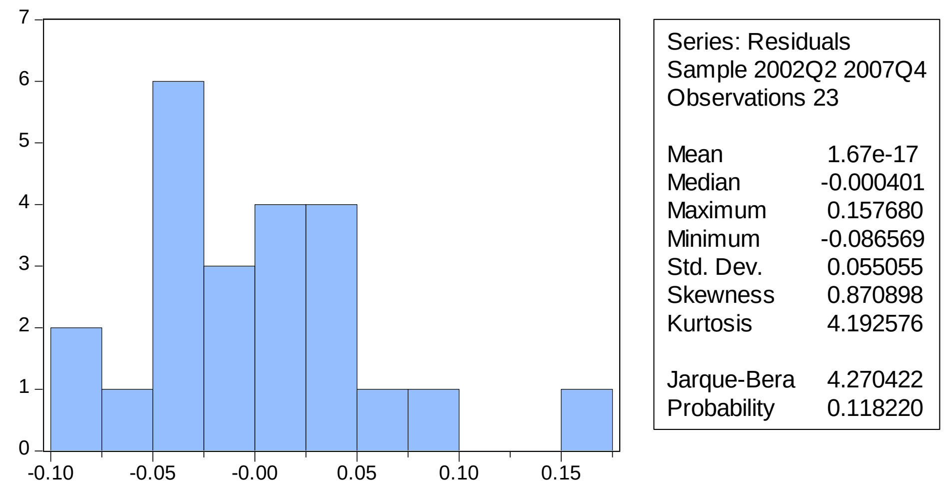
Source: The PRS Group, Inc.; IMF's PINs: 05/196; 06/17; 08/11; 08/53; 08/122; Countries statistical agencies and Central banks; author's calculations

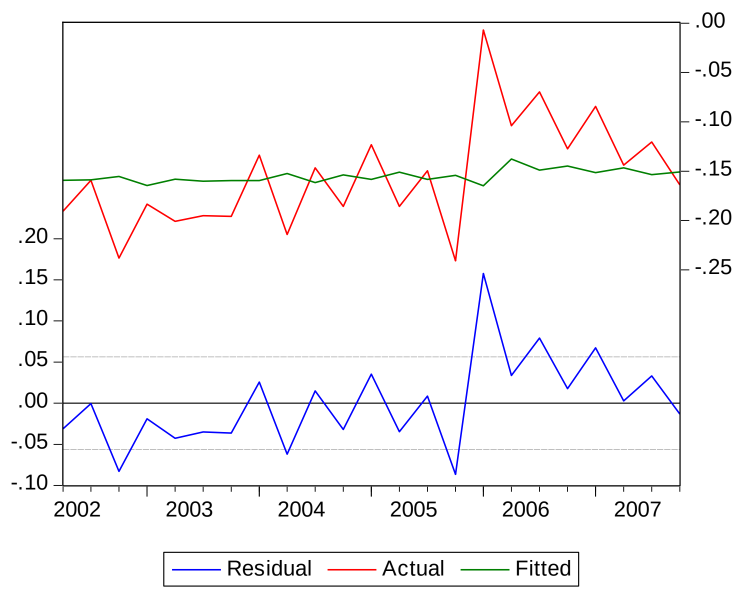
APPENDIX 3.2: Model 1 Individual Countries and Model 2 Western Balkans

## Model 1: Individual Countries

Bosnia and Herzegovina

Bosnia and Herzegovina's residuals



Dependent Variable: D(BOSNCAGDP)
Method: Least Squares
Date: 12/02/08 Time: 02:00
Sample (adjusted): 2002Q2 2007Q4
Included observations: 23 after adjustments

| | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | -0.210266 | 0.038346 | -5.483425 | 0.0000 |
| BOSNCAGDP(-1) | -1.173303 | 0.205245 | -5.716601 | 0.0000 |
| DUMSHIFT2006 | 0.077795 | 0.023575 | 3.299894 | 0.0040 |
| DUMQ42005 | -0.056415 | 0.034456 | -1.637290 | 0.1189 |
| DUMQ12006 | 0.083656 | 0.046143 | 1.812960 | 0.0865 |

| | | | |
|---|---|---|---|
| R-squared | 0.840708 | Mean dependent var | 0.001316 |
| Adjusted R-squared | 0.805310 | S.D. dependent var | 0.074036 |
| S.E. of regression | 0.032668 | Akaike info criterion | -3.815208 |
| Sum squared resid | 0.019209 | Schwarz criterion | -3.568361 |
| Log likelihood | 48.87489 | Hannan-Quinn criter. | -3.753127 |
| F-statistic | 23.75005 | Durbin-Watson stat | 1.923353 |
| Prob(F-statistic) | 0.000001 | | |

Dependent Variable: D(BOSNCAGDP)
Method: Least Squares
Date: 12/02/08 Time: 02:03
Sample (adjusted): 2002Q2 2007Q4
Included observations: 23 after adjustments

| | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | -0.263565 | 0.031178 | -8.453455 | 0.0000 |
| BOSNCAGDP(-1) | -1.448863 | 0.165873 | -8.734771 | 0.0000 |
| DUMSHIFT2006 | 0.110641 | 0.019081 | 5.798519 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.793756 | Mean dependent var | 0.001316 |
| Adjusted R-squared | 0.773132 | S.D. dependent var | 0.074036 |
| S.E. of regression | 0.035264 | Akaike info criterion | -3.730799 |
| Sum squared resid | 0.024871 | Schwarz criterion | -3.582691 |
| Log likelihood | 45.90419 | Hannan-Quinn criter. | -3.693550 |
| F-statistic | 38.48630 | Durbin-Watson stat | 1.364659 |
| Prob(F-statistic) | 0.000000 | | |

Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 1.078927 | Prob. F(4,16) | 0.3996 |

| | | | |
|---|---|---|---|
| Obs*R-squared | 4.885937 | Prob. Chi-Square(4) | 0.2992 |

Ramsey RESET Test:

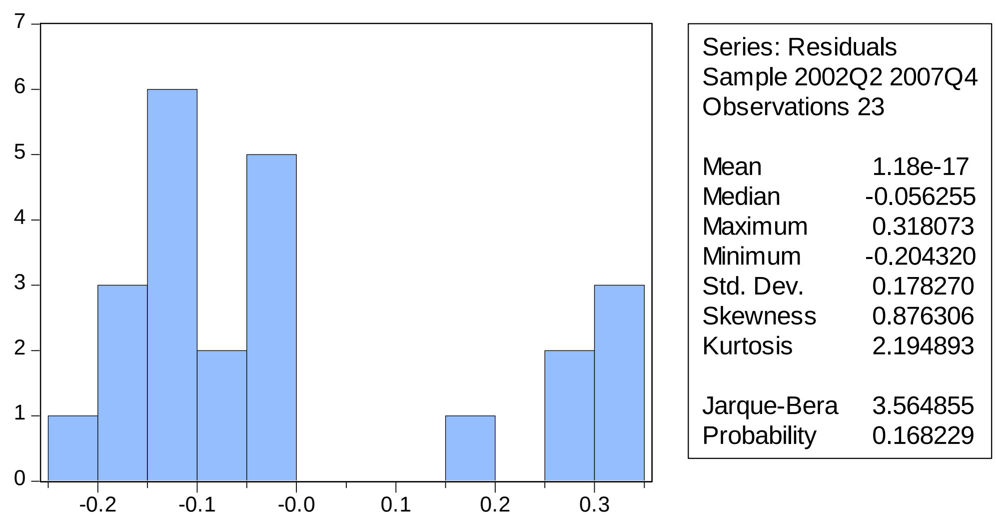
| | | | |
|---|---|---|---|
| F-statistic | 2.953100 | Prob. F(1,19) | 0.1020 |
| Log likelihood ratio | 3.322795 | Prob. Chi-Square(1) | 0.0683 |

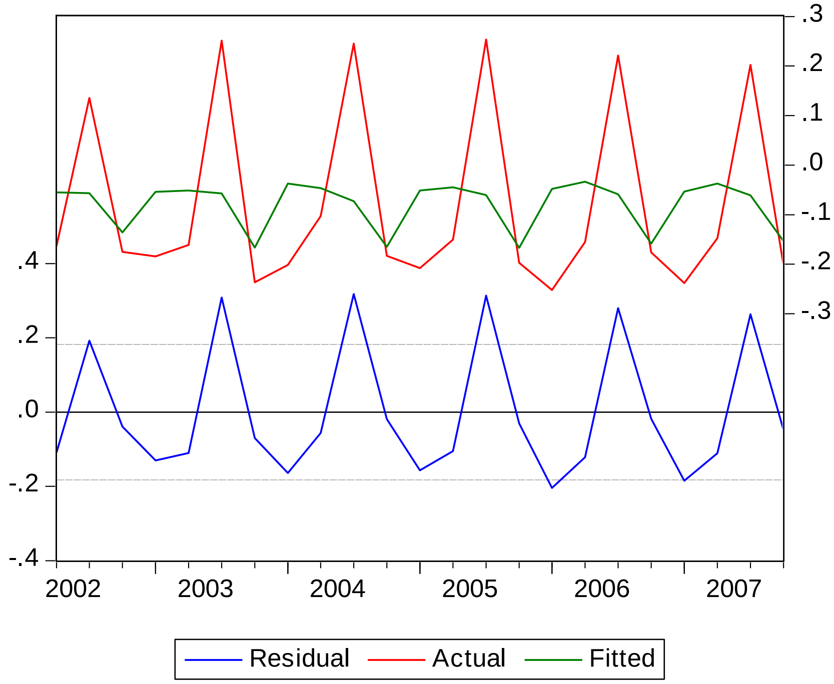
Heteroskedasticity Test: Breusch-Pagan-Godfrey

| | | | |
|---|---|---|---|
| F-statistic | 0.480018 | Prob. F(2,20) | 0.6257 |
| Obs*R-squared | 1.053473 | Prob. Chi-Square(2) | 0.5905 |
| Scaled explained SS | 0.379984 | Prob. Chi-Square(2) | 0.8270 |

## Croatia

Croatia's residuals






Dependent Variable: D(CROCAGDP_SA)
Method: Least Squares
Date: 11/20/08 Time: 01:42
Sample (adjusted): 2002Q2 2007Q4
Included observations: 23 after adjustments

| | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | -0.086365 | 0.013509 | -6.393134 | 0.0000 |
| CROCAGDP_SA(-1) | -1.062797 | 0.153907 | -6.905456 | 0.0000 |
| DUMCROQ32002 | -0.096382 | 0.021952 | -4.390641 | 0.0003 |

| | | | |
|---|---|---|---|
| R-squared | 0.760812 | Mean dependent var | -0.002380 |
| Adjusted R-squared | 0.736894 | S.D. dependent var | 0.041783 |
| S.E. of regression | 0.021432 | Akaike info criterion | -4.726753 |
| Sum squared resid | 0.009187 | Schwarz criterion | -4.578645 |
| Log likelihood | 57.35766 | Hannan-Quinn criter. | -4.689504 |
| F-statistic | 31.80817 | Durbin-Watson stat | 1.669156 |
| Prob(F-statistic) | 0.000001 | | |

Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 0.182507 | Prob. F(4,16) | 0.9441 |
| Obs*R-squared | 1.003622 | Prob. Chi-Square(4) | 0.9092 |

Ramsey RESET Test:

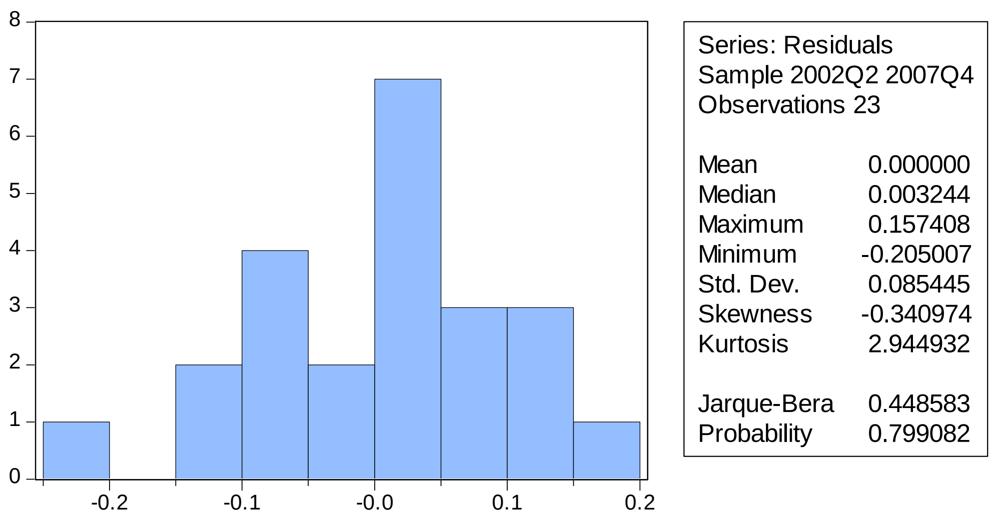
| | | | |
|---|---|---|---|
| F-statistic | 0.689258 | Prob. F(1,19) | 0.4167 |
| Log likelihood ratio | 0.819588 | Prob. Chi-Square(1) | 0.3653 |

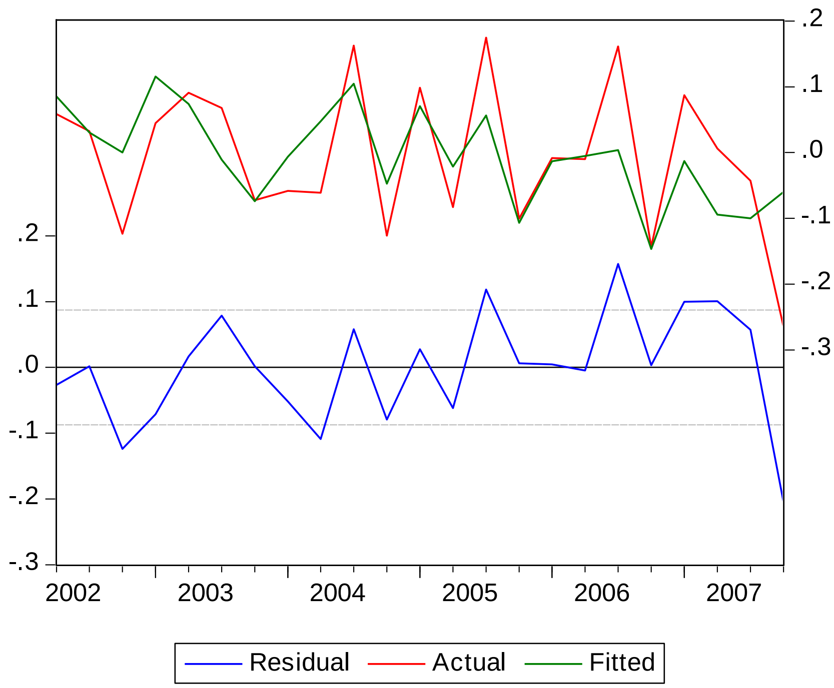
Heteroskedasticity Test: Breusch-Pagan-Godfrey

| | | | |
|---|---|---|---|
| F-statistic | 0.434641 | Prob. F(2,20) | 0.6535 |
| Obs*R-squared | 0.958034 | Prob. Chi-Square(2) | 0.6194 |
| Scaled explained SS | 0.800126 | Prob. Chi-Square(2) | 0.6703 |

## Macedonia

Macedonia's residuals






Dependent Variable: D(MACECAGDP)
Method: Least Squares
Date: 11/20/08 Time: 01:44
Sample (adjusted): 2002Q2 2007Q4
Included observations: 23 after adjustments

| | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| MACECAGDP(-1) | -0.831115 | 0.214846 | -3.868421 | 0.0010 |
| C | -0.037556 | 0.019883 | -1.888842 | 0.0735 |
| DUMQ42007 | -0.220612 | 0.078796 | -2.799799 | 0.0111 |

| | | | |
|---|---|---|---|
| R-squared | 0.576598 | Mean dependent var | -0.004758 |
| Adjusted R-squared | 0.534257 | S.D. dependent var | 0.111301 |
| S.E. of regression | 0.075958 | Akaike info criterion | -2.196168 |
| Sum squared resid | 0.115392 | Schwarz criterion | -2.048060 |
| Log likelihood | 28.25593 | Hannan-Quinn criter. | -2.158919 |
| F-statistic | 13.61819 | Durbin-Watson stat | 2.122596 |
| Prob(F-statistic) | 0.000185 | | |

Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 1.261402 | Prob. F(4,16) | 0.3256 |
| Obs*R-squared | 5.514167 | Prob. Chi-Square(4) | 0.2385 |

Ramsey RESET Test:

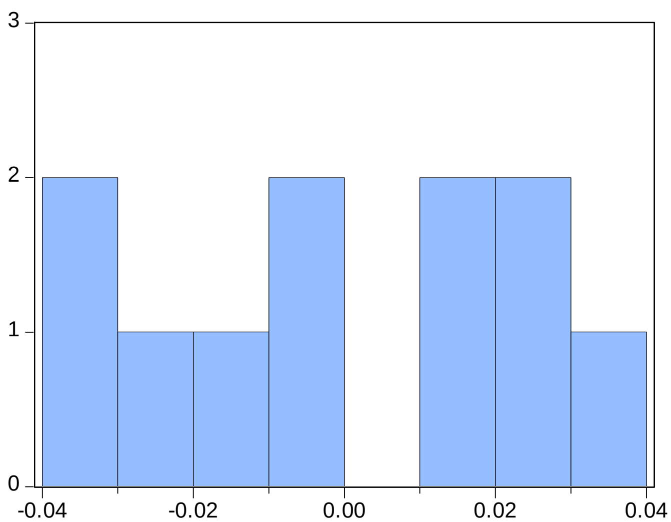
| | | | |
|---|---|---|---|
| F-statistic | 0.000589 | Prob. F(1,19) | 0.9809 |
| Log likelihood ratio | 0.000713 | Prob. Chi-Square(1) | 0.9787 |

Heteroskedasticity Test: Breusch-Pagan-Godfrey

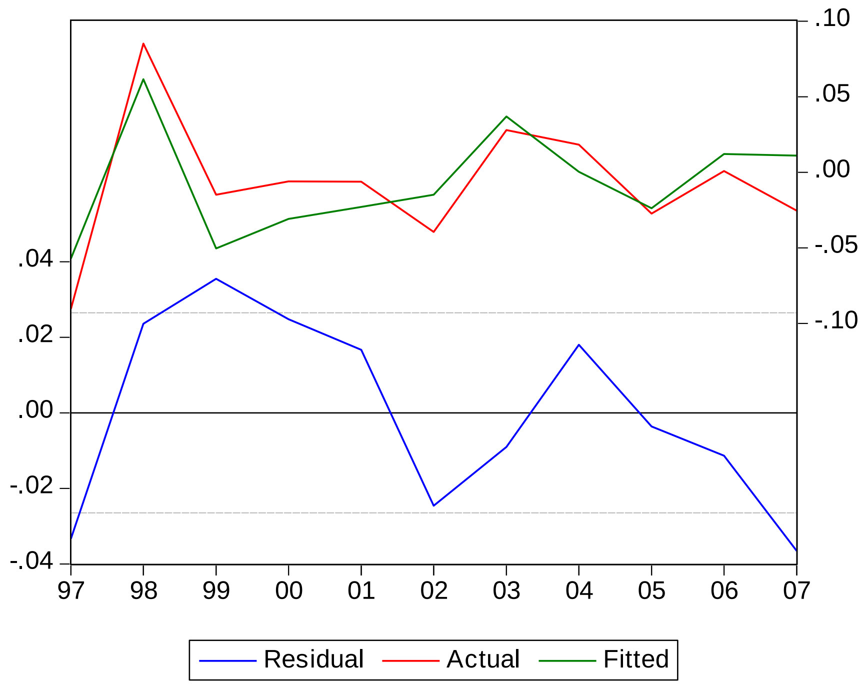
| | | | |
|---|---|---|---|
| F-statistic | 0.482360 | Prob. F(2,20) | 0.6243 |
| Obs*R-squared | 1.058375 | Prob. Chi-Square(2) | 0.5891 |
| Scaled explained SS | 0.586659 | Prob. Chi-Square(2) | 0.7458 |

## Albania

Albania's residuals




| | |
|---|---|
| Series: Residuals | |
| Sample 1997 2007 | |
| Observations 11 | |
| Mean | 3.15e-18 |
| Median | -0.003601 |
| Maximum | 0.035449 |
| Minimum | -0.036581 |
| Std. Dev. | 0.025112 |
| Skewness | -0.130273 |
| Kurtosis | 1.620470 |
| Jarque-Bera | 0.903370 |
| Probability | 0.636555 |




Dependent Variable: D(ALBCAGDP)
Method: Least Squares
Date: 11/20/08 Time: 01:46
Sample (adjusted): 1997 2007
Included observations: 11 after adjustments

| | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | -0.081745 | 0.019136 | -4.271858 | 0.0021 |
| ALBCAGDP(-1) | -1.313528 | 0.305770 | -4.295801 | 0.0020 |

| | | | |
|---|---|---|---|
| R-squared | 0.672178 | Mean dependent var | -0.007033 |
| Adjusted R-squared | 0.635753 | S.D. dependent var | 0.043859 |
| S.E. of regression | 0.026470 | Akaike info criterion | -4.262609 |
| Sum squared resid | 0.006306 | Schwarz criterion | -4.190264 |
| Log likelihood | 25.44435 | Hannan-Quinn criter. | -4.308212 |
| F-statistic | 18.45390 | Durbin-Watson stat | 1.173300 |
| Prob(F-statistic) | 0.002003 | | |

Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 1.073794 | Prob. F(4,5) | 0.4574 |
| Obs*R-squared | 5.082951 | Prob. Chi-Square(4) | 0.2789 |

Ramsey RESET Test:

| | | | |
|---|---|---|---|
| F-statistic | 0.434803 | Prob. F(1,8) | 0.5282 |
| Log likelihood ratio | 0.582173 | Prob. Chi-Square(1) | 0.4455 |

Heteroskedasticity Test: Breusch-Pagan-Godfrey

| | | | |
|---|---|---|---|
| F-statistic | 1.414518 | Prob. F(1,9) | 0.2647 |
| Obs*R-squared | 1.494039 | Prob. Chi-Square(1) | 0.2216 |
| Scaled explained SS | 0.310279 | Prob. Chi-Square(1) | 0.5775 |

## Model 2: Western Balkans

Hausman test

The Hausman test is based on the difference between the fixed and the random effects estimators. Applied researchers have interpreted a rejection as justifying adoption of the fixed effect model and non-rejection as faviouring the random effects model (Baltagi, 2008:22). Using EViews 6.0 we applied three different tests to assess option under the random effects panel data procedure (Swamy and Arora; Wallace and Hussain; Amemiya/Wansbeek and Kapteyn). A central assumption in random effects estimation is that the random effects are uncorrelated with the explanatory variables. The test statistic provides sufficient evidence to adopt the fixed effect model.

Swamy and Arora

**Correlated Random Effects - Hausman Test**
Equation: Untitled
Test cross-section random effects

| Test Summary | Chi-Sq. Statistic | Chi-Sq. d.f. | Prob. |
|---|---|---|---|
| Cross-section random | 13.371633 | 1 | 0.0003 |

Wallace and Hussain

**Correlated Random Effects - Hausman Test**
Equation: Untitled
Test cross-section random effects

| Test Summary | Chi-Sq. Statistic | Chi-Sq. d.f. | Prob. |
|---|---|---|---|
| Cross-section random | 5.919810 | 1 | 0.0150 |

Amemiya/Wansbeek And Kapteyn

**Correlated Random Effects - Hausman Test**
Equation: Untitled
Test cross-section random effects

| Test Summary | Chi-Sq. Statistic | Chi-Sq. d.f. | Prob. |
|---|---|---|---|
| Cross-section random | 2.918703 | 1 | 0.0876 |

One and two way fixed effect regression estimates are performed using both EViews 6.0 and Stata 8.0 software. The software's estimates have reported the same coefficients on the speed of adjustment. The Stata 8.0 is preferred for the two way fixed effects analysis since it reports the individual effect of each dummy variable included. Based on Stata 8.0 the collective group dummies are identified as significant for the two way fixed effect model estimation. A strong seasonality influence in each third quarter was found. Assessing the individual countries data we noticed that Croatia's data have a strong seasonality influence in each third quarter which is most likely due to the summer season and Croatia's strong orientation to tourism.

**Stata 8.0 report on Hausman test:**

```
xtreg diff2 lag, fe

Fixed-effects (within) regression               Number of obs      =        92
Group variable (i): country                     Number of groups   =         4
R-sq:  within  = 0.5497                         Obs per group: min =        23
       between = 0.0267                                        avg =      23.0
       overall = 0.4801                                        max =        23
```

```
                                                F(1,87)            =    106.18
corr(u_i, Xb)  = -0.3588                        Prob > F           =    0.0000

------------------------------------------------------------------------------
       diff2 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         lag |   -1.12979   .1096401   -10.30   0.000    -1.347712   -.9118689
       _cons |  -.1200348   .0162146    -7.40   0.000     -.152263   -.0878066
-------------+----------------------------------------------------------------
     sigma_u |  .05291323
     sigma_e |  .11165644
         rho |  .18339001   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(3, 87) =     4.50               Prob > F = 0.0055

. est sto fixed

. xtreg diff2 lag, re

Random-effects GLS regression                   Number of obs      =        92
Group variable (i): country                     Number of groups   =         4

R-sq:  within  = 0.5497                         Obs per group: min =        23
       between = 0.0267                                        avg =      23.0
       overall = 0.4801                                        max =        23

Random effects u_i ~ Gaussian                   Wald chi2(1)       =     83.12
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000

------------------------------------------------------------------------------
       diff2 |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         lag |  -.9853533   .1080803    -9.12   0.000    -1.197187   -.7735198
       _cons |  -.1051654   .0165869    -6.34   0.000    -.1376751   -.0726557
-------------+----------------------------------------------------------------
     sigma_u |          0
     sigma_e |  .11165644
         rho |          0   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. est sto random

. hausman fixed random

                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |     fixed        random       Difference          S.E.
-------------+----------------------------------------------------------------
         lag |    -1.12979    -.9853533       -.1444372        .0184281
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(1) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       61.43
                Prob>chi2 =      0.0000
```

## EViews 6.0 estimation output for one way fixed effect regression:

Dependent Variable: D(CAGDPWBQ)
Method: Panel Least Squares
Date: 11/20/08   Time: 01:09
Sample (adjusted): 2002Q2 2007Q4
Periods included: 23

Cross-sections included: 4
Total panel (balanced) observations: 92

| | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| CAGDPWBQ(-1) | -1.129790 | 0.109640 | -10.30454 | 0.0000 |
| C | -0.120035 | 0.016215 | -7.402900 | 0.0000 |

Effects Specification

Cross-section fixed (dummy variables)

| | | | |
|---|---|---|---|
| R-squared | 0.549961 | Mean dependent var | -0.003726 |
| Adjusted R-squared | 0.529270 | S.D. dependent var | 0.162741 |
| S.E. of regression | 0.111656 | Akaike info criterion | -1.493965 |
| Sum squared resid | 1.084643 | Schwarz criterion | -1.356911 |
| Log likelihood | 73.72238 | Hannan-Quinn criter. | -1.438649 |
| F-statistic | 26.57919 | Durbin-Watson stat | 2.084666 |
| Prob(F-statistic) | 0.000000 | | |

**EViews 6.0 estimation output for two way fixed effect regression:**

Dependent Variable: D(CAGDPWBQ)
Method: Panel Least Squares
Date: 11/20/08 Time: 01:10
Sample (adjusted): 2002Q2 2007Q4
Periods included: 23
Cross-sections included: 4
Total panel (balanced) observations: 92

| | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| CAGDPWBQ(-1) | -0.973037 | 0.124647 | -7.806357 | 0.0000 |
| C | -0.103897 | 0.016620 | -6.251356 | 0.0000 |

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

| | | | |
|---|---|---|---|
| R-squared | 0.723188 | Mean dependent var | -0.003726 |
| Adjusted R-squared | 0.612464 | S.D. dependent var | 0.162741 |
| S.E. of regression | 0.101310 | Akaike info criterion | -1.501700 |
| Sum squared resid | 0.667147 | Schwarz criterion | -0.761610 |
| Log likelihood | 96.07820 | Hannan-Quinn criter. | -1.202993 |
| F-statistic | 6.531412 | Durbin-Watson stat | 2.039905 |
| Prob(F-statistic) | 0.000000 | | |

**Stata 8.0 estimation output for one way fixed-effects regression:**

```
Fixed-effects (within) regression               Number of obs      =        92
Group variable (i): country                     Number of groups   =         4

R-sq:  within  = 0.5496                         Obs per group: min =        23
       between = 0.0262                                        avg =      23.0
       overall = 0.4800                                        max =        23

                                                F(1,87)            =    106.16
corr(u_i, Xb)  = -0.3588                        Prob > F           =    0.0000

------------------------------------------------------------------------------
        diff |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         lag |  -1.129702   .1096457   -10.30   0.000    -1.347635   -.9117696
       _cons |  -.1200385   .0162142    -7.40   0.000     -.152266    -.087811
-------------+----------------------------------------------------------------
     sigma_u |  .05291466
     sigma_e |    .111637
         rho |  .18345027   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(3, 87) =     4.50               Prob > F = 0.0055
```

**Stata 8.0 estimation output for two-way fixed-effects regression:**

```
Fixed-effects (within) regression               Number of obs      =        92
Group variable (i): country                     Number of groups   =         4

R-sq:  within  = 0.7229                         Obs per group: min =        23
       between = 0.0262                                        avg =      23.0
       overall = 0.6683                                        max =        23

                                                F(23,65)           =      7.37
corr(u_i, Xb)  = -0.2770                        Prob > F           =    0.0000

------------------------------------------------------------------------------
        diff |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         lag |  -.9730254   .1246498    -7.81   0.000    -1.221968   -.7240825
        dum1 |  (dropped)
        dum2 |   .0448998   .0728747     0.62   0.540    -.1006411    .1904406
        dum3 |   .1308333   .0724391     1.81   0.076    -.0138376    .2755042
        dum4 |  (dropped)
        dum5 |   .0177162   .0734011     0.24   0.810     -.128876    .1643085
        dum6 |   .0478319   .0730341     0.65   0.515    -.0980273     .193691
        dum7 |   .1805091   .0723889     2.49   0.015     .0359386    .3250797
        dum8 |    .018908   .0719001     0.26   0.793    -.1246864    .1625024
        dum9 |     .02417    .072892     0.33   0.741    -.1214053    .1697453
       dum10 |    .019893    .072869     0.27   0.786    -.1256364    .1654225
       dum11 |   .1845077    .072968     2.53   0.014     .0387804    .3302349
       dum12 |  -.0204297   .0719362    -0.28   0.777    -.1640961    .1232368
       dum13 |   .0567288   .0739541     0.77   0.446    -.0909678    .2044253
       dum14 |   .0367933   .0722518     0.51   0.612    -.1075035    .1810902
       dum15 |   .1790289   .0725791     2.47   0.016     .0340784    .3239794
       dum16 |   .0097052   .0718816     0.14   0.893    -.1338523    .1532627
       dum17 |   .0486695   .0731142     0.67   0.508    -.0973496    .1946886
       dum18 |   .0617389   .0723755     0.85   0.397    -.0828049    .2062827
       dum19 |   .1993612   .0721467     2.76   0.007     .0552744    .3434481
       dum20 |   .0276387   .0721467     0.38   0.703    -.1164481    .1717256
       dum21 |   .0344205   .0726874     0.47   0.637    -.1107462    .1795872
       dum22 |   .0711098   .0726403     0.98   0.331    -.0739628    .2161824
       dum23 |   .1291185   .0720216     1.79   0.078    -.0147185    .2729555
       dum24 |   -.064723   .0716323    -0.90   0.370    -.2077826    .0783365
       _cons |   -.166448   .0508843    -3.27   0.002    -.2680711   -.0648249
-------------+----------------------------------------------------------------
     sigma_u |   .0455328
     sigma_e |  .10130319
         rho |  .16806967   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(3, 65) =     3.77               Prob > F = 0.0146
```

Based on output regression collectively group dummies are significant for the estimation.

# APPENDIX 4.1: Diagnostic tests for Fundamental Equilibrium Exchange Rate

**Unit root test:**

Data sample for all variables is from 2003:Q1 to 2009:Q4, except for the CPI based REER for which sample size is from 2005:Q1 to 2010:Q2. In section 4.2.1 calculated correlation between RPI and CPI is found to be 0.992. The price indices do not seem to be concern because they track each other almost perfectly (Graph: 4.3), hence our decision to combine overlapping periods of both RPI and CPI (2005 through 2007) in order to calculate longer index of REER. Data sample for the new calculated REER is from 2003:Q1 to 2010:Q2.

Table A4.1: Order of integration, indicated by ADF and PP unit root tests

| *Variables (levels)* | ADF | PP | *Variables (differences)* | ADF | PP |
|---|---|---|---|---|---|
| REER_LN | I(0) | I(0) | D(REER_LN) | I(1)** | I(1)** |
| OPEN_LN | I(0) | I(0) | D(OPEN_LN) | I(1)** | I(1)** |
| INVEST_LN | I(0) | I(0)* | D(INVEST_LN) | I(1)** | I(1)** |
| GCGDP_LN | I(0) | I(0) | D(GCGDP_LN) | I(1)** | I(1)** |
| PROD_LN | I(0) | I(0)* | D(PROD_LN) | I(1)** | I(1)** |
| TOT_LN | I(0) | I(0) | D(TOT_LN) | I(1)** | I(1)** |

Note:
ADF is Augmented Dickey-Fuller test and PP is Phillips-Peron test.
In each case, Ho: the series is characterised by unite root. Significant result suggests rejection.
** Significant at 1% level or better
* Significant at 5% level or better

The results are consistent with the view that most macroeconomic variables are non-stationary in levels but stationary in first differences (Nelson and Plosser, 1982).

**Model 1: Test diagnostics**

**Cointegrated equation: REER based RPI (dependent variable)**

Dependent Variable: REER_LN
Method: Least Squares
Date: 03/27/09 Time: 13:08
Sample: 2003Q1 2007Q4
Included observations: 20

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| GCGDP_LN | 0.049677 | 0.012729 | 3.902546 | 0.0016 |
| INVEST_LN | -4.04E-05 | 0.004917 | -0.008224 | 0.9936 |
| LNPROD | -0.111849 | 0.036877 | -3.033046 | 0.0089 |
| OPEN_LN | -0.147281 | 0.027682 | -5.320403 | 0.0001 |
| TOT_LN | -0.101965 | 0.020956 | -4.865732 | 0.0002 |
| C | -5.662739 | 0.229887 | -24.63276 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.829049 | Mean dependent var | -4.604059 |
| Adjusted R-squared | 0.767996 | S.D. dependent var | 0.015084 |
| S.E. of regression | 0.007266 | Akaike info criterion | -6.768028 |
| Sum squared resid | 0.000739 | Schwarz criterion | -6.469309 |
| Log likelihood | 73.68028 | F-statistic | 13.57901 |
| Durbin-Watson stat | 1.642801 | Prob(F-statistic) | 0.000060 |

Null Hypothesis: Residual has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=4)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -3.450995 | 0.0218 |
| Test critical values: | 1% level | -3.831511 | |
| | 5% level | -3.029970 | |
| | 10% level | -2.655194 | |

Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 0.582630 | Prob. F(4,10) | 0.682366 |
| Obs*R-squared | 3.780082 | Prob. Chi-Square(4) | 0.436586 |

Ramsey RESET Test:

| | | | |
|---|---|---|---|
| F-statistic | 1.286441 | Prob. F(1,13) | 0.277187 |
| Log likelihood ratio | 1.887231 | Prob. Chi-Square(1) | 0.169515 |

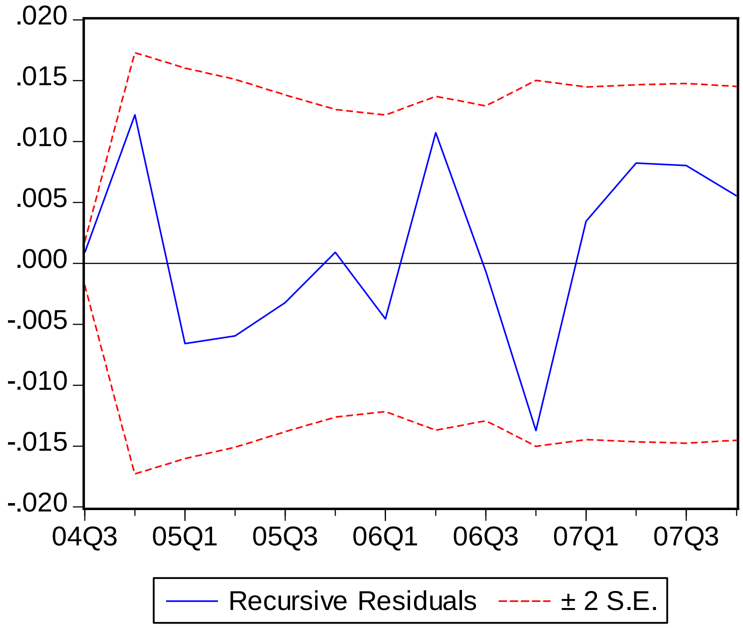
Heteroskedasticity Test:

| | | | |
|---|---|---|---|
| F-statistic | 0.617740 | Prob. F(10,9) | 0.768296 |
| Obs*R-squared | 8.140263 | Prob. Chi-Square(10) | 0.615138 |

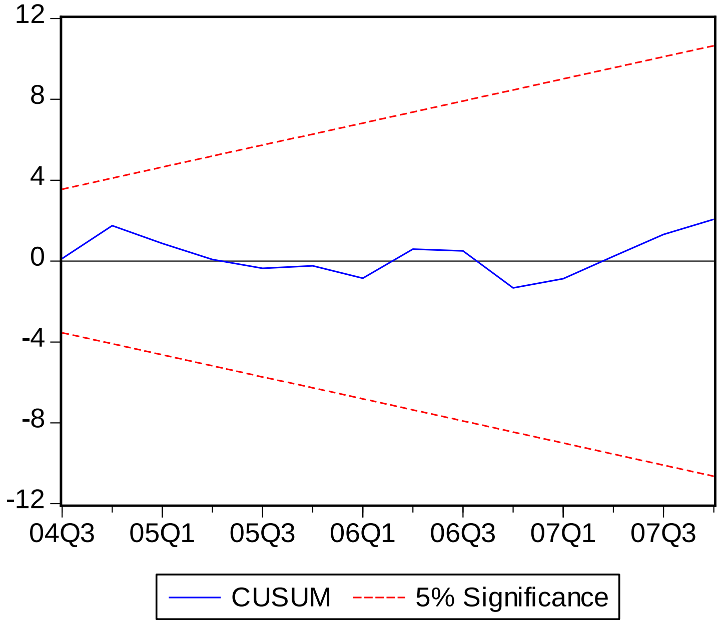
Recursive residuals: (computed in EViews 6.0)

If the maintained model is valid, the recursive residuals will be independently and normally distributed with zero mean and constant variance. This option shows a plot of the recursive residuals about the zero line. Plus and minus two standard errors are also shown at each point. Residuals outside the standard error bands suggest instability in the parameters of the equation. It can be concluded that stability in the parameters is indicated by the recursive residuals plot based on model 1, cointegrated equation specification.

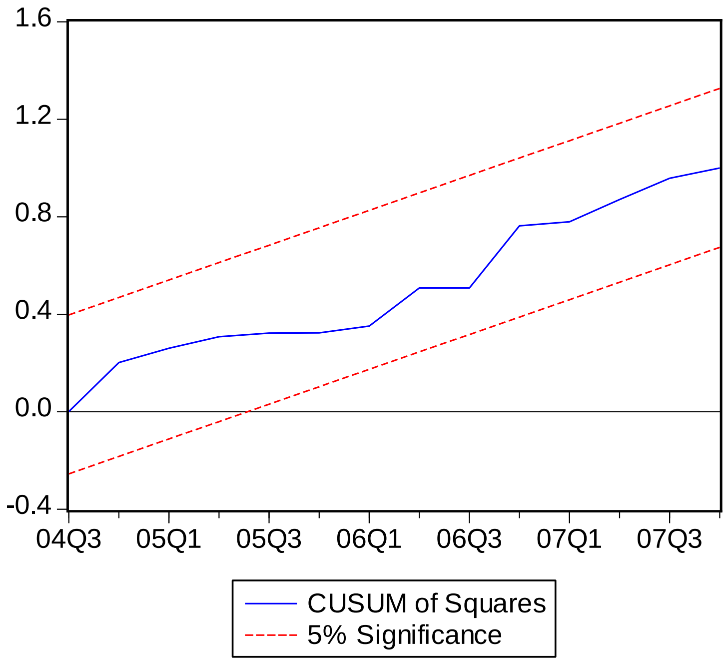
*Recursive residuals for model 1, cointegrated equation*




*The CUSUM test* is also computed in EViews 6.0. It is based on the cumulative sum of the recursive residuals. This option plots the cumulative sum together with the 5% critical lines. The test finds parameter instability if the cumulative sum goes outside the area between the two critical lines. Based on the CUSUM test plot it can be concluded that stability in the parameters is suggested by our model.




*The CUSUM of squares test* is computed in EViews 6.0. As with the CUSUM test, movement outside the critical lines is suggestive of parameter or variance instability. The cumulative sum of squares is generally within the 5% significance lines, suggesting that the residual variance is stable.



**Error Correction Model for model 1:**

Dependent Variable: D(REER_LN)
Method: Least Squares
Date: 03/27/09 Time: 14:09
Sample (adjusted): 2003Q2 2007Q4
Included observations: 19 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(GCGDP_LN) | 0.052108 | 0.007669 | 6.794881 | 0.0000 |
| D(INVEST_LN) | -0.001805 | 0.002582 | -0.698934 | 0.4979 |
| D(LNPROD) | -0.026065 | 0.039807 | -0.654774 | 0.5250 |
| D(OPEN_LN) | -0.079750 | 0.028998 | -2.750217 | 0.0176 |
| D(TOT_LN) | -0.001404 | 0.034444 | -0.040756 | 0.9682 |
| C | -0.003142 | 0.001659 | -1.894221 | 0.0825 |
| ECM(-1) | -0.623152 | 0.227435 | -2.739909 | 0.0179 |

| | | | |
|---|---|---|---|
| R-squared | 0.907741 | Mean dependent var | -0.001042 |
| Adjusted R-squared | 0.861612 | S.D. dependent var | 0.014842 |
| S.E. of regression | 0.005521 | Akaike info criterion | -7.283083 |
| Sum squared resid | 0.000366 | Schwarz criterion | -6.935132 |
| Log likelihood | 76.18929 | F-statistic | 19.67820 |
| Durbin-Watson stat | 2.085461 | Prob(F-statistic) | 0.000015 |

Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 1.173544 | Prob. F(2,10) | 0.348479 |
| Obs*R-squared | 3.611757 | Prob. Chi-Square(2) | 0.164330 |

Ramsey RESET Test:

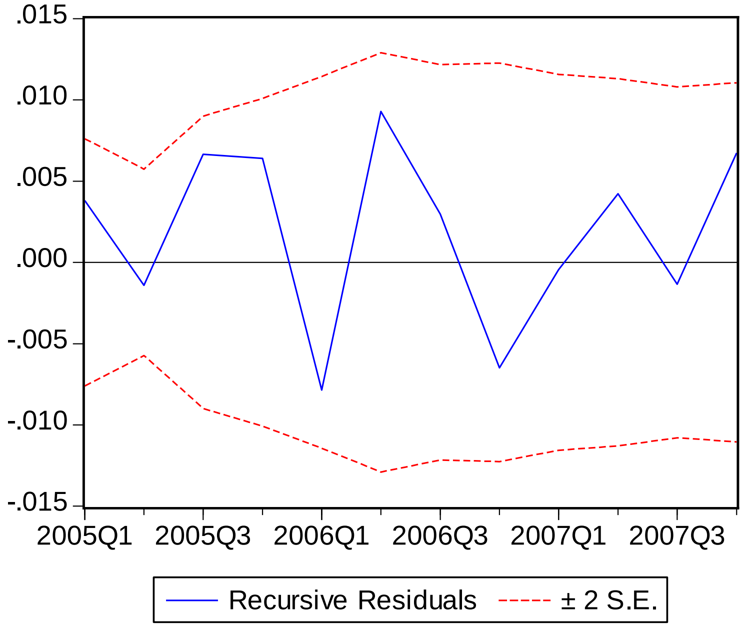
| | | | |
|---|---|---|---|
| F-statistic | 0.465999 | Prob. F(1,11) | 0.508954 |
| Log likelihood ratio | 0.788325 | Prob. Chi-Square(1) | 0.374607 |

White Heteroskedasticity Test:

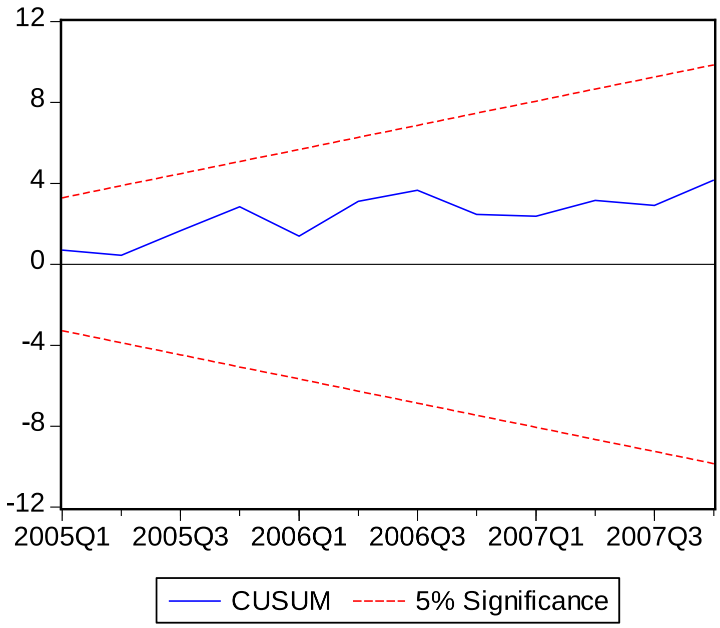
| | | | |
|---|---|---|---|
| F-statistic | 0.971913 | Prob. F(12,6) | 0.547337 |
| Obs*R-squared | 12.54581 | Prob. Chi-Square(12) | 0.402898 |

Recursive residuals, CUSUM test and CUSUM of squares test (computed in EViews 6.0) are all inside the critical lines which suggests parameter and variance stability as can be seen from the following plots:

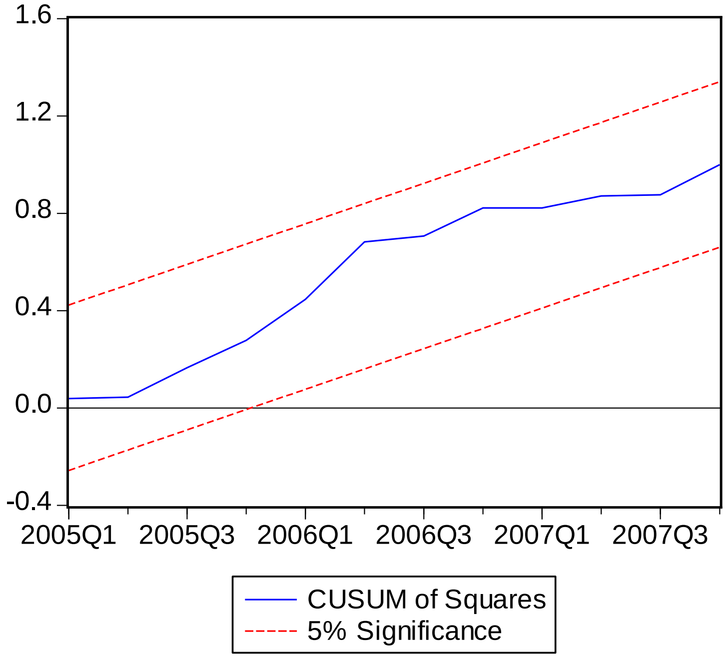
*Recursive residuals for model 1, error correction equation*




*CUSUM test for model 1, error correction equation*



*CUSUM of squares test for model one, error correction equation*




**Model 2: Test diagnostics**

**Cointegrated equation: REER based CPI (dependent variable)**

Dependent Variable: REER_LN
Method: Least Squares
Date: 04/02/09   Time: 13:03
Sample: 2005Q1 2008Q3
Included observations: 15

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| GCGDP_LN | 0.020460 | 0.015759 | 1.298324 | 0.2265 |
| INVEST_LN | -0.016735 | 0.003550 | -4.713498 | 0.0011 |
| OPEN_LN | -0.095263 | 0.028146 | -3.384610 | 0.0081 |
| PROD_LN | 0.026809 | 0.029643 | 0.904398 | 0.3894 |
| TOT_LN | -0.025484 | 0.019673 | -1.295381 | 0.2274 |
| C | -4.954497 | 0.214242 | -23.12565 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.853468 | Mean dependent var | -4.600503 |
| Adjusted R-squared | 0.772061 | S.D. dependent var | 0.014604 |
| S.E. of regression | 0.006972 | Akaike info criterion | -6.804550 |
| Sum squared resid | 0.000438 | Schwarz criterion | -6.521330 |
| Log likelihood | 57.03412 | F-statistic | 10.48401 |
| Durbin-Watson stat | 2.191189 | Prob(F-statistic) | 0.001508 |

Null Hypothesis: Residual has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=3)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -3.857242 | 0.0130 |
| Test critical values: | 1% level | -4.004425 | |
| | 5% level | -3.098896 | |
| | 10% level | -2.690439 | |

Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 0.524012 | Prob. F(2,7) | 0.6137 |
| Obs*R-squared | 1.953321 | Prob. Chi-Square(2) | 0.3766 |

Ramsey RESET Test:

| | | | |
|---|---|---|---|
| F-statistic | 1.616835 | Prob. F(1,8) | 0.2393 |
| Log likelihood ratio | 2.761105 | Prob. Chi-Square(1) | 0.0966 |

Heteroskedasticity Test: Breusch-Pagan-Godfrey

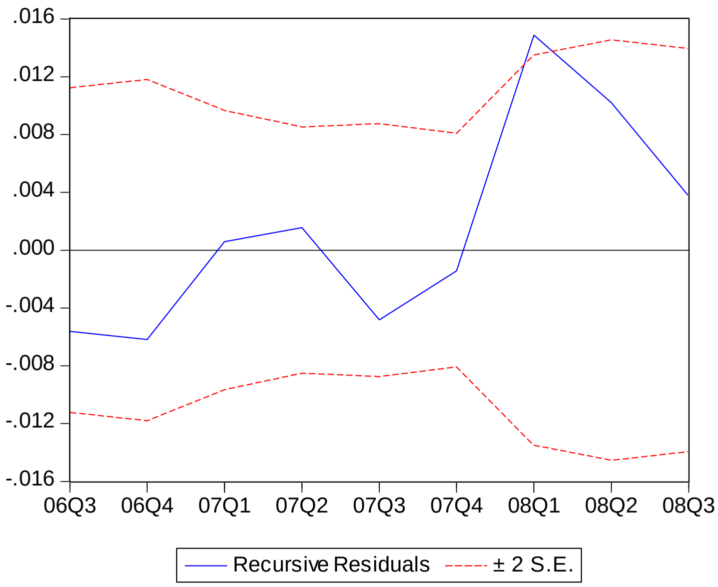
| | | | |
|---|---|---|---|
| F-statistic | 1.043308 | Prob. F(5,9) | 0.4489 |
| Obs*R-squared | 5.504017 | Prob. Chi-Square(5) | 0.3575 |
| Scaled explained SS | 1.103825 | Prob. Chi-Square(5) | 0.9538 |

Heteroskedasticity Test: Harvey

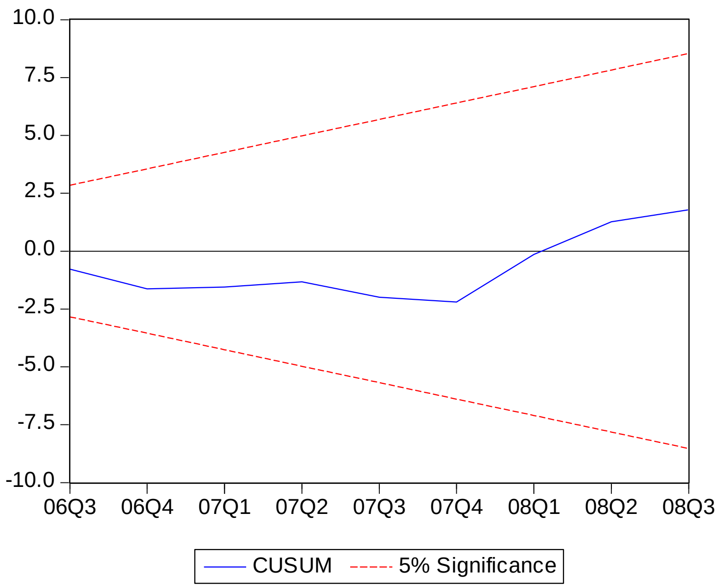
| | | | |
|---|---|---|---|
| F-statistic | 1.798169 | Prob. F(5,9) | 0.2093 |
| Obs*R-squared | 7.496183 | Prob. Chi-Square(5) | 0.1863 |
| Scaled explained SS | 2.674902 | Prob. Chi-Square(5) | 0.7500 |

Even though only fifteen observations are available for CPI based REER we have performed stability test diagnostic. Recursive residuals, CUSUM test and CUSUM of squares test are all computed in EViews 6.0. CUSUM test is inside the critical lines which suggest parameters stability. Recursive residuals and CUSUM of squares tests are outside of suggested critical lines which suggest parameter and variance instability as can be seen from the following plots:

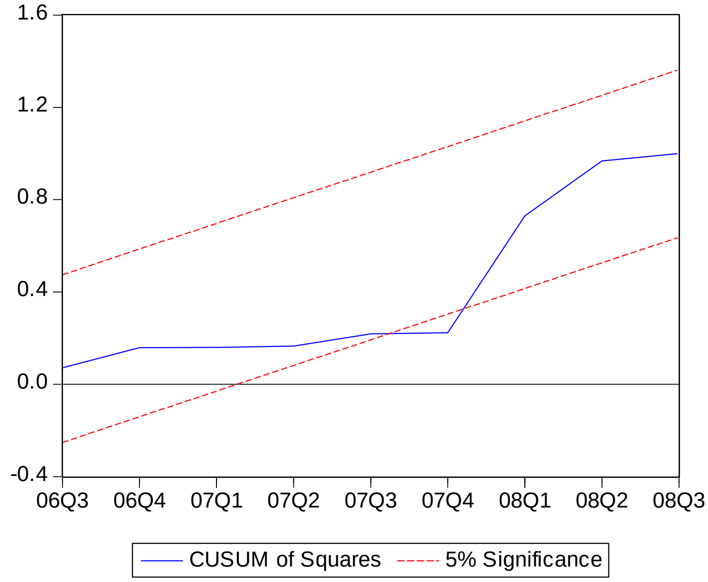
*Recursive residuals for model 2, cointegrated equation*




*CUSUM test for model 2, cointegrated equation*



*CUSUM of squares test for model 2, cointegrated equation*




## Error Correction Model for model 2:

Dependent Variable: D(REER_LN)
Method: Least Squares
Date: 04/02/09 Time: 13:12
Sample (adjusted): 2005Q2 2008Q3
Included observations: 14 after adjustments

| | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(GCGDP_LN) | 0.009456 | 0.008382 | 1.128076 | 0.2965 |
| D(INVEST_LN) | -0.009991 | 0.002496 | -4.003138 | 0.0052 |
| D(OPEN_LN) | -0.105574 | 0.039739 | -2.656694 | 0.0326 |
| D(PROD_LN) | 0.030054 | 0.020004 | 1.502417 | 0.1767 |
| D(TOT_LN) | -0.005746 | 0.035479 | -0.161953 | 0.8759 |
| ECM(-1) | -1.468871 | 0.293562 | -5.003613 | 0.0016 |
| C | -0.001697 | 0.001589 | -1.067959 | 0.3210 |

| | | | |
|---|---|---|---|
| R-squared | 0.953113 | Mean dependent var | -0.001089 |
| Adjusted R-squared | 0.912924 | S.D. dependent var | 0.016107 |
| S.E. of regression | 0.004753 | Akaike info criterion | -7.553223 |
| Sum squared resid | 0.000158 | Schwarz criterion | -7.233694 |
| Log likelihood | 59.87256 | Hannan-Quinn criter. | -7.582801 |
| F-statistic | 23.71568 | Durbin-Watson stat | 1.155588 |
| Prob(F-statistic) | 0.000256 | | |

Ramsey RESET Test:

| | | | |
|---|---|---|---|
| F-statistic | 0.357606 | Prob. F(1,6) | 0.5717 |
| Log likelihood ratio | 0.810494 | Prob. Chi-Square(1) | 0.3680 |

Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 0.970575 | Prob. F(2,5) | 0.4404 |
| Obs*R-squared | 3.915217 | Prob. Chi-Square(2) | 0.1412 |

Heteroskedasticity Test: Breusch-Pagan-Godfrey

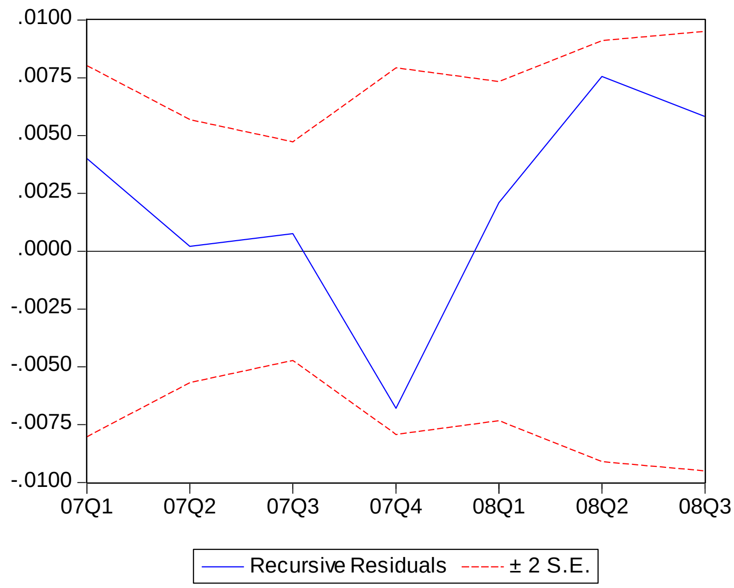
| | | | |
|---|---|---|---|
| F-statistic | 0.730972 | Prob. F(6,7) | 0.6408 |
| Obs*R-squared | 5.392811 | Prob. Chi-Square(6) | 0.4945 |
| Scaled explained SS | 0.789477 | Prob. Chi-Square(6) | 0.9924 |

Heteroskedasticity Test: Harvey

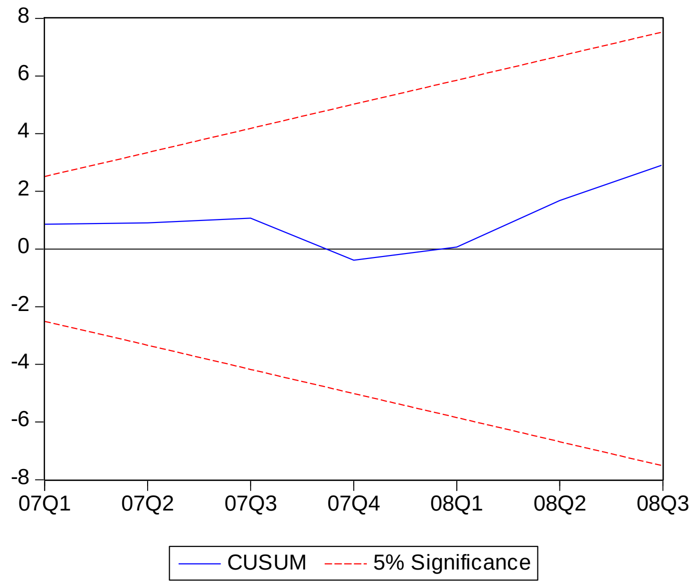
| | | | |
|---|---|---|---|
| F-statistic | 2.678047 | Prob. F(6,7) | 0.1117 |
| Obs*R-squared | 9.751742 | Prob. Chi-Square(6) | 0.1355 |
| Scaled explained SS | 11.96570 | Prob. Chi-Square(6) | 0.0627 |

In the case of the error correction model Recursive residuals, CUSUM test and CUSUM of squares test are all inside the critical lines which suggests parameter and variance stability as can be seen from the following plots:

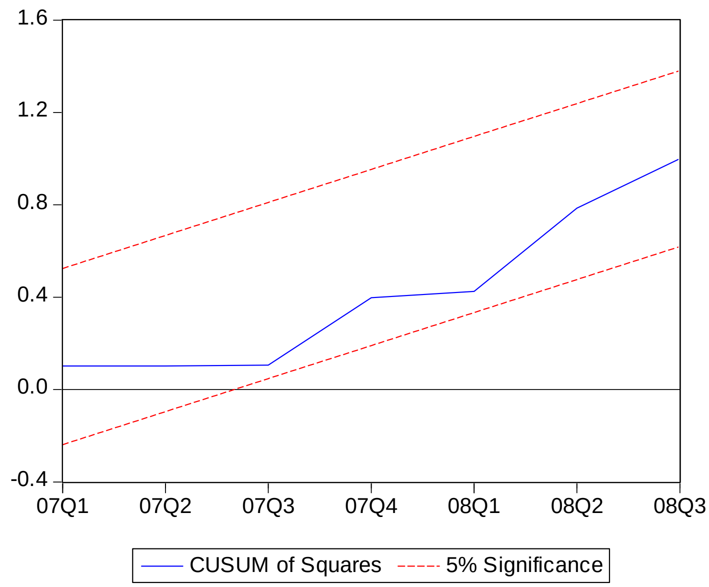
*Recursive residuals for model 2, error correction model*




*CUSUM test for model 2, error correction model*



*CUSUM of squares test for model 2, error correction model*




**Model 3: Test diagnostics**

**Unit root test:**

Table A4.2: Order of integration, indicated by ADF and PP unit root tests

| *Variables (levels)* | ADF | PP | *Variables (differences)* | ADF | PP |
|---|---|---|---|---|---|
| REER_LN | I(0)* | I(0)* | D(REER_LN) | I(1)** | I(1)** |
| OPEN_LN | I(0) | I(0) | D(OPEN_LN) | I(1)** | I(1)** |
| INVEST_LN | I(0) | I(0)* | D(INVEST_LN) | I(1)* | I(1)** |
| GCGDP_LN | I(0) | I(0)* | D(GCGDP_LN) | I(1)** | I(1)** |
| PROD_LN | I(0) | I(0) | D(PROD_LN) | I(1)* | I(1)** |
| TOT_LN | I(0) | I(0) | D(TOT_LN) | I(1)** | I(1)* |

Note: ADF is Augmented Dickey-Fuller test and PP is Phillips-Peron test.
In each case, Ho: the series is characterised by unite root. Significant result suggests rejection.
** Significant at 1% level or better
* Significant at 5% level or better

**Cointegrated equation: REER based CPI (dependent variable)**

Dependent Variable: REER_LNI
Method: Least Squares
Date: 08/06/10   Time: 17:03
Sample: 2005Q1 2009Q4

Included observations: 20

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| GCGDP_LN | 0.045112 | 0.024636 | 1.831151 | 0.0884 |
| INVEST_LN | 0.001389 | 0.007880 | 0.176308 | 0.8626 |
| OPEN_LN | -0.061130 | 0.034514 | -1.771139 | 0.0983 |
| PROD_LN | 0.052034 | 0.029005 | 1.793985 | 0.0944 |
| TOT_LN | -0.011420 | 0.024405 | -0.467948 | 0.6470 |
| C | -4.708281 | 0.244774 | -19.23521 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.482630 | Mean dependent var | -4.596173 |
| Adjusted R-squared | 0.297855 | S.D. dependent var | 0.013706 |
| S.E. of regression | 0.011485 | Akaike info criterion | -5.852281 |
| Sum squared resid | 0.001847 | Schwarz criterion | -5.553561 |
| Log likelihood | 64.52281 | Hannan-Quinn criter. | -5.793967 |
| F-statistic | 2.611991 | Durbin-Watson stat | 1.391064 |
| Prob(F-statistic) | 0.071816 | | |

Null Hypothesis: ECM has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic - based on SIC, maxlag=4)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -3.796278 | 0.0135 |
| Test critical values: | 1% level | -3.959148 | |
| | 5% level | -3.081002 | |
| | 10% level | -2.681330 | |

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations

Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 1.802704 | Prob. F(1,13) | 0.2024 |
| Obs*R-squared | 2.435642 | Prob. Chi-Square(1) | 0.1186 |

Ramsey RESET Test:

| | | | |
|---|---|---|---|
| F-statistic | 0.099471 | Prob. F(1,13) | 0.7575 |
| Log likelihood ratio | 0.152450 | Prob. Chi-Square(1) | 0.6962 |

Heteroskedasticity Test: Breusch-Pagan-Godfrey

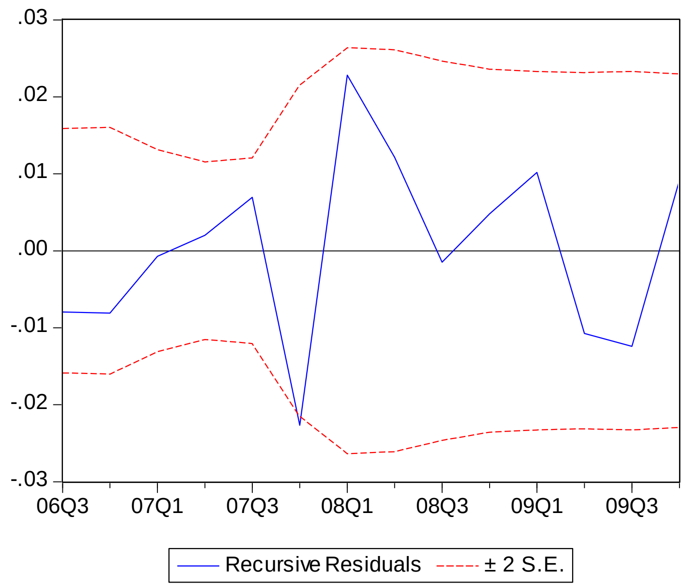
| | | | |
|---|---|---|---|
| F-statistic | 0.961088 | Prob. F(5,14) | 0.4737 |
| Obs*R-squared | 5.110691 | Prob. Chi-Square(5) | 0.4025 |
| Scaled explained SS | 1.637123 | Prob. Chi-Square(5) | 0.8967 |

Heteroskedasticity Test: Harvey

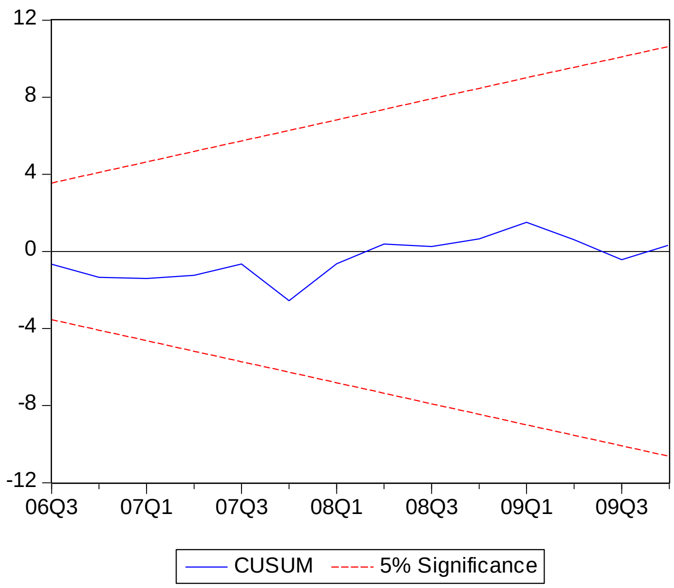
| | | | |
|---|---|---|---|
| F-statistic | 1.612784 | Prob. F(5,14) | 0.2207 |
| Obs*R-squared | 7.309598 | Prob. Chi-Square(5) | 0.1986 |
| Scaled explained SS | 7.002584 | Prob. Chi-Square(5) | 0.2204 |

Recursive residuals, CUSUM test and CUSUM of squares test for Cointegrated equation of model 3 are all inside the critical lines which suggest parameter and variance stability as can be seen from the following plots:

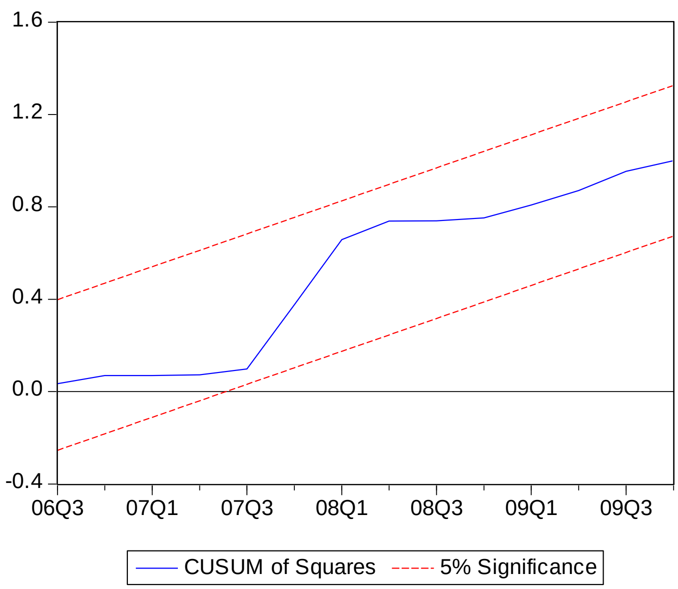
*Recursive residuals for model 3, cointegrated equation*



*CUSUM test for model 3, cointegrated equation*




*CUSUM of squares test for model 3, cointegrated equation*



## Error Correction Model for model 3:

Dependent Variable: D(REER_LNI)
Method: Least Squares
Date: 08/27/10 Time: 17:05
Sample (adjusted): 2005Q2 2009Q4
Included observations: 19 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(GCGDP_LN) | 0.021969 | 0.016757 | 1.311061 | 0.2144 |
| D(INVEST_LN) | 0.004615 | 0.005855 | 0.788246 | 0.4458 |
| D(OPEN_LN) | -0.077316 | 0.028756 | -2.688665 | 0.0197 |
| D(PROD_LN) | 0.036363 | 0.022970 | 1.583101 | 0.1394 |
| D(TOT_LN) | -0.020017 | 0.030462 | -0.657104 | 0.5235 |
| C | 2.51E-05 | 0.002761 | 0.009094 | 0.9929 |
| ECM(-1) | -0.818694 | 0.272386 | -3.005635 | 0.0110 |

| | | | |
|---|---|---|---|
| R-squared | 0.700669 | Mean dependent var | 0.000123 |
| Adjusted R-squared | 0.551004 | S.D. dependent var | 0.016008 |
| S.E. of regression | 0.010727 | Akaike info criterion | -5.954885 |
| Sum squared resid | 0.001381 | Schwarz criterion | -5.606934 |
| Log likelihood | 63.57141 | Hannan-Quinn criter. | -5.895998 |
| F-statistic | 4.681568 | Durbin-Watson stat | 1.465268 |
| Prob(F-statistic) | 0.011159 | | |

Ramsey RESET Test:

| | | | |
|---|---|---|---|
| F-statistic | 1.008763 | Prob. F(2,10) | 0.3990 |
| Log likelihood ratio | 3.491838 | Prob. Chi-Square(2) | 0.1745 |

Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 3.163473 | Prob. F(4,8) | 0.0777 |
| Obs*R-squared | 11.64061 | Prob. Chi-Square(4) | 0.0202 |

Heteroskedasticity Test: Breusch-Pagan-Godfrey

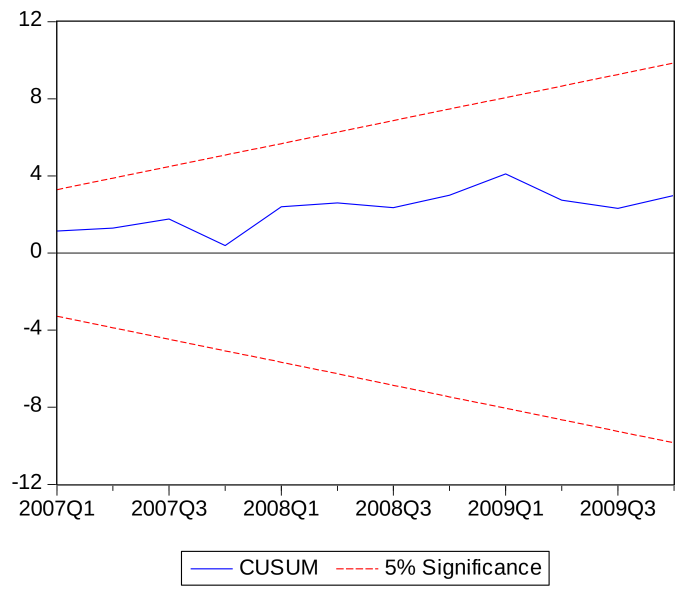
| | | | |
|---|---|---|---|
| F-statistic | 0.978401 | Prob. F(6,12) | 0.4801 |
| Obs*R-squared | 6.241475 | Prob. Chi-Square(6) | 0.3967 |
| Scaled explained SS | 2.120983 | Prob. Chi-Square(6) | 0.9082 |

Heteroskedasticity Test: Glejser

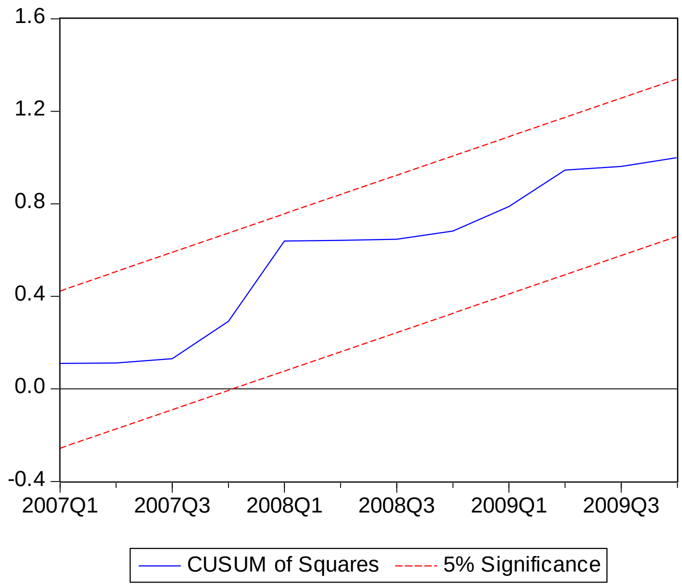
| | | | |
|---|---|---|---|
| F-statistic | 1.683696 | Prob. F(6,12) | 0.2082 |
| Obs*R-squared | 8.684273 | Prob. Chi-Square(6) | 0.1921 |
| Scaled explained SS | 4.852758 | Prob. Chi-Square(6) | 0.5628 |

*Recursive residuals for model 3, error correction model*


*CUSUM test for model 3, error correction model*



*CUSUM of squares test for model 3, error correction model*




Recursive residuals, CUSUM test and CUSUM of squares test for error correction equation of model 3 are all inside the critical lines which suggest parameter and variance stability as can be seen from the above plots.

## Model 4: Test diagnostics

### Cointegrated equation: REER (dependent variable)

Dependent Variable: REER_LN
Method: Least Squares
Date: 09/22/10 Time: 03:23
Sample: 2003Q1 2009Q4
Included observations: 28

| | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| GCGDP_LN | 0.049850 | 0.009104 | 5.475597 | 0.0000 |
| INVEST_LN | -6.47E-05 | 0.005793 | -0.011177 | 0.9912 |
| OPEN_LN | -0.056355 | 0.026240 | -2.147728 | 0.0430 |
| PROD_LN | 0.048962 | 0.020663 | 2.369553 | 0.0270 |
| TOT_LN | -0.015253 | 0.016612 | -0.918197 | 0.3685 |
| C | -4.739352 | 0.161311 | -29.38025 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.857536 | Mean dependent var | -4.608161 |
| Adjusted R-squared | 0.825158 | S.D. dependent var | 0.023529 |
| S.E. of regression | 0.009839 | Akaike info criterion | -6.217612 |
| Sum squared resid | 0.002130 | Schwarz criterion | -5.932140 |
| Log likelihood | 93.04657 | Hannan-Quinn criter. | -6.130341 |
| F-statistic | 26.48505 | Durbin-Watson stat | 1.450831 |
| Prob(F-statistic) | 0.000000 | | |

Null Hypothesis: ECM has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic based on SIC, MAXLAG=6)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -4.879976 | 0.0008 |
| Test critical values: | 1% level | -3.752946 | |
| | 5% level | -2.998064 | |
| | 10% level | -2.638752 | |

*MacKinnon (1996) one-sided p-values.

Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 1.939066 | Prob. F(1,21) | 0.1783 |
| Obs*R-squared | 2.366872 | Prob. Chi-Square(1) | 0.1239 |

Ramsey RESET Test:

| | | | |
|---|---|---|---|
| F-statistic | 0.323719 | Prob. F(1,21) | 0.5754 |
| Log likelihood ratio | 0.428333 | Prob. Chi-Square(1) | 0.5128 |

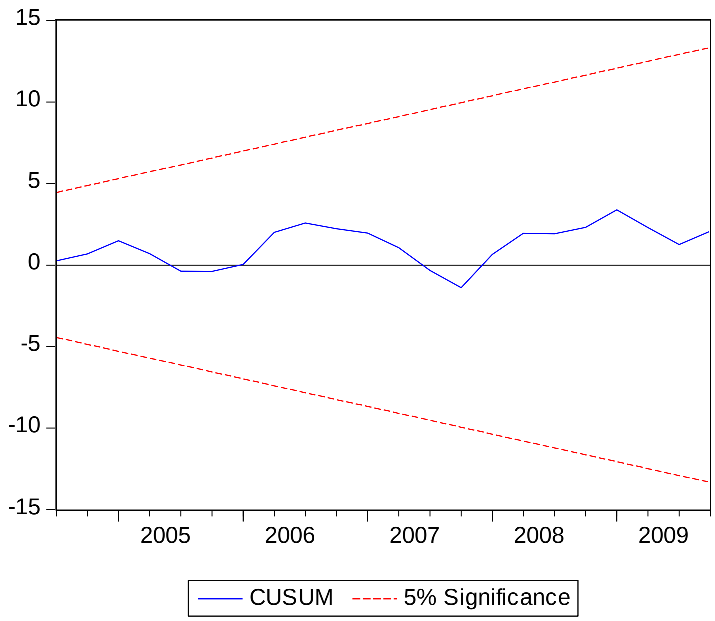
Heteroskedasticity Test: Breusch-Pagan-Godfrey

| | | | |
|---|---|---|---|
| F-statistic | 1.308963 | Prob. F(5,22) | 0.2964 |
| Obs*R-squared | 6.419898 | Prob. Chi-Square(5) | 0.2675 |
| Scaled explained SS | 2.651221 | Prob. Chi-Square(5) | 0.7536 |

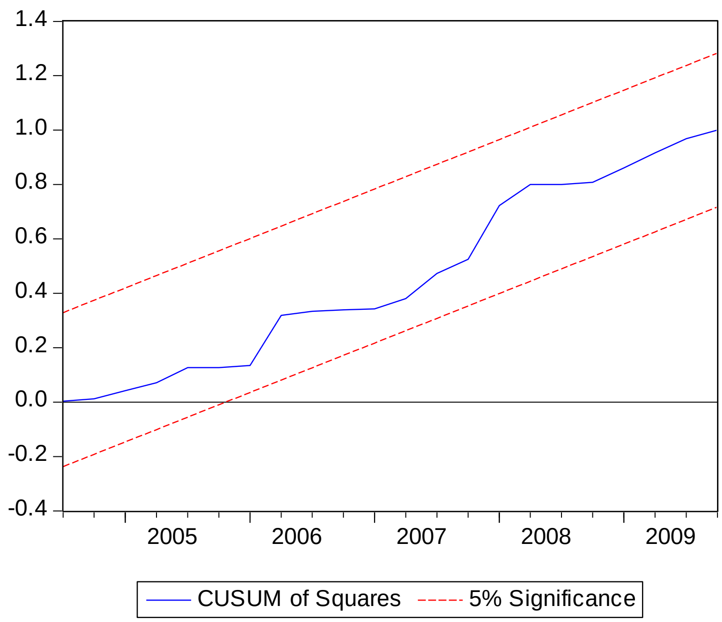
Recursive residuals, CUSUM test and CUSUM of squares test for Cointegrated equation of model 4 are all inside the critical lines which suggest parameter and variance stability as can be seen from the following plots:

*Recursive residuals for model 4, cointegrated equation*


*CUSUM test for model 4, cointegrated equation*



*CUSUM of squares test for model 4, cointegrated equation*




## Error Correction Model for model 4:

Dependent Variable: D(REER_LN)
Method: Least Squares
Date: 09/22/10 Time: 03:23
Sample (adjusted): 2003Q2 2009Q4
Included observations: 27 after adjustments

| | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(GCGDP_LN) | 0.040687 | 0.009538 | 4.265543 | 0.0004 |
| D(INVEST_LN) | 0.000684 | 0.004340 | 0.157546 | 0.8764 |
| D(OPEN_LN) | -0.065521 | 0.024290 | -2.697477 | 0.0139 |
| D(PROD_LN) | 0.039820 | 0.018725 | 2.126590 | 0.0461 |
| D(TOT_LN) | -0.008215 | 0.022452 | -0.365875 | 0.7183 |
| C | -0.000361 | 0.002113 | -0.170777 | 0.8661 |
| ECM(-1) | -0.833094 | 0.222306 | -3.747516 | 0.0013 |

| | | | |
|---|---|---|---|
| R-squared | 0.796672 | Mean dependent var | 0.001569 |
| Adjusted R-squared | 0.735674 | S.D. dependent var | 0.018392 |
| S.E. of regression | 0.009456 | Akaike info criterion | -6.265930 |
| Sum squared resid | 0.001788 | Schwarz criterion | -5.929972 |
| Log likelihood | 91.59005 | Hannan-Quinn criter. | -6.166032 |
| F-statistic | 13.06058 | Durbin-Watson stat | 1.681122 |
| Prob(F-statistic) | 0.000005 | | |

Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 1.567885 | Prob. F(4,16) | 0.2308 |
| Obs*R-squared | 7.603048 | Prob. Chi-Square(4) | 0.1073 |

Ramsey RESET Test:

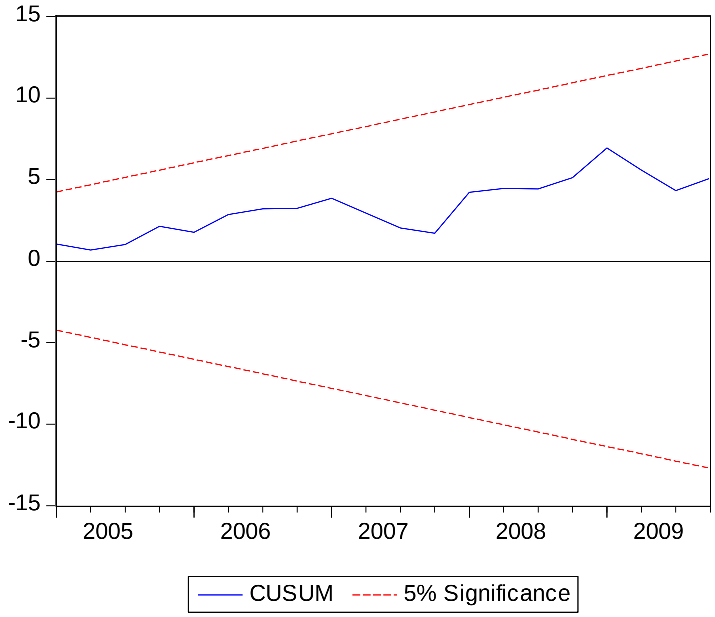
| | | | |
|---|---|---|---|
| F-statistic | 0.678708 | Prob. F(1,19) | 0.4203 |
| Log likelihood ratio | 0.947654 | Prob. Chi-Square(1) | 0.3303 |

Heteroskedasticity Test: Breusch-Pagan-Godfrey

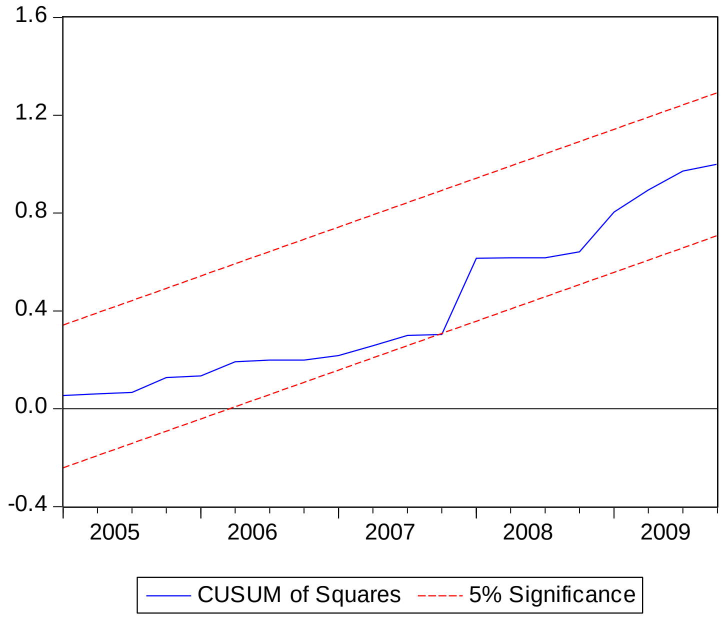
| | | | |
|---|---|---|---|
| F-statistic | 1.260029 | Prob. F(6,20) | 0.3192 |
| Obs*R-squared | 7.406509 | Prob. Chi-Square(6) | 0.2849 |
| Scaled explained SS | 2.442287 | Prob. Chi-Square(6) | 0.8749 |

*Recursive residuals for model 4, error correction model*

*CUSUM test for model 4, error correction model*




*CUSUM of squares test for model 4, error correction model*



## APPENDIX 5.1: The import structure of the Western Balkan countries based on SITC-level

All data are presented in units of GDP and transformation is applied in order to have a comparable analysis across Western Balkan countries. In Table A5.1 we use Bole's suggestion and calculate imports by SITC-level classification for each of the WB countries. Data are collected from Statistical agencies of Western Balkan countries. We include Slovenia in our calculation, but using more recent data. SITC-level classification for BH trade data is available starting from 2005. Table A5.1 indicates the import structure of the Western Balkan countries, according to the sections of SITC-level classification.

Table A5.1: The import structure of the WB countries based on SITC-level classification

| Food and live animals | | | | |
|---|---|---|---|---|
| Countries | 2005 | 2006 | 2007 | 2008 |
| Bosnia and Herzegovina | 8.8 | 7.4 | 7.5 | 7.6 |
| Slovenia | 2.9 | 3.1 | 3.5 | |
| Croatia | 3.0 | 3.2 | 3.1 | 3.1 |
| Serbia | 3.4 | 3.3 | 3.5 | |
| Macedonia | 7.6 | 7.6 | 9.4 | 6.7 |
| Albania | 4.2 | 4.4 | 4.8 | 4.9 |

| Chemical products | | | | |
|---|---|---|---|---|
| Countries | 2005 | 2006 | 2007 | 2008 |
| Bosnia and Herzegovina | 7.1 | 6.4 | 6.8 | 6.7 |
| Slovenia | 7.1 | 7.2 | 7.5 | |
| Croatia | 4.6 | 4.7 | 4.8 | 4.7 |
| Serbia | 8.4 | 9.4 | 10.9 | |
| Macedonia | 7.4 | 7.6 | 8.8 | 6.6 |
| Albania | 3.1 | 3.5 | 3.8 | 4.0 |

| Beverages and tobacco | | | | |
|---|---|---|---|---|
| Countries | 2005 | 2006 | 2007 | 2008 |
| Bosnia and Herzegovina | 2.0 | 2.1 | 2.0 | 1.9 |
| Slovenia | 0.4 | 0.4 | 0.4 | |
| Croatia | 0.3 | 0.3 | 0.3 | 0.3 |
| Serbia | 0.7 | 0.8 | 0.7 | |
| Macedonia | 0.7 | 0.7 | 0.7 | 0.6 |
| Albania | 1.0 | 1.1 | 1.1 | 1.3 |

| Manufactured materials | | | | |
|---|---|---|---|---|
| Countries | 2005 | 2006 | 2007 | 2008 |
| Bosnia and Herzegovina | 13.1 | 12.5 | 14.3 | 13.7 |
| Slovenia | 12.4 | 13.6 | 14.1 | |
| Croatia | 8.0 | 8.5 | 8.7 | 8.2 |
| Serbia | 12.3 | 13.8 | 16.9 | |
| Macedonia | 20.9 | 23.5 | 27.1 | 20.1 |
| Albania | 7.7 | 8.6 | 9.5 | 9.8 |

| Crude materials | | | | |
|---|---|---|---|---|
| Countries | 2005 | 2006 | 2007 | 2008 |
| Bosnia and Herzegovina | 2.2 | 2.4 | 2.4 | 2.5 |
| Slovenia | 2.9 | 3.3 | 3.5 | |
| Croatia | 0.9 | 0.8 | 0.8 | 0.9 |
| Serbia | 2.7 | 3.1 | 2.8 | |
| Macedonia | 2.4 | 2.8 | 5.4 | 3.8 |
| Albania | 1.2 | 1.2 | 0.9 | 0.9 |

| Machinery and transport equipment | | | | |
|---|---|---|---|---|
| Countries | 2005 | 2006 | 2007 | 2008 |
| Bosnia and Herzegovina | 16.8 | 13.5 | 15.5 | 15.2 |
| Slovenia | 18.0 | 19.2 | 21.4 | |
| Croatia | 13.8 | 14.1 | 14.3 | 14.2 |
| Serbia | 15.3 | 16.9 | 22.2 | |
| Macedonia | 12.4 | 14.4 | 18.8 | 15.6 |
| Albania | 7.4 | 6.7 | 8.0 | 9.0 |

| Mineral fuels | | | | |
|---|---|---|---|---|
| Countries | 2005 | 2006 | 2007 | 2008 |
| Bosnia and Herzegovina | 8.6 | 9.2 | 9.0 | 10.6 |
| Slovenia | 5.8 | 6.6 | 5.9 | 0.0 |
| Croatia | 6.3 | 6.9 | 6.7 | 7.7 |
| Serbia | 11.5 | 13.0 | 13.3 | |
| Macedonia | 13.6 | 15.9 | 17.9 | 15.4 |
| Albania | 2.7 | 3.5 | 5.7 | 6.7 |

| Miscellaneous manufactured articles | | | | |
|---|---|---|---|---|
| Countries | 2005 | 2006 | 2007 | 2008 |
| Bosnia and Herzegovina | 6.8 | 5.8 | 6.2 | 6.1 |
| Slovenia | 5.5 | 5.6 | 5.9 | |
| Croatia | 4.8 | 5.1 | 5.2 | 4.7 |
| Serbia | 5.0 | 5.5 | 6.8 | |
| Macedonia | 5.6 | 5.4 | 6.5 | 4.8 |
| Albania | 3.9 | 4.0 | 4.3 | 4.1 |

| Oil and fats | | | | |
|---|---|---|---|---|
| Countries | 2005 | 2006 | 2007 | 2008 |
| Bosnia and Herzegovina | 0.5 | 0.4 | 0.4 | 0.4 |
| Slovenia | 0.1 | 0.2 | 0.1 | |
| Croatia | 0.1 | 0.1 | 0.1 | 0.2 |
| Serbia | 0.1 | 0.2 | 0.2 | |
| Macedonia | 0.7 | 0.7 | 0.9 | 0.7 |
| Albania | 0.4 | 0.4 | 0.4 | 0.6 |

| Other | | | | |
|---|---|---|---|---|
| Countries | 2005 | 2006 | 2007 | 2008 |
| Bosnia and Herzegovina | 0.1 | 0.0 | 0.0 | 0.0 |
| Slovenia | 0.0 | 0.0 | 0.1 | |
| Croatia | 0.0 | 0.0 | 0.0 | 0.0 |
| Serbia | 0.2 | 0.1 | 0.0 | |
| Macedonia | 0.0 | 0.0 | 0.1 | 0.1 |
| Albania | 0.0 | 0.0 | 0.0 | 0.0 |

Source: Author's own calculation based on data obtained from statistical agencies of these countries web sites.

# APPENDIX 6.1: Stata 10.do file

## Stata10.do file

```
tsset code year

quietly tabulate year, generate(dum)
```

***Stage one as suggested in the literature, FE model***

```
xtreg bh_exp fbh_gdp gdppc distance d_cc d_bor d_cefta06 dum2-dum6, fe
xtreg bh_exp fbh_gdp gdppc distance d_cc d_bor d_cefta06 dum2-dum6, fe
vce(robust)
```

***Stage two, fixed effects obtained from stage one***

```
predict Fixed_effects, u

reg Fixed_effects distance d_cc d_bor
```

***Stage three, residuals obtained from stage two***

```
predict resid_stage2, residuals
reg bh_exp fbh_gdp gdppc distance d_cc d_bor d_cefta06 resid_stage2
dum2-dum6

lvr2plot
estat hettest
estat imtest
estat ovtest
estat vif

reg bh_exp fbh_gdp gdppc distance d_cc d_bor d_cefta06 resid_stage2
dum2-dum6, vce(robust)

xtserial bh_exp fbh_gdp gdppc distance d_cc d_bor d_cefta06 resid_stage2
dum2-dum6
```

***Model improvements***
***Testing and accounting for serial correlation***

```
xtreg bh_exp fbh_gdp gdppc distance d_cc d_bor d_cefta06 dum2-dum6, fe

xtserial bh_exp fbh_gdp gdppc distance d_cc d_bor d_cefta06 dum2-dum6
```

***testing the lagged model for CFR***

```
generate float L_bh_exp = l.bh_exp
generate float L_fbh_gdp = l.fbh_gdp
generate float L_gdppc = l.gdppc
```

***1)OLS***

```
xtreg  bh_exp L_bh_exp fbh_gdp L_fbh_gdp gdppc L_gdppc d_cefta06 dum2-dum6

testnl _b[L_bh_exp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]
testnl _b[L_bh_exp]*_b[ gdppc] = -_b[ L_gdppc]
```

***2)FE***

```
xtreg  bh_exp L_bh_exp fbh_gdp L_fbh_gdp gdppc L_gdppc d_cefta06 dum2-dum6, fe

testnl _b[L_bh_exp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]
testnl _b[L_bh_exp]*_b[ gdppc] = -_b[ L_gdppc]
```

***First stage: AR1 correction***

```
xtregar bh_exp fbh_gdp gdppc d_cefta06 dum2-dum6,fe rhotype(dw) lbi
```

***AR1 correction with two steps***

```
xtregar bh_exp fbh_gdp gdppc d_cefta06 dum2-dum6,fe rhotype(dw) twostep lbi
```

***Fixed Effects(FE) from AR1 correction with two steps***

```
predict FEAR1_correct, u
```

***Second stage***

```
reg FEAR1_correct distance d_cc d_bor

predict FEAR1_resid_stage2, residuals
```

***Stage 3***

```
reg bh_exp fbh_gdp gdppc distance d_cc d_bor d_cefta06 FEAR1_resid_stage2 dum2-dum6

estat hettest
estat imtest
estat ovtest
estat vif

xtserial bh_exp fbh_gdp gdppc distance d_cc d_bor d_cefta06 FEAR1_resid_stage2 dum2-dum6

reg bh_exp fbh_gdp gdppc distance d_cc d_bor d_cefta06 FEAR1_resid_stage2 dum2-dum6, robust

*because of evidence of serial correlation, test for CFR in the third stage*
```

***1a)OLS***

```
xtreg  bh_exp L_bh_exp fbh_gdp L_fbh_gdp gdppc L_gdppc d_cefta06 FEAR1_resid_stage2 dum2-dum6
```

```
testnl _b[L_bh_exp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]
testnl _b[L_bh_exp]*_b[ gdppc] = -_b[ L_gdppc]
```

***2a)FE***

```
xtreg  bh_exp L_bh_exp fbh_gdp L_fbh_gdp gdppc L_gdppc d_cefta06
FEAR1_resid_stage2 dum2-dum6, fe

testnl _b[L_bh_exp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]
testnl _b[L_bh_exp]*_b[ gdppc] = -_b[ L_gdppc]
```

***Prais-Winston for the consistency with the OLS***

```
prais bh_exp fbh_gdp gdppc distance d_cc d_bor d_cefta06
FEAR1_resid_stage2  dum2-dum6, rhotype(regress)

log close
```

## APPENDIX 6.2: The estimation of a CEFTA effect on Bosnia and Herzegovina trade flows

### *The estimation of a CEFTA effect on Bosnia and Herzegovina trade flows using an improved procedure FEVDA*

This Appendix 6.2 summarises the results from the estimation of the main gravity modelling approach (equations 6.1 to 6.4) with the improvements discussed in section 6.3.4. These results are obtained from our "small" dataset, which includes only Bosnian trade flows. The results of these estimations of BH trade flows are presented in tables: A6.1 and A6.2 In Table A6.1 we present diagnostic results for BH import and export flows. In table A6.2 BH import and export flows are presented from the fixed effects vector decomposition (FEVD) and our FEVD augmented (FEVDA) approach. The estimation results for Federation of BH (FBH) for both methods are in Tables: A6.3 and A6.4 and for Republika Srpska (RS) in Tables A6.5 and A6.6 of the Appendix 6.7. In the first two columns of each table we present the estimation results for the imports and in the third and fourth column the estimation results for the exports. In each table we provide a description of the right hand side variables of the main model and their corresponding coefficients are reported with the statistical significance information. The gravity equation with the approach applied is indicated in each column first, namely FEVD or FEVDA. Hence our results:

Table A6.1: Test diagnostics for BH import and export flows with FEVD and FEVDA procedure

| Estimation technique: | | FEVD | FEVDA | FEVD | FEVDA |
|---|---|---|---|---|---|
| Hypothesis | Diagnostic tests: | BH imports | BH imports | BH exports | BH exports |
| | | 1 | 2 | 3 | 4 |
| Ho: constant variance | Breusch-Pagan/ Cook-Weinsberg Prob>Chi sqr. | 0.00 | 0.00 | 0.00 | 0.00 |
| Ho: normal distribution | Cameron & Trivedi's IM-test | | | | |
| | Heteroscedasticity | 0.03 | 0.18 | 0.01 | 0.00 |
| | Skewness | 0.11 | 0.24 | 0.65 | 0.21 |
| | Kurtosis | 0.02 | 0.06 | 0.07 | 0.16 |
| Ho: model has no omitted variables | Ramsey RESET Prob>F | 0.00 | 0.78 | 0.50 | 0.01 |
| Ho: no first-order autocorrelation | Wooldridge test Prob>F | 0.00 | 0.00 | 0.00 | 0.00 |
| | Mean VIF | 4.14 | 4.94 | 20.91 | 4.97 |
| R-squared | | 0.97 | 0.98 | 0.88 | 0.88 |
| observations | | 126 | 105 | 126 | 105 |

There is systematic evidence of serial correlation. FEVD does not take serial correlation into account, but FEVDA does and corrects the estimates for it.

BH imports

The reported test diagnostics (Table A6.1) of BH imports equation indicate that FEVDA (column 2) is our preferred model. Hence, test diagnostics of the FEVDA indicate that by accounting for autoregressive structure no major specification error exists in the BH imports equation, except that the Breush-Pagan/Cook-Weinsberg (BPCW) test suggests that heteroscedasticity remains. However, we are applying the Prais-Winston estimator with computed robust standard errors, which means that heteroscedasticity is taken into account by applying the above estimator. All regression estimations and test diagnostics are reported in Appendix 6.3. As suggested in section 6.3.3 we first checked whether common factor restrictions (CFR) hold (Appendix 6.3, under model improvements).

From pooled OLS estimation of the dynamic linear regression model of order one:

```
_b[L_bh_imp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

               chi2(1) =        0.34
           Prob > chi2 =        0.5588


_b[L_bh_imp]*_b[ gdppc] = -_b[ L_gdppc]

               chi2(1) =        0.72
           Prob > chi2 =        0.3974
```

From FE estimation of the dynamic linear regression model of order one:

```
_b[L_bh_imp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

              F(1, 74) =        0.07
              Prob > F =        0.7989


_b[L_bh_imp]*_b[ gdppc] = -_b[ L_gdppc]

              F(1, 74) =        0.02
              Prob > F =        0.8923
```

Since, the CFRs hold, we decided to estimate the unobserved components model. Only under this condition can we assume “pure” serial correlation in the residuals.

Based on our findings (Table A6.2) it is noticeable that coefficient estimates on the income elasticity for FEVD (column 1) is positive and significant at 1% while for FEVDA (column 2) it is negative and significant at 10%. So we cannot consider these as our prefered results. The high value of the estimated coefficients on FEVD (column 1) also suggests that the estimation results may not be valid for imports. The variance inflation factor (VIF) on income is above 10 (Appendix 6.3) which suggests that multicollinearity could be a problem for the estimation results. This is another reason why these are not our prefered results. The time specific dummy variables suggest that time has a significant effect on BH import flows, however time dummy variables for 2005 and 2006 were dropped because of collinearity (Appendix 6.3, under model improvements). Since all the test diagnostic tests and checks are supportive of our results, except the VIF on income, and since our main interest is in CEFTA membership and its impact on BH trade flows, we will focus our discussion on this variable. Our results suggest that the CEFTA coefficient is insignificant, although its sign is positive, which is what we would expect to find and is in accordance with the standard result and with the theory of regional integration.

Table A6.2: BH import and export flows with FEVD and FEVDA procedure

| Estimation technique: | | FEVD | FEVDA | FEVD | FEVDA |
|---|---|---|---|---|---|
| Descripiton | Variables | BH imports | BH imports | BH exports | BH exports |
| | | 1 | 2 | 3 | 4 |
| Income | log(fbh_gdp) | 1.96 ***<br>(0.06) | -0.13 *<br>(0.07) | 4.08 ***<br>(0.34) | 0.85 ***<br>(0.21) |
| Linder | log(gdppc) | -1.48 ***<br>(0.07) | -0.20 ***<br>(0.04) | -2.21 ***<br>(0.31) | -1.21 **<br>(0.44) |
| Distance | log(distance) | -2.65 ***<br>(0.09) | 0.87 ***<br>(0.16) | -6.38 ***<br>(0.45) | -0.51<br>(0.52) |
| Common country | d_cc | 0.94 ***<br>(0.04) | 0.42 ***<br>(0.04) | 1.47 ***<br>(0.09) | 0.75 ***<br>(0.09) |
| Border | d_bor | -0.25 ***<br>(0.05) | 0.89 ***<br>(0.05) | -1.31 ***<br>(0.17) | 0.39 ***<br>(0.13) |
| CEFTA | cefta06 | 0.11 **<br>(0.06) | 0.04<br>(0.07) | -0.07<br>(0.07) | 0.08<br>(0.08) |
| VAT | vat_bh | -0.07 *<br>(0.04) | 0.02<br>(0.04) | -0.16<br>(0.11) | -0.01<br>(0.08) |
| Unit effect | unit effect | 1.00 ***<br>(0.05) | 1.036 ***<br>(0.06) | 1.00 ***<br>(0.13) | 0.72 ***<br>(0.16) |
| time effect | 2004 | 0.00<br>(0.04) | -0.18 ***<br>(0.04) | 0.09<br>(0.10) | -0.22 **<br>(0.08) |
| time effect | 2005 | 0.11 *<br>(0.04) | | 0.21 **<br>(0.09) | |
| time effect | 2006 | 0.09 **<br>(0.04) | | 0.27 ***<br>(0.08) | |
| time effect | 2007 | 0.05<br>(0.03) | 0.07 **<br>(0.03) | 0.11<br>(0.07) | -0.01<br>(0.04) |
| time effect | 2008 | | 0.12 ***<br>(0.04) | | 0.09<br>(0.04) |
| constant | _cons | 0.40 ***<br>(0.17) | -0.00<br>(0.20) | 0.69 *<br>(0.41) | 0.40<br>(0.17) |

Note: *** significant at 1%; ** significant at 5%; * significant at 10%, robust standard errors are reported in parenthesis..

Looking at the FEVD (column 1) estimation results they suggest that the formation of CEFTA had a significant positive effect on BH's imports. However, relying on the FEVD model estimation (column 1) and not checking for the test diagnostics could result in wrong conclusions being drawn. The conclusion from FEVD would suggest that in a short period of time (2006 to 2008) the establishment of CEFTA resulted in an 11.3% increase in the import flows from other CEFTA members. Since the test diagnostics do not confirm that model is correctly specified, these FEVD findings cannot be considered as valid. In contrast, based on the FEVDA finding (column 2) we can only suggest that CEFTA has a positive sign . What would be suggested to be more confident in our results is to increase our data sample, but first we will assess the other findings from our small sample model.

BH exports

Turning to the exports model and looking at the third and fourth column of Table A6.1 it is evident from the diagnostics on the FEVD exports model, particularly BPCW; IM-test; Ramsey RESET test and the VIF check, that some further improvements of the exports model are necessary. Hence we applied our FEVDA to exports too. In the third and fourth column of the Table A6.2 we presented BH exports flow results from our main exports model estimation. Hence in the FEVDA we first tested to see whether the CFRs hold (Appendix 6.4, under model improvements).

For OLS specification:

```
_b[L_bh_exp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]
               chi2(1) =        0.23
           Prob > chi2 =        0.6328

_b[L_bh_exp]*_b[ gdppc] = -_b[ L_gdppc]
               chi2(1) =        0.06
           Prob > chi2 =        0.8038
```

For FE specification:

```
_b[L_bh_exp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]
              F(1, 74) =        1.44
              Prob > F =        0.2337

_b[L_bh_exp]*_b[ gdppc] = -_b[ L_gdppc]
              F(1, 74) =        2.82
              Prob > F =        0.0975
```

Since the CFRs hold, the unobserved components model is the correct model to estimate. An additional support for the unobserved components model estimation is that in the full dynamic estimation the t-statistic on the lagged dependent variable is rather low (Appendix 6.4, in model improvements), while if the dynamic model is appropriate the lagged dependent variable should have a large and significant t-value. This suggests that the dynamics in the model arise from unobserved variables, in which case, given that the CFRs cannot be rejected, the appropriate strategy is to estimate an unobserved components model.

Based on our findings (Table A6.2, column 4) it is noticeable that coefficient estimates on the income elasticities have a more plausible size than the FEDV estimates (column 3). All the coefficients are found to be statistically significant, except for distance, CEFTA and BH VAT, and they are all with the expected sign (Table A6.2, column 4). Looking at the CEFTA coefficient (Table A6.2, column 4) we find that it is not significant, and since all other diagnostics, besides the VIF check, are not supportive of these estimates we cannot confirm that CEFTA had an affect on BH exports in the observed period of time.

FBH Trade

A similar problem to that found with BH exports data is detected with both FBH and RS. We present FBH imports and exports diagnostic tests and checks in Table A6.3 while the estimation results are presented in Table A6.4 As can be seen from Table A6.3 the test diagnostics suggest that both FEVD and FEVDA on the main FBH import equations model results should not to be considered as valid, since all diagnostics have failed to support the model (column 1 and 2).

Table A6.3: Test diagnostics for FBH import and export flows with FEVD and FEVDA procedure

| Estimation technique: | | FEVD | FEVDA | FEVD | FEVDA |
|---|---|---|---|---|---|
| Hypothesis | Diagnostic tests: | FBH imports | FBH imports | FBH exports | FBH exports |
| | | 1 | 2 | 3 | 4 |
| Ho: constant variance | Breusch-Pagan/ Cook-Weinsberg Prob>Chi sqr. | 0.00 | 0.00 | 0.04 | 0.00 |
| Ho: normal distribution | Cameron & Trivedi's IM-test | | | | |
| | Heteroscedasticity | 0.07 | 0.04 | 0.26 | 0.53 |
| | Skewness | 0.22 | 0.07 | 0.95 | 0.79 |
| | Kurtosis | 0.20 | 0.24 | 0.04 | 0.06 |
| Ho: model has no omitted variables | Ramsey RESET Prob>F | 0.00 | 0.00 | 0.94 | 0.64 |
| Ho: no first-order autocorrelation | Wooldridge test Prob>F | 0.00 | 0.00 | 0.00 | 0.01 |
| | Mean VIF | 15.01 | 6.89 | 30.80 | 6.36 |
| R-squared | | 0.97 | 0.96 | 0.93 | 0.94 |
| observations | | 105.00 | 84.00 | 105.00 | 84.00 |

Still the CFR suggests that unobserved components model is the correct model to estimate for both FBH imports (Appendix 6.5, in the model improvements) and exports (Appendix 6.6, in the model improvements). In contrast, the diagnostics for the FBH export model estimation are all supportive, except for the BPCW heteroscedasticity test as can be seen from table A6.4 (column 3 and 4) and the VIF check. Based on the FBH exports FEVDA results (Table A6.4, column 4) we can conclude that all variables have the expected sign and that they are statistically significant at 1% level. Time dummies are all found to be insignificant (Table A6.4, column 4).

Table A6.4: FBH import and export flows with FEVD and FEVDA procedure

| Estimation technique: | | FEVD | FEVDA | FEVD | FEVDA |
|---|---|---|---|---|---|
| Descripiton | Variables | FBH imports | FBH imports | FBH exports | FBH exports |
| | | 1 | 2 | 3 | 4 |
| Income | log(fbh_gdp) | -2.99 ***<br>(0.24) | 2.82 ***<br>(0.16) | -2.09 ***<br>(0.24) | 0.62 ***<br>(0.06) |
| Linder | log(gdppc) | 3.68 ***<br>(0.23) | -2.82 ***<br>(0.19) | 4.93 ***<br>(0.34) | 2.46 ***<br>(0.22) |
| Distance | log(distance) | 5.39 ***<br>(0.44) | -3.86 ***<br>(0.19) | -0.42 *<br>(0.24) | -3.86 ***<br>(0.20) |
| Common country | d_cc | -0.02<br>(0.05) | 1.06 ***<br>(0.07) | -0.06<br>(0.07) | 0.51 ***<br>(0.06) |
| Border | d_bor | 2.34 ***<br>(0.15) | -0.93 ***<br>(0.11) | 1.51 ***<br>(0.12) | 0.20 ***<br>(0.04) |
| CEFTA | cefta06 | 0.23 **<br>(0.09) | 0.24 **<br>(0.10) | -0.22 **<br>(0.06) | -0.25 ***<br>(0.06) |
| VAT | vat_bh | 0.59 ***<br>(0.04) | -0.25 ***<br>(0.05) | 1.01<br>(0.09) | 0.37 ***<br>(0.05) |
| Unit effect | unit effect | 1.00 ***<br>(0.06) | 1.03 ***<br>(0.08) | 1.00 ***<br>(0.07) | 0.91 ***<br>(0.09) |
| time effect | 2004 | 0.13 **<br>(0.04) | -0.18 ***<br>(0.06) | 0.21 ***<br>(0.08) | -0.09<br>(0.07) |
| time effect | 2005 | 0.45 ***<br>(0.04) | | 0.37 ***<br>(0.08) | |
| time effect | 2006 | | 0.08 **<br>(0.04) | 0.20 ***<br>(0.06) | -0.06<br>(0.04) |
| time effect | 2007 | 0.23 ***<br>(0.05) | | | |
| time effect | 2008 | n/a | n/a | n/a | n/a |
| constant | _cons | -1.57 ***<br>(0.28) | -1.57<br>(0.28) | 9.49<br>(0.49) | 7.78 ***<br>(0.51) |

Note: *** significant at 1%; ** significant at 5%; * significant at 10%, robust standard errors are reported in parenthesis.

Since our main interest is in the CEFTA membership and its impact on FBH trade flows here we find that CEFTA has a negative and significant effect on FBH exports (Table A6.4, column 4) in the observed time period. We cannot confirm this pattern in either BH exports or RS export flows (Table A6.5, Appendix 6.7) since the test diagnostics are unsupportive of the estimation results.

RS Trade

Diagnostics from Table A6.5 (Appendix 6.7) and estimation results presented in Table A6.6 (Appendix 6.7) suggest that multicollinearity could be a problem in the RS estimation results. A high value of the estimated coefficients also suggests that the estimation results may not be valid for either imports or exports. Details of the whole estimation procedure are provided in the Appendix 6.7 for the RS's imports and in the Appendix 6.8 for the RS's exports. The reasons why our results are quite mixed could be that our data sample is small for both entities. Another reason could be that there is just not enough variation in the data sample. Hence our findings suggest the importance of taking seriously the requirement that estimated models must be valid with respect to the statistical assumptions of linear modelling.

To pursue our investigation, we increase our data sample with more countries. We decided to increase the data sample with other Western Balkan countries and then by introducing interaction terms we check the consistency of the directly estimated CEFTA coefficient for BH (Table A6.1) with the CEFTA coefficient for BH derived from estimating the Western Balkan model (Table 6.7).

APPENDIX 6.3: Bosnia and Herzegovina imports

***stage one as suggested in the literature, FE model***

```
. xtreg bh_imp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh dum2-dum6, fe

Fixed-effects (within) regression               Number of obs      =       126
Group variable: code                            Number of groups   =        21
R-sq:  within  = 0.5719                         Obs per group: min =         6
       between = 0.0386                                        avg =       6.0
       overall = 0.0439                                        max =         6
                                                F(8,97)            =     16.19
corr(u_i, Xb)  = -0.8394                        Prob > F           =    0.0000
------------------------------------------------------------------------------
      bh_imp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   1.956244   1.512815     1.29   0.199    -1.046275    4.958764
       gdppc |  -1.479699   1.363797    -1.08   0.281    -4.186459    1.227062
    distance |  (dropped)
        d_cc |  (dropped)
       d_bor |  (dropped)
   d_cefta06 |   .1063039   .0584015     1.82   0.072     -.009607    .2222148
      vat_bh |  -.0722578   .3300305    -0.22   0.827     -.727277    .5827614
        dum2 |    .001916   .0640895     0.03   0.976     -.125284     .129116
        dum3 |   .1133721   .1006125     1.13   0.263    -.0863159    .3130601
        dum4 |   .0895241    .163438     0.55   0.585    -.2348551    .4139033
        dum5 |   .0528888   .0915326     0.58   0.565    -.1287781    .2345557
        dum6 |  (dropped)
       _cons |  -7.625378    7.21471    -1.06   0.293    -21.94458    6.693823
-------------+----------------------------------------------------------------
     sigma_u |  1.3436332
     sigma_e |  .13573171
         rho |  .98989836   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(20, 97) =    44.53              Prob > F = 0.0000

.  xtreg  bh_imp  fbh_gdp  gdppc  distance  d_cc  d_bor  d_cefta06  vat_bh  dum2-dum6,  fe
vce(robust)

Fixed-effects (within) regression               Number of obs      =       126
Group variable: code                            Number of groups   =        21
R-sq:  within  = 0.5719                         Obs per group: min =         6
       between = 0.0386                                        avg =       6.0
       overall = 0.0439                                        max =         6
                                                F(8,97)            =     17.59
corr(u_i, Xb)  = -0.8394                        Prob > F           =    0.0000
                                   (Std. Err. adjusted for clustering on code)
------------------------------------------------------------------------------
             |               Robust
      bh_imp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   1.956244   1.161686     1.68   0.095    -.3493809     4.26187
       gdppc |  -1.479699   1.032286    -1.43   0.155      -3.5285    .5691028
    distance |  (dropped)
        d_cc |  (dropped)
       d_bor |  (dropped)
   d_cefta06 |   .1063039   .0696541     1.53   0.130    -.0319402    .2445479
      vat_bh |  -.0722578   .2543244    -0.28   0.777    -.5770212    .4325056
        dum2 |    .001916   .0593383     0.03   0.974    -.1158541     .119686
        dum3 |   .1133721   .0874348     1.30   0.198    -.0601618    .2869059
        dum4 |   .0895241   .1225938     0.73   0.467    -.1537907     .332839
        dum5 |   .0528888   .0741345     0.71   0.477    -.0942477    .2000252
        dum6 |  (dropped)
       _cons |  -7.625378   5.549803    -1.37   0.173     -18.6402    3.389445
-------------+----------------------------------------------------------------
     sigma_u |  1.3436332
```

```
     sigma_e |  .13573171
         rho |  .98989836   (fraction of variance due to u_i)
------------------------------------------------------------------------------

.
. *stage two, fixed effects obtained from stage one*

. predict Fixed_effects, u

. reg Fixed_effects distance d_cc d_bor

      Source |       SS       df       MS              Number of obs =     126
-------------+------------------------------           F(  3,   122) =  158.82
       Model |  172.478641     3  57.4928804           Prob > F      =  0.0000
    Residual |  44.1633733   122  .361994863           R-squared     =  0.7961
-------------+------------------------------           Adj R-squared =  0.7911
       Total |  216.642015   125  1.73313612           Root MSE      =  .60166

------------------------------------------------------------------------------
Fixed_effe~s |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    distance |  -2.649291   .1908344   -13.88   0.000    -3.027067   -2.271515
        d_cc |   .9447497   .2048645     4.61   0.000     .5391999    1.350299
       d_bor |  -.2549898   .2476357    -1.03   0.305    -.7452093    .2352297
       _cons |   8.027825    .612682    13.10   0.000      6.81496     9.24069
------------------------------------------------------------------------------


. *stage three, residuals obtained from stage two*

. predict resid_stage2, residuals

. reg bh_imp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh resid_stage2 dum2-dum6

      Source |       SS       df       MS              Number of obs =     126
-------------+------------------------------           F( 12,   113) =  353.08
       Model |   67.004608    12  5.58371733           Prob > F      =  0.0000
    Residual |  1.78704032   113  .015814516           R-squared     =  0.9740
-------------+------------------------------           Adj R-squared =  0.9713
       Total |  68.7916483   125  .550333186           Root MSE      =  .12576

------------------------------------------------------------------------------
      bh_imp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   1.956244   .0517141    37.83   0.000     1.853789    2.058699
       gdppc |  -1.479699   .0583778   -25.35   0.000    -1.595355   -1.364042
    distance |  -2.649291   .0921934   -28.74   0.000    -2.831943   -2.466639
        d_cc |   .9447496   .0441458    21.40   0.000     .8572889     1.03221
       d_bor |  -.2549899   .0620712    -4.11   0.000    -.3779641   -.1320156
   d_cefta06 |   .1063039   .0506546     2.10   0.038      .005948    .2066598
      vat_bh |  -.0722578   .0431523    -1.67   0.097    -.1577503    .0132347
resid_stage2 |          1   .0310464    32.21   0.000     .9384916    1.061508
        dum2 |    .001916   .0388437     0.05   0.961    -.0750403    .0788723
        dum3 |   .1133721   .0389328     2.91   0.004     .0362391    .1905051
        dum4 |   .0895241   .0391916     2.28   0.024     .0118785    .1671697
        dum5 |   .0528888   .0389133     1.36   0.177    -.0242055     .129983
        dum6 |  (dropped)
       _cons |   .4024469   .1337526     3.01   0.003     .1374588     .667435
------------------------------------------------------------------------------

. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of bh_imp

         chi2(1)      =    52.78
         Prob > chi2  =   0.0000

. imtest

Cameron & Trivedi's decomposition of IM-test
```

```
---------------------------------------------------
              Source |       chi2     df      p
---------------------+-----------------------------
  Heteroskedasticity |      86.76     65    0.0370
            Skewness |      18.02     12    0.1150
            Kurtosis |       5.20      1    0.0225
---------------------+-----------------------------
               Total |     109.99     78    0.0099
---------------------------------------------------

. ovtest

Ramsey RESET test using powers of the fitted values of bh_imp
       Ho:  model has no omitted variables
                 F(3, 110) =      5.49
                  Prob > F =      0.0015

. vif

    Variable |       VIF       1/VIF
-------------+----------------------
     fbh_gdp |     13.58    0.073622
    distance |      8.69    0.115103
       gdppc |      7.09    0.141098
      vat_bh |      3.71    0.269611
resid_stage2 |      2.69    0.371512
       d_bor |      2.65    0.378059
        d_cc |      2.39    0.417673
   d_cefta06 |      2.14    0.466417
        dum4 |      1.70    0.588345
        dum3 |      1.68    0.596191
        dum5 |      1.68    0.596791
        dum2 |      1.67    0.598931
-------------+----------------------
    Mean VIF |      4.14

.
. reg bh_imp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh resid_stage2 dum2-dum6,
vce(robust)

Linear regression                                      Number of obs =     126
                                                       F( 12,   113) =  314.85
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.9740
                                                       Root MSE      =  .12576

------------------------------------------------------------------------------
             |               Robust
      bh_imp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   1.956244     .06042    32.38   0.000     1.836542    2.075947
       gdppc |  -1.479699   .0676059   -21.89   0.000    -1.613638   -1.345759
    distance |  -2.649291   .0947007   -27.98   0.000     -2.83691   -2.461672
        d_cc |   .9447496   .0426401    22.16   0.000     .8602719    1.029227
       d_bor |  -.2549899   .0502114    -5.08   0.000    -.3544677    -.155512
   d_cefta06 |   .1063039   .0585087     1.82   0.072    -.0096124    .2222201
      vat_bh |  -.0722578   .0443912    -1.63   0.106    -.1602049    .0156893
resid_stage2 |          1   .0471978    21.19   0.000     .9064926    1.093507
        dum2 |    .001916   .0389606     0.05   0.961    -.0752719    .0791039
        dum3 |   .1133721   .0436358     2.60   0.011     .0269218    .1998224
        dum4 |   .0895241   .0408192     2.19   0.030     .0086538    .1703944
        dum5 |   .0528888   .0347491     1.52   0.131    -.0159555    .1217331
        dum6 |  (dropped)
       _cons |   .4024469   .1740469     2.31   0.023     .0576286    .7472653
------------------------------------------------------------------------------

. xtserial bh_imp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh dum2-dum6

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,      20) =     23.429
```

```
          Prob > F =      0.0001
```

```
. *Model improvements*
. *Testing and accounting for serial correlation*

. xtreg bh_imp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh dum2-dum6, fe

Fixed-effects (within) regression               Number of obs      =       126
Group variable: code                            Number of groups   =        21
R-sq:  within  = 0.5719                         Obs per group: min =         6
       between = 0.0386                                        avg =       6.0
       overall = 0.0439                                        max =         6
                                                F(8,97)            =     16.19
corr(u_i, Xb)  = -0.8394                        Prob > F           =    0.0000
------------------------------------------------------------------------------
      bh_imp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   1.956244   1.512815     1.29   0.199    -1.046275    4.958764
       gdppc |  -1.479699   1.363797    -1.08   0.281    -4.186459    1.227062
    distance |  (dropped)
        d_cc |  (dropped)
       d_bor |  (dropped)
   d_cefta06 |   .1063039   .0584015     1.82   0.072     -.009607    .2222148
      vat_bh |  -.0722578   .3300305    -0.22   0.827     -.727277    .5827614
        dum2 |    .001916   .0640895     0.03   0.976     -.125284     .129116
        dum3 |   .1133721   .1006125     1.13   0.263    -.0863159    .3130601
        dum4 |   .0895241    .163438     0.55   0.585    -.2348551    .4139033
        dum5 |   .0528888   .0915326     0.58   0.565    -.1287781    .2345557
        dum6 |  (dropped)
       _cons |  -7.625378    7.21471    -1.06   0.293    -21.94458    6.693823
-------------+----------------------------------------------------------------
     sigma_u |  1.3436332
     sigma_e |  .13573171
         rho |  .98989836   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(20, 97) =    44.53             Prob > F = 0.0000


. xtserial bh_imp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh dum2-dum6

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,      20) =     23.429
           Prob > F =      0.0001


. *testing the lagged model for CFR*

. generate float L_bh_imp = l.bh_imp
(21 missing values generated)

. generate float L_fbh_gdp = l.fbh_gdp
(21 missing values generated)

. generate float L_gdppc = l.gdppc
(21 missing values generated)


. *1)OLS*
.
. xtreg  bh_imp L_bh_imp fbh_gdp L_fbh_gdp gdppc L_gdppc d_cefta06 vat_bh dum2-dum6
note: dum3 dropped because of collinearity
note: dum6 dropped because of collinearity

Random-effects GLS regression                   Number of obs      =       105
Group variable: code                            Number of groups   =        21
R-sq:  within  = 0.4618                         Obs per group: min =         5
       between = 0.9975                                        avg =       5.0
       overall = 0.9673                                        max =         5
```

```
Random effects u_i ~ Gaussian                      Wald chi2(10)      =   2779.74
corr(u_i, X)       = 0 (assumed)                   Prob > chi2        =    0.0000
------------------------------------------------------------------------------
      bh_imp |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    L_bh_imp |   .9634564   .0237555    40.56   0.000     .9168966    1.010016
     fbh_gdp |  -.5643482   2.374236    -0.24   0.812    -5.217766    4.089069
   L_fbh_gdp |   .5958155   2.377066     0.25   0.802    -4.063148    5.254779
       gdppc |   .0096112   2.205003     0.00   0.997    -4.312116    4.331338
     L_gdppc |  -.0843095   2.196777    -0.04   0.969    -4.389914    4.221295
   d_cefta06 |   -.045115   .0501035    -0.90   0.368     -.143316    .0530859
      vat_bh |  -.1063562   .0747994    -1.42   0.155    -.2529603    .0402478
        dum2 |  -.1116664   .0440878    -2.53   0.011    -.1980768    -.025256
        dum4 |   -.025004   .0434577    -0.58   0.565    -.1101795    .0601715
        dum5 |   .0150479   .0432963     0.35   0.728    -.0698113     .099907
       _cons |   .1402297   .1257937     1.11   0.265    -.1063213    .3867808
-------------+----------------------------------------------------------------
     sigma_u |          0
     sigma_e |   .1192694
         rho |          0   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. testnl _b[L_bh_imp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

  (1)  _b[L_bh_imp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

               chi2(1) =        0.34
           Prob > chi2 =        0.5588

. testnl _b[L_bh_imp]*_b[ gdppc] = -_b[ L_gdppc]

  (1)  _b[L_bh_imp]*_b[ gdppc] = -_b[ L_gdppc]

               chi2(1) =        0.72
           Prob > chi2 =        0.3974


. *2)FE*
.
. xtreg  bh_imp L_bh_imp fbh_gdp L_fbh_gdp gdppc L_gdppc d_cefta06 vat_bh dum2-dum6, fe

Fixed-effects (within) regression                  Number of obs      =       105
Group variable: code                               Number of groups   =        21
R-sq:  within  = 0.5661                            Obs per group: min =         5
       between = 0.3062                                           avg =       5.0
       overall = 0.3159                                           max =         5
                                                   F(10,74)           =      9.66
corr(u_i, Xb)  = -0.2549                           Prob > F           =    0.0000
------------------------------------------------------------------------------
      bh_imp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    L_bh_imp |   .3520773   .1094242     3.22   0.002     .1340448    .5701099
     fbh_gdp |    .015395   3.867547     0.00   0.997    -7.690861    7.721651
   L_fbh_gdp |   .7148204   3.914965     0.18   0.856    -7.085918    8.515559
       gdppc |  -.6506262   3.383263    -0.19   0.848    -7.391925    6.090673
     L_gdppc |  -.1106349   3.434021    -0.03   0.974    -6.953072    6.731802
   d_cefta06 |   .0054776   .0654775     0.08   0.934    -.1249892    .1359444
      vat_bh |  -.0527099   .1948888    -0.27   0.788    -.4410343    .3356144
        dum2 |  -.1343727   .0727687    -1.85   0.069    -.2793675    .0106222
        dum3 |  (dropped)
        dum4 |  -.0200603   .1066028    -0.19   0.851    -.2324711    .1923505
        dum5 |  (dropped)
        dum6 |  -.0157044   .1100772    -0.14   0.887    -.2350381    .2036293
       _cons |  -2.031576   9.620679    -0.21   0.833     -21.2012    17.13804
-------------+----------------------------------------------------------------
     sigma_u |   .6178625
     sigma_e |   .1192694
         rho |  .96407592   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(20, 74) =     2.48             Prob > F = 0.0026
```

```
. testnl _b[L_bh_imp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

  (1)  _b[L_bh_imp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

              F(1, 74) =        0.07
              Prob > F =        0.7989

. testnl _b[L_bh_imp]*_b[ gdppc] = -_b[ L_gdppc]

  (1)  _b[L_bh_imp]*_b[ gdppc] = -_b[ L_gdppc]

              F(1, 74) =        0.02
              Prob > F =        0.8923
```

```
. *first stage: AR1 correction*
```

```
. xtregar bh_imp fbh_gdp gdppc d_cefta06 vat_bh dum2-dum6,fe rhotype(dw) lbi
note: dum4 dropped because of collinearity

FE (within) regression with AR(1) disturbances  Number of obs      =       105
Group variable: code                            Number of groups   =        21
R-sq:  within  = 0.2477                         Obs per group: min =         5
       between = 0.1887                                        avg =       5.0
       overall = 0.1558                                        max =         5
                                                F(7,77)            =      3.62
corr(u_i, Xb)  = -0.6848                        Prob > F           =    0.0020
------------------------------------------------------------------------------
      bh_imp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |  -.3768441   2.715623    -0.14   0.890     -5.78434    5.030651
       gdppc |   -.028689   2.441545    -0.01   0.991    -4.890426    4.833048
   d_cefta06 |  -.0040496   .0720769    -0.06   0.955     -.147573    .1394739
      vat_bh |  (dropped)
        dum2 |  -.1049639   .0941695    -1.11   0.268    -.2924793    .0825516
        dum3 |  -.0015564   .0995701    -0.02   0.988    -.1998257     .196713
        dum5 |   .0622217   .1237046     0.50   0.616    -.1841057    .3085491
        dum6 |   .1194299   .2602358     0.46   0.648    -.3987657    .6376255
       _cons |   4.164327   7.107391     0.59   0.560    -9.988297    18.31695
-------------+----------------------------------------------------------------
      rho_ar |  .46513953
     sigma_u |  .89750195
     sigma_e |  .11810026
     rho_fov |  .98297938   (fraction of variance because of u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(20,77) =    36.40             Prob > F = 0.0000
modified Bhargava et al. Durbin-Watson = 1.1169492
Baltagi-Wu LBI = 1.4915079
```

```
. *AR1 correction with two steps*
```

```
. xtregar bh_imp fbh_gdp gdppc d_cefta06 vat_bh dum2-dum6,fe rhotype(dw) twostep lbi
note: dum4 dropped because of collinearity

FE (within) regression with AR(1) disturbances  Number of obs      =       105
Group variable: code                            Number of groups   =        21
R-sq:  within  = 0.2610                         Obs per group: min =         5
       between = 0.2898                                        avg =       5.0
       overall = 0.2021                                        max =         5
                                                F(7,77)            =      3.88
corr(u_i, Xb)  = -0.6434                        Prob > F           =    0.0011
------------------------------------------------------------------------------
      bh_imp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |  -.0726709    2.64683    -0.03   0.978    -5.343183    5.197841
       gdppc |  -.2700399   2.380795    -0.11   0.910    -5.010808    4.470728
   d_cefta06 |  -.0023757    .071147    -0.03   0.973    -.1440474    .1392961
      vat_bh |  (dropped)
        dum2 |  -.0990057   .0967802    -1.02   0.310    -.2917197    .0937083
```

```
        dum3 |    .006629   .1002624     0.07   0.947    -.1930189    .2062769
        dum5 |   .0509215   .1227986     0.41   0.680    -.1936016    .2954447
        dum6 |   .0943252   .2571302     0.37   0.715    -.4176865    .6063369
       _cons |   2.655938   7.229876     0.37   0.714    -11.74059    17.05246
-------------+----------------------------------------------------------------
      rho_ar |  .44152541
     sigma_u |  .82560835
     sigma_e |  .11775009
     rho_fov |  .98006442   (fraction of variance because of u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(20,77) =    40.01               Prob > F = 0.0000
modified Bhargava et al. Durbin-Watson = 1.1169492
Baltagi-Wu LBI = 1.4915079
```

. *FE from AR1 correction with two steps*

```
. predict FEAR1_correct, u
(21 missing values generated)
(21 missing values generated)
```

. *second stage*

```
. reg FEAR1_correct distance d_cc d_bor

      Source |       SS       df       MS              Number of obs =     105
-------------+------------------------------           F(  3,   101) =    7.04
       Model |  11.3831138     3  3.79437125           Prob > F      =  0.0002
    Residual |   54.429187   101  .538902841           R-squared     =  0.1730
-------------+------------------------------           Adj R-squared =  0.1484
       Total |  65.8123007   104  .632810584           Root MSE      =   .7341

------------------------------------------------------------------------------
FEAR1_corr~t |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    distance |   .8176229   .2550653     3.21   0.002     .3116419    1.323604
        d_cc |   .4452351   .2738176     1.63   0.107    -.0979454    .9884156
       d_bor |   .8866547   .3309846     2.68   0.009     .2300702    1.543239
       _cons |  -2.694835   .8188979    -3.29   0.001    -4.319308   -1.070362
------------------------------------------------------------------------------

.
. predict FEAR1_resid_stage2, residuals
(21 missing values generated)
```

. *stage 3*

```
. reg bh_imp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh FEAR1_resid_stage2 dum2-
dum6

      Source |       SS       df       MS              Number of obs =     105
-------------+------------------------------           F( 11,    93) =  330.18
       Model |  52.3755987    11  4.76141807           Prob > F      =  0.0000
    Residual |  1.34111731    93  .014420616           R-squared     =  0.9750
-------------+------------------------------           Adj R-squared =  0.9721
       Total |   53.716716   104  .516506885           Root MSE      =  .12009

------------------------------------------------------------------------------
      bh_imp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |  -.1275488   .0622949    -2.05   0.043     -.251254   -.0038435
       gdppc |  -.2049628   .0433116    -4.73   0.000    -.2909711   -.1189545
    distance |    .868198   .1169582     7.42   0.000     .6359421    1.100454
        d_cc |   .4224982   .0491773     8.59   0.000     .3248418    .5201546
       d_bor |   .8856099   .0632286    14.01   0.000     .7600505    1.011169
   d_cefta06 |   .0403782   .0527329     0.77   0.446    -.0643389    .1450954
      vat_bh |   .0191402   .0390329     0.49   0.625    -.0583714    .0966519
FEAR1_resi~2 |   1.033631   .0370828    27.87   0.000     .9599916     1.10727
        dum2 |  -.1819115   .0371421    -4.90   0.000    -.2556682   -.1081547
        dum3 |  (dropped)
        dum4 |  (dropped)
```

```
        dum5 |    .068346   .0371909     1.84   0.069    -.0055078    .1421998
        dum6 |   .1213344   .0375679     3.23   0.002     .0467319    .1959369
       _cons |   .0128784   .1410684     0.09   0.927    -.2672554    .2930122
------------------------------------------------------------------------------

. estat hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of bh_imp

         chi2(1)      =    42.15
         Prob > chi2  =   0.0000

. estat imtest

Cameron & Trivedi's decomposition of IM-test

---------------------------------------------------
              Source |       chi2     df      p
---------------------+-----------------------------
  Heteroskedasticity |      67.36     58    0.1874
            Skewness |      13.77     11    0.2461
            Kurtosis |       3.55      1    0.0596
---------------------+-----------------------------
               Total |      84.68     70    0.1115
. estat ovtest

Ramsey RESET test using powers of the fitted values of bh_imp
       Ho:  model has no omitted variables
                  F(3, 90) =      0.37
                  Prob > F =      0.7784

. estat vif

    Variable |       VIF       1/VIF  
-------------+----------------------
     fbh_gdp |     17.78    0.056235
    distance |     12.78    0.078259
FEAR1_resi~2 |      5.19    0.192667
       gdppc |      3.39    0.295349
        d_cc |      2.72    0.368294
      vat_bh |      2.66    0.375597
       d_bor |      2.51    0.398678
   d_cefta06 |      2.48    0.403344
        dum6 |      1.64    0.608190
        dum5 |      1.61    0.620584
        dum2 |      1.61    0.622218
-------------+----------------------
    Mean VIF |      4.94


. xtserial bh_imp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh FEAR1_resid_stage2
dum2-dum6

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,      20) =     24.154
           Prob > F =      0.0001


. reg bh_imp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh FEAR1_resid_stage2 dum2-
dum6, vce(robust)

Linear regression                                      Number of obs =     105
                                                       F( 11,    93) =  299.18
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.9750
                                                       Root MSE      =  .12009

------------------------------------------------------------------------------
             |               Robust
```

```
      bh_imp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |  -.1275488   .0645944    -1.97   0.051    -.2558205     .000723
       gdppc |  -.2049628   .0350591    -5.85   0.000    -.2745832   -.1353424
    distance |    .868198   .1462119     5.94   0.000     .5778501    1.158546
        d_cc |   .4224982   .0345769    12.22   0.000     .3538353    .4911611
       d_bor |   .8856099   .0440319    20.11   0.000     .7981713    .9730486
   d_cefta06 |   .0403782    .061339     0.66   0.512    -.0814289    .1621853
      vat_bh |   .0191402    .038183     0.50   0.617    -.0566837    .0949642
FEAR1_resi~2 |   1.033631   .0550147    18.79   0.000     .9243824    1.142879
        dum2 |  -.1819115   .0439781    -4.14   0.000    -.2692433   -.0945797
        dum3 |  (dropped)
        dum4 |  (dropped)
        dum5 |    .068346   .0333178     2.05   0.043     .0021834    .1345086
        dum6 |   .1213344   .0366511     3.31   0.001     .0485526    .1941162
       _cons |   .0128784   .1806443     0.07   0.943    -.3458455    .3716022
------------------------------------------------------------------------------
```

```
. *because of evidence of serial correlation, test for CFR in the third stage*
```

```
. *1a)OLS*
```

```
.  xtreg    bh_imp  L_bh_imp  fbh_gdp  L_fbh_gdp  gdppc  L_gdppc  d_cefta06  vat_bh
FEAR1_resid_stage2 dum2-dum6
note: dum3 dropped because of collinearity
note: dum6 dropped because of collinearity

Random-effects GLS regression                   Number of obs      =       105
Group variable: code                            Number of groups   =        21

R-sq:  within  = 0.4732                         Obs per group: min =         5
       between = 0.9965                                        avg =       5.0
       overall = 0.9680                                        max =         5
Random effects u_i ~ Gaussian                   Wald chi2(11)      =   2816.27
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000
------------------------------------------------------------------------------
      bh_imp |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    L_bh_imp |   .9103609   .0431438    21.10   0.000     .8258006    .9949212
     fbh_gdp |   -1.16453    2.39474    -0.49   0.627    -5.858135    3.529074
   L_fbh_gdp |   1.202013   2.398211     0.50   0.616    -3.498395     5.90242
       gdppc |   .4352711   2.210537     0.20   0.844    -3.897303    4.767845
     L_gdppc |  -.5552738   2.206694    -0.25   0.801    -4.880314    3.769767
   d_cefta06 |  -.0067963   .0562037    -0.12   0.904    -.1169536     .103361
      vat_bh |  -.0900173   .0751672    -1.20   0.231    -.2373423    .0573077
FEAR1_resi~2 |   .0841534   .0572328     1.47   0.141    -.0280209    .1963277
        dum2 |  -.1144299   .0438581    -2.61   0.009    -.2003901   -.0284697
        dum4 |  -.0308109   .0433717    -0.71   0.477     -.115818    .0541961
        dum5 |   .0112594   .0431082     0.26   0.794    -.0732311    .0957498
       _cons |   .2520246   .1463272     1.72   0.085    -.0347715    .5388206
-------------+----------------------------------------------------------------
     sigma_u |          0
     sigma_e |   .1192694
         rho |          0   (fraction of variance due to u_i)
------------------------------------------------------------------------------


. testnl _b[L_bh_imp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

  (1)  _b[L_bh_imp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

               chi2(1) =        0.40
           Prob > chi2 =        0.5259

. testnl _b[L_bh_imp]*_b[ gdppc] = -_b[ L_gdppc]

  (1)  _b[L_bh_imp]*_b[ gdppc] = -_b[ L_gdppc]

               chi2(1) =        0.61
           Prob > chi2 =        0.4364
```

```
. *2a)FE*
.  xtreg    bh_imp  L_bh_imp  fbh_gdp  L_fbh_gdp  gdppc  L_gdppc  d_cefta06  vat_bh
FEAR1_resid_stage2 dum2-dum6, fe

Fixed-effects (within) regression               Number of obs      =       105
Group variable: code                            Number of groups   =        21
R-sq:  within  = 0.5661                         Obs per group: min =         5
       between = 0.3062                                        avg =       5.0
       overall = 0.3159                                        max =         5
                                                F(10,74)           =      9.66
corr(u_i, Xb)  = -0.2549                        Prob > F           =    0.0000
------------------------------------------------------------------------------
      bh_imp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    L_bh_imp |   .3520773   .1094242     3.22   0.002     .1340448    .5701099
     fbh_gdp |    .015395   3.867547     0.00   0.997    -7.690861    7.721651
   L_fbh_gdp |   .7148204   3.914965     0.18   0.856    -7.085918    8.515559
       gdppc |  -.6506262   3.383263    -0.19   0.848    -7.391925    6.090673
     L_gdppc |  -.1106349   3.434021    -0.03   0.974    -6.953072    6.731802
   d_cefta06 |   .0054776   .0654775     0.08   0.934    -.1249892    .1359444
      vat_bh |  -.0527099   .1948888    -0.27   0.788    -.4410343    .3356144
FEAR1_resi~2 |  (dropped)
        dum2 |  -.1343727   .0727687    -1.85   0.069    -.2793675    .0106222
        dum3 |  (dropped)
        dum4 |  -.0200603   .1066028    -0.19   0.851    -.2324711    .1923505
        dum5 |  (dropped)
        dum6 |  -.0157044   .1100772    -0.14   0.887    -.2350381    .2036293
       _cons |  -2.031576   9.620679    -0.21   0.833     -21.2012    17.13804
-------------+----------------------------------------------------------------
     sigma_u |   .6178625
     sigma_e |   .1192694
         rho |  .96407592   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(20, 74) =     2.34             Prob > F = 0.0045


. testnl _b[L_bh_imp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

  (1)  _b[L_bh_imp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

              F(1, 74) =        0.07
              Prob > F =        0.7989

. testnl _b[L_bh_imp]*_b[ gdppc] = -_b[ L_gdppc]

  (1)  _b[L_bh_imp]*_b[ gdppc] = -_b[ L_gdppc]

              F(1, 74) =        0.02
              Prob > F =        0.8923


. *Prais-Winston for the consistency with the OLS*

. prais bh_imp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh FEAR1_resid_stage2
dum2-dum6, rhotype(regress) vce(robust)
note: dum3 dropped because of collinearity
note: dum4 dropped because of collinearity

Number of gaps in sample:  20   (gap count includes panel changes)
(note: computations for rho restarted at each gap)

Iteration 0:  rho = 0.0000
Iteration 1:  rho = 0.1327
Iteration 2:  rho = 0.1383
Iteration 3:  rho = 0.1386
Iteration 4:  rho = 0.1386
Iteration 5:  rho = 0.1386

Prais-Winsten AR(1) regression -- iterated estimates
```

```
Linear regression                                      Number of obs =     105
                                                       F( 12,    93) = 6229.24
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.9690
                                                       Root MSE      =  .11878
------------------------------------------------------------------------------
             |             Semi-robust
      bh_imp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |  -.1273958   .0729956    -1.75   0.084    -.2723506    .0175591
       gdppc |  -.2039247   .0396501    -5.14   0.000    -.2826619   -.1251876
    distance |   .8729739    .164587     5.30   0.000     .5461367    1.199811
        d_cc |    .426042   .0399516    10.66   0.000      .346706     .505378
       d_bor |   .8891302   .0510829    17.41   0.000     .7876897    .9905707
   d_cefta06 |   .0399267   .0659276     0.61   0.546    -.0909923    .1708458
      vat_bh |   .0192473   .0352237     0.55   0.586    -.0506999    .0891945
FEAR1_resi~2 |   1.036415   .0606593    17.09   0.000     .9159577    1.156872
        dum2 |  -.1818838   .0400076    -4.55   0.000     -.261331   -.1024366
        dum5 |   .0683394   .0311492     2.19   0.031     .0064832    .1301955
        dum6 |   .1213321   .0365829     3.32   0.001     .0486857    .1939785
       _cons |  -.0042517   .2023762    -0.02   0.983    -.4061308    .3976273
-------------+----------------------------------------------------------------
         rho |   .1385974
------------------------------------------------------------------------------
Durbin-Watson statistic (original)    1.312458
Durbin-Watson statistic (transformed) 1.445490
```

# APPENDIX 6.4: Bosnia and Herzegovina exports

## Bosnia and Herzegovina exports

```
. *stage one as suggested in the literature, FE model*
.
. xtreg bh_exp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh dum2-dum6, fe

Fixed-effects (within) regression               Number of obs      =       126
Group variable: code                            Number of groups   =        21
R-sq:  within  = 0.4078                         Obs per group: min =         6
       between = 0.0353                                        avg =       6.0
       overall = 0.0373                                        max =         6
                                                F(8,97)            =      8.35
corr(u_i, Xb)  = -0.9547                        Prob > F           =    0.0000
------------------------------------------------------------------------------
      bh_exp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   4.080805   3.731995     1.09   0.277    -3.326172    11.48778
       gdppc |  -2.218714   3.183371    -0.70   0.487    -8.536823    4.099396
    distance |  (dropped)
        d_cc |  (dropped)
       d_bor |  (dropped)
   d_cefta06 |  -.0691952   .1367427    -0.51   0.614    -.3405916    .2022012
      vat_bh |  -.1603939   .7871823    -0.20   0.839    -1.722733    1.401945
        dum2 |   .0881556   .1506991     0.58   0.560    -.2109404    .3872515
        dum3 |   .2099806   .2404764     0.87   0.385    -.2672985    .6872598
        dum4 |   .2690542   .3888662     0.69   0.491    -.5027376    1.040846
        dum5 |   .1144067   .2149467     0.53   0.596    -.3122029    .5410164
        dum6 |  (dropped)
       _cons |  -18.68716   17.36329    -1.08   0.284    -53.14848    15.77416
-------------+----------------------------------------------------------------
     sigma_u |  2.5318711
     sigma_e |  .30733154
         rho |   .9854796   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(20, 97) =     3.93              Prob > F = 0.0000
```

```
.  xtreg  bh_exp  fbh_gdp  gdppc  distance  d_cc  d_bor  d_cefta06  vat_bh  dum2-dum6,  fe
vce(robust)

Fixed-effects (within) regression               Number of obs      =       126
Group variable: code                            Number of groups   =        21
R-sq:  within  = 0.4078                         Obs per group: min =         6
       between = 0.0353                                        avg =       6.0
       overall = 0.0373                                        max =         6
                                                F(8,97)            =     21.10
corr(u_i, Xb)  = -0.9547                        Prob > F           =    0.0000
                                   (Std. Err. adjusted for clustering on code)
------------------------------------------------------------------------------
             |               Robust
      bh_exp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   4.080805   3.395097     1.20   0.232    -2.657523    10.81913
       gdppc |  -2.218714   3.114966    -0.71   0.478    -8.401059    3.963632
    distance |  (dropped)
        d_cc |  (dropped)
       d_bor |  (dropped)
   d_cefta06 |  -.0691952   .1350358    -0.51   0.610    -.3372039    .1988135
      vat_bh |  -.1603939   .7436999    -0.22   0.830    -1.636432    1.315645
        dum2 |   .0881556     .14232     0.62   0.537    -.1943103    .3706214
        dum3 |   .2099806   .2240381     0.94   0.351    -.2346729    .6546341
        dum4 |   .2690542   .3709469     0.73   0.470    -.4671727    1.005281
        dum5 |   .1144067   .2057499     0.56   0.579      -.29395    .5227634
        dum6 |  (dropped)
       _cons |  -18.68716   15.77089    -1.18   0.239    -49.98802    12.61369
```

```
-------------+----------------------------------------------------------------
     sigma_u |  2.5318711
     sigma_e |  .30733154
         rho |   .9854796   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

```
. *stage two, fixed effects obtained from stage one*

. predict Fixed_effects, u

.
. reg Fixed_effects distance d_cc d_bor

      Source |       SS       df       MS              Number of obs =     126
-------------+------------------------------           F(  3,   122) =  154.77
       Model |  609.182582     3  203.060861           Prob > F      =  0.0000
    Residual |  160.061947   122  1.31198317           R-squared     =  0.7919
-------------+------------------------------           Adj R-squared =  0.7868
       Total |   769.24453   125  6.15395624           Root MSE      =  1.1454

------------------------------------------------------------------------------
Fixed_effe~s |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    distance |   -6.37948   .4432343   -14.39   0.000    -7.256907   -5.502054
        d_cc |   1.467729   .4009261     3.66   0.000     .6740562    2.261403
       d_bor |  -1.309932   .4732964    -2.77   0.007     -2.24687   -.3729945
       _cons |   19.37994   1.406179    13.78   0.000     16.59626    22.16361
------------------------------------------------------------------------------
```

```
. *stage three, residuals obtained from stage two*

. predict resid_stage2, residuals

. reg bh_exp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh resid_stage2 dum2-dum6

      Source |       SS       df       MS              Number of obs =     126
-------------+------------------------------           F( 12,   113) =   73.10
       Model |  71.1229833    12  5.92691528           Prob > F      =  0.0000
    Residual |  9.16190949   113  .081078845           R-squared     =  0.8859
-------------+------------------------------           Adj R-squared =  0.8738
       Total |  80.2848928   125  .642279142           Root MSE      =  .28474

------------------------------------------------------------------------------
      bh_exp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   4.080806   .3604815    11.32   0.000     3.366627    4.794985
       gdppc |  -2.218714    .302719    -7.33   0.000    -2.818455   -1.618973
    distance |  -6.379481   .5044652   -12.65   0.000    -7.378917   -5.380044
        d_cc |   1.467729   .1302397    11.27   0.000     1.209701    1.725758
       d_bor |  -1.309932   .2187817    -5.99   0.000    -1.743378    -.876486
   d_cefta06 |  -.0691952   .1066185    -0.65   0.518    -.2804257    .1420353
      vat_bh |   -.160394   .1200089    -1.34   0.184    -.3981532    .0773653
resid_stage2 |          1   .1045019     9.57   0.000      .792963    1.207037
        dum2 |   .0881555   .0885962     1.00   0.322    -.0873695    .2636806
        dum3 |   .2099806    .090433     2.32   0.022     .0308165    .3891448
        dum4 |   .2690542   .0950596     2.83   0.006     .0807241    .4573844
        dum5 |   .1144067   .0898036     1.27   0.205    -.0635103    .2923238
        dum6 |  (dropped)
       _cons |   .6927726   .4204467     1.65   0.102     -.140208    1.525753
------------------------------------------------------------------------------
```

```
. lvr2plot

. estat hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of bh_exp

         chi2(1)      =    31.54
```

```
        Prob > chi2  =   0.0000

. estat imtest

Cameron & Trivedi's decomposition of IM-test

---------------------------------------------------
              Source |       chi2     df      p
---------------------+-----------------------------
  Heteroskedasticity |      94.61     65    0.0097
            Skewness |       9.56     12    0.6547
            Kurtosis |       3.34      1    0.0677
---------------------+-----------------------------
               Total |     107.50     78    0.0151
---------------------------------------------------

. estat ovtest

Ramsey RESET test using powers of the fitted values of bh_exp
       Ho:  model has no omitted variables
                 F(3, 110) =      0.79
                  Prob > F =      0.4999

. estat vif

    Variable |       VIF       1/VIF  
-------------+----------------------
     fbh_gdp |    132.75    0.007533
    distance |     38.31    0.026103
       gdppc |     33.18    0.030140
resid_stage2 |     21.56    0.046384
       d_bor |      6.41    0.156016
      vat_bh |      5.60    0.178719
        d_cc |      4.06    0.246026
        dum4 |      1.95    0.512717
   d_cefta06 |      1.85    0.539758
        dum3 |      1.77    0.566520
        dum5 |      1.74    0.574490
        dum2 |      1.69    0.590254
-------------+----------------------
    Mean VIF |     20.91

.
. reg bh_exp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh resid_stage2 dum2-dum6,
vce(robust)

Linear regression                                      Number of obs =     126
                                                       F( 12,   113) =  217.38
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.8859
                                                       Root MSE      =  .28474

------------------------------------------------------------------------------
             |               Robust
      bh_exp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   4.080806   .3417102    11.94   0.000     3.403816    4.757795
       gdppc |  -2.218714   .3063417    -7.24   0.000    -2.825632   -1.611796
    distance |  -6.379481   .4460533   -14.30   0.000    -7.263193   -5.495769
        d_cc |   1.467729   .0933931    15.72   0.000     1.282701    1.652758
       d_bor |  -1.309932   .1722192    -7.61   0.000    -1.651129   -.9687347
   d_cefta06 |  -.0691952   .0703595    -0.98   0.327    -.2085901    .0701998
      vat_bh |   -.160394   .1146152    -1.40   0.164    -.3874674    .0666795
resid_stage2 |          1   .1322005     7.56   0.000     .7380871    1.261913
        dum2 |   .0881555   .1040421     0.85   0.399    -.1179706    .2942816
        dum3 |   .2099806   .0927436     2.26   0.025     .0262389    .3937224
        dum4 |   .2690542   .0805573     3.34   0.001     .1094558    .4286527
        dum5 |   .1144067   .0745755     1.53   0.128    -.0333408    .2621543
        dum6 |  (dropped)
       _cons |   .6927726   .4084807     1.70   0.093    -.1165013    1.502047
------------------------------------------------------------------------------
```

```
.
. xtserial bh_exp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh resid_stage2 dum2-
dum6

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,      20) =     85.970
           Prob > F =      0.0000
```

**. *Model improvements***

**. *Testing and accounting for serial correlation***

```
. xtreg bh_exp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh dum2-dum6, fe

Fixed-effects (within) regression               Number of obs      =       126
Group variable: code                            Number of groups   =        21
R-sq:  within  = 0.4078                         Obs per group: min =         6
       between = 0.0353                                        avg =       6.0
       overall = 0.0373                                        max =         6
                                                F(8,97)            =      8.35
corr(u_i, Xb)  = -0.9547                        Prob > F           =    0.0000
------------------------------------------------------------------------------
      bh_exp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   4.080805   3.731995     1.09   0.277    -3.326172    11.48778
       gdppc |  -2.218714   3.183371    -0.70   0.487    -8.536823    4.099396
    distance |  (dropped)
        d_cc |  (dropped)
       d_bor |  (dropped)
   d_cefta06 |  -.0691952   .1367427    -0.51   0.614    -.3405916    .2022012
      vat_bh |  -.1603939   .7871823    -0.20   0.839    -1.722733    1.401945
        dum2 |   .0881556   .1506991     0.58   0.560    -.2109404    .3872515
        dum3 |   .2099806   .2404764     0.87   0.385    -.2672985    .6872598
        dum4 |   .2690542   .3888662     0.69   0.491    -.5027376    1.040846
        dum5 |   .1144067   .2149467     0.53   0.596    -.3122029    .5410164
        dum6 |  (dropped)
       _cons |  -18.68716   17.36329    -1.08   0.284    -53.14848    15.77416
-------------+----------------------------------------------------------------
     sigma_u |  2.5318711
     sigma_e |  .30733154
         rho |   .9854796   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(20, 97) =     3.93             Prob > F = 0.0000


. xtserial bh_exp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh dum2-dum6

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,      20) =     85.970
           Prob > F =      0.0000
```

**. *testing the lagged model for CFR***

```
. generate float L_bh_exp = l.bh_exp
(21 missing values generated)

. generate float L_fbh_gdp = l.fbh_gdp
(21 missing values generated)

. generate float L_gdppc = l.gdppc
(21 missing values generated)
```

**. *1)OLS***

```
. xtreg  bh_exp L_bh_exp fbh_gdp L_fbh_gdp gdppc L_gdppc d_cefta06 vat_bh dum2-dum6
note: dum2 dropped because of collinearity
```

```
note: dum6 dropped because of collinearity

Random-effects GLS regression                   Number of obs      =       105
Group variable: code                            Number of groups   =        21
R-sq:  within  = 0.4082                         Obs per group: min =         5
       between = 0.9812                                        avg =       5.0
       overall = 0.8784                                        max =         5
Random effects u_i ~ Gaussian                   Wald chi2(10)      =    631.57
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000
------------------------------------------------------------------------------
      bh_exp |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    L_bh_exp |   .8948581   .0428945    20.86   0.000     .8107864    .9789298
     fbh_gdp |   3.346361    5.32073     0.63   0.529    -7.082078     13.7748
   L_fbh_gdp |   -3.27558   5.307934    -0.62   0.537    -13.67894    7.127779
       gdppc |  -1.231123   4.829862    -0.25   0.799    -10.69748    8.235233
     L_gdppc |   1.222891   4.779303     0.26   0.798    -8.144372    10.59015
   d_cefta06 |   .0646738   .1055589     0.61   0.540    -.1422178    .2715654
      vat_bh |  -.1480618    .142233    -1.04   0.298    -.4268334    .1307098
        dum3 |   .0469182   .0903734     0.52   0.604    -.1302104    .2240469
        dum4 |  -.0132098   .0890032    -0.15   0.882    -.1876528    .1612332
        dum5 |  -.0468969   .0885578    -0.53   0.596    -.2204669    .1266732
       _cons |  -.1357423    .362371    -0.37   0.708    -.8459764    .5744918
-------------+----------------------------------------------------------------
     sigma_u |  .03278134
     sigma_e |   .2379019
         rho |  .01863327   (fraction of variance due to u_i)
------------------------------------------------------------------------------


. testnl _b[L_bh_exp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

  (1)  _b[L_bh_exp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

               chi2(1) =        0.23
           Prob > chi2 =        0.6328

. testnl _b[L_bh_exp]*_b[ gdppc] = -_b[ L_gdppc]

  (1)  _b[L_bh_exp]*_b[ gdppc] = -_b[ L_gdppc]

               chi2(1) =        0.06
           Prob > chi2 =        0.8038


. *2)FE*

. xtreg  bh_exp L_bh_exp fbh_gdp L_fbh_gdp gdppc L_gdppc d_cefta06 vat_bh dum2-dum6, fe

Fixed-effects (within) regression               Number of obs      =       105
Group variable: code                            Number of groups   =        21
R-sq:  within  = 0.4992                         Obs per group: min =         5
       between = 0.0106                                        avg =       5.0
       overall = 0.0135                                        max =         5
                                                F(10,74)           =      7.38
corr(u_i, Xb)  = -0.9570                        Prob > F           =    0.0000
------------------------------------------------------------------------------
      bh_exp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    L_bh_exp |   .5052493   .0889572     5.68   0.000     .3279982    .6825004
     fbh_gdp |  -1.990702   7.454679    -0.27   0.790    -16.84447    12.86307
   L_fbh_gdp |   7.242444   7.980146     0.91   0.367    -8.658344    23.14323
       gdppc |   2.728791   6.280668     0.43   0.665    -9.785713    15.24329
     L_gdppc |  -8.748831   6.716645    -1.30   0.197    -22.13204    4.634375
   d_cefta06 |   .1796757   .1288811     1.39   0.167    -.0771254    .4364768
      vat_bh |  -.4515825    .389553    -1.16   0.250    -1.227784    .3246188
        dum2 |   .0536038    .151723     0.35   0.725    -.2487109    .3559186
        dum3 |  (dropped)
        dum4 |   .2780832   .2200698     1.26   0.210    -.1604156    .7165819
        dum5 |  (dropped)
        dum6 |  -.2089881   .2263395    -0.92   0.359    -.6599795    .2420032
```

```
       _cons |  -22.51816   19.97462    -1.13   0.263    -62.31845    17.28213
-------------+----------------------------------------------------------------
     sigma_u |  2.5532779
     sigma_e |   .2379019
         rho |  .99139312   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(20, 74) =     2.73              Prob > F = 0.0009


. testnl _b[L_bh_exp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

  (1)  _b[L_bh_exp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

              F(1, 74) =        1.44
              Prob > F =        0.2337

. testnl _b[L_bh_exp]*_b[ gdppc] = -_b[ L_gdppc]

  (1)  _b[L_bh_exp]*_b[ gdppc] = -_b[ L_gdppc]

              F(1, 74) =        2.82
              Prob > F =        0.0975


. *first stage: AR1 correction*

. xtregar bh_exp fbh_gdp gdppc d_cefta06 vat_bh dum2-dum6,fe rhotype(dw) lbi
note: dum6 dropped because of collinearity

FE (within) regression with AR(1) disturbances  Number of obs      =       105
Group variable: code                            Number of groups   =        21
R-sq:  within  = 0.0555                         Obs per group: min =         5
       between = 0.1600                                        avg =       5.0
       overall = 0.1168                                        max =         5
                                                F(7,77)            =      0.65
corr(u_i, Xb)  = -0.7892                        Prob > F           =    0.7163
------------------------------------------------------------------------------
      bh_exp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   .9246158   6.549214     0.14   0.888    -12.11654    13.96577
       gdppc |  -2.063554   5.650697    -0.37   0.716    -13.31553     9.18842
   d_cefta06 |   .0839056   .1582645     0.53   0.598    -.2312392    .3990505
      vat_bh |  (dropped)
        dum2 |   .0184104   .4200287     0.04   0.965    -.8179736    .8547944
        dum3 |    .156005   .5941256     0.26   0.794     -1.02705     1.33906
        dum4 |   .0818848   .4877624     0.17   0.867    -.8893742    1.053144
        dum5 |   .0257329   .2803904     0.09   0.927    -.5325957    .5840615
       _cons |    -1.9414   13.67682    -0.14   0.887    -29.17542    25.29262
-------------+----------------------------------------------------------------
      rho_ar |  .57082255
     sigma_u |  1.0917917
     sigma_e |  .24492526
     rho_fov |  .95208586   (fraction of variance because of u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(20,77) =     6.55               Prob > F = 0.0000
modified Bhargava et al. Durbin-Watson = .87263302
Baltagi-Wu LBI = 1.2850019


. *AR1 correction with two steps*

. xtregar bh_exp fbh_gdp gdppc d_cefta06 vat_bh dum2-dum6,fe rhotype(dw) twostep lbi
note: dum6 dropped because of collinearity

FE (within) regression with AR(1) disturbances  Number of obs      =       105
Group variable: code                            Number of groups   =        21
R-sq:  within  = 0.0568                         Obs per group: min =         5
       between = 0.1379                                        avg =       5.0
       overall = 0.0990                                        max =         5
                                                F(7,77)            =      0.66
corr(u_i, Xb)  = -0.7867                        Prob > F           =    0.7033
```

```
------------------------------------------------------------------------------
      bh_exp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   1.053346   6.501581     0.16   0.872    -11.89296    13.99965
       gdppc |  -2.169703   5.608371    -0.39   0.700     -13.3374    8.997991
   d_cefta06 |   .0836677    .157768     0.53   0.597    -.2304886     .397824
      vat_bh |  (dropped)
        dum2 |   .0247328   .4248232     0.06   0.954    -.8211983    .8706638
        dum3 |   .1657075   .5976784     0.28   0.782    -1.024422    1.355837
        dum4 |   .0900157   .4894815     0.18   0.855    -.8846664    1.064698
        dum5 |   .0304698   .2808102     0.11   0.914    -.5286948    .5896343
       _cons |  -2.570456   13.80093    -0.19   0.853    -30.05162    24.91071
-------------+----------------------------------------------------------------
      rho_ar |  .56368349
     sigma_u |  1.1004477
     sigma_e |  .24458398
     rho_fov |  .95292649   (fraction of variance because of u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(20,77) =     6.76             Prob > F = 0.0000
modified Bhargava et al. Durbin-Watson = .87263302
Baltagi-Wu LBI = 1.2850019


. *FE from AR1 correction with two steps*

. predict FEAR1_correct, u
(21 missing values generated)
(21 missing values generated)
```

## . *second stage*

```
. reg FEAR1_correct distance d_cc d_bor

      Source |       SS       df       MS              Number of obs =     105
-------------+------------------------------           F(  3,   101) =    6.07
       Model |  16.9747931     3  5.65826435           Prob > F      =  0.0008
    Residual |  94.1041184   101  .931723945           R-squared     =  0.1528
-------------+------------------------------           Adj R-squared =  0.1277
       Total |  111.078911   104  1.06806646           Root MSE      =  .96526

------------------------------------------------------------------------------
FEAR1_corr~t |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    distance |  -.2595031   .4091697    -0.63   0.527    -1.071186    .5521795
        d_cc |   .6762325   .3701131     1.83   0.071    -.0579723    1.410437
       d_bor |   .3518852   .4369214     0.81   0.422    -.5148494     1.21862
       _cons |    .632311   1.298107     0.49   0.627    -1.942785    3.207407
------------------------------------------------------------------------------

. predict FEAR1_resid_stage2, residuals
(21 missing values generated)
```

## . *stage 3*

```
. reg bh_exp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh FEAR1_resid_stage2 dum2-
dum6

      Source |       SS       df       MS              Number of obs =     105
-------------+------------------------------           F( 11,    93) =   59.40
       Model |  52.4109788    11  4.76463444           Prob > F      =  0.0000
    Residual |  7.46010939    93   .08021623           R-squared     =  0.8754
-------------+------------------------------           Adj R-squared =  0.8607
       Total |  59.8710882   104   .57568354           Root MSE      =  .28322

------------------------------------------------------------------------------
      bh_exp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   .8846737   .0870968    10.16   0.000     .7117167    1.057631
       gdppc |  -1.339829   .2364155    -5.67   0.000    -1.809304   -.8703551
    distance |  -.4523471   .2391878    -1.89   0.062    -.9273266    .0226325
        d_cc |   .7501829   .1119596     6.70   0.000     .5278533    .9725126
       d_bor |   .3813012   .1383357     2.76   0.007     .1065939    .6560085
```

```
   d_cefta06 |   .0876157   .1200256     0.73   0.467    -.1507313    .3259627
      vat_bh |   .2130593   .0923745     2.31   0.023     .0296218    .3964968
FEAR1_resi~2 |   .7681451   .0925987     8.30   0.000     .5842624    .9520279
        dum2 |  (dropped)
        dum3 |   .2240815   .0874436     2.56   0.012     .0504358    .3977272
        dum4 |  (dropped)
        dum5 |   -.016924   .0875669    -0.19   0.847    -.1908146    .1569665
        dum6 |  -.0078116   .0882927    -0.09   0.930    -.1831434    .1675203
       _cons |   -1.21308   .6102417    -1.99   0.050    -2.424899   -.001261
------------------------------------------------------------------------------


. estat hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of bh_exp

         chi2(1)      =    49.77
         Prob > chi2  =   0.0000

. estat imtest

Cameron & Trivedi's decomposition of IM-test

---------------------------------------------------
              Source |       chi2     df      p
---------------------+-----------------------------
  Heteroskedasticity |      93.07     58    0.0024
            Skewness |      14.36     11    0.2136
            Kurtosis |       2.01      1    0.1560
---------------------+-----------------------------
               Total |     109.44     70    0.0018
---------------------------------------------------

. estat ovtest

Ramsey RESET test using powers of the fitted values of bh_exp
       Ho:  model has no omitted variables
                  F(3, 90) =      3.95
                  Prob > F =      0.0107

. estat vif

    Variable |       VIF       1/VIF
-------------+----------------------
       gdppc |     16.38    0.061051
FEAR1_resi~2 |     10.06    0.099413
    distance |      7.25    0.137852
     fbh_gdp |      6.41    0.155909
      vat_bh |      2.68    0.373042
        d_cc |      2.53    0.395257
   d_cefta06 |      2.31    0.433082
       d_bor |      2.16    0.463297
        dum6 |      1.63    0.612496
        dum5 |      1.61    0.622691
        dum3 |      1.60    0.624449
-------------+----------------------
    Mean VIF |      4.97

. xtserial bh_exp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh FEAR1_resid_stage2
dum2-dum6

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,      20) =     28.960
           Prob > F =      0.0000

.
. reg bh_exp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh FEAR1_resid_stage2 dum2-
dum6, robust
```

```
Linear regression                                      Number of obs =     105
                                                       F( 11,    93) =  252.21
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.8754
                                                       Root MSE      =  .28322

------------------------------------------------------------------------------
             |               Robust
      bh_exp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   .8846737   .1556161     5.68   0.000      .575651    1.193696
       gdppc |  -1.339829   .3107775    -4.31   0.000    -1.956972   -.7226869
    distance |  -.4523471   .3803801    -1.19   0.237    -1.207707    .3030125
        d_cc |   .7501829   .0621304    12.07   0.000     .6268043    .8735616
       d_bor |   .3813012   .0957842     3.98   0.000     .1910928    .5715096
  d_cefta06 |   .0876157   .0685617     1.28   0.204    -.0485343    .2237657
      vat_bh |   .2130593   .1186738     1.80   0.076    -.0226034    .4487219
FEAR1_resi~2 |   .7681451   .1198186     6.41   0.000     .5302092    1.006081
        dum2 |  (dropped)
        dum3 |   .2240815   .1219981     1.84   0.069    -.0181824    .4663455
        dum4 |  (dropped)
        dum5 |   -.016924   .0473248    -0.36   0.721    -.1109016    .0770536
        dum6 |  -.0078116   .0596551    -0.13   0.896    -.1262747    .1106516
       _cons |   -1.21308    .574701    -2.11   0.037    -2.354322   -.0718378
------------------------------------------------------------------------------
```

```
. *because of evidence of serial correlation, test for CFR in the third stage*
```

## . *1a)OLS*

```
.  xtreg    bh_exp  L_bh_exp  fbh_gdp  L_fbh_gdp  gdppc  L_gdppc  d_cefta06  vat_bh
FEAR1_resid_stage2 dum2-dum6
note: dum3 dropped because of collinearity
note: dum6 dropped because of collinearity

Random-effects GLS regression                   Number of obs      =       105
Group variable: code                            Number of groups   =        21
R-sq:  within  = 0.4467                         Obs per group: min =         5
       between = 0.9909                                        avg =       5.0
       overall = 0.9100                                        max =         5
Random effects u_i ~ Gaussian                   Wald chi2(11)      =    939.81
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000
------------------------------------------------------------------------------
      bh_exp |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    L_bh_exp |   .7132888   .0488332    14.61   0.000     .6175775        .809
     fbh_gdp |   .8299564   4.537802     0.18   0.855    -8.063973    9.723886
   L_fbh_gdp |  -.4886744   4.532197    -0.11   0.914    -9.371616    8.394268
       gdppc |  -.9435835   4.109437    -0.23   0.818    -8.997932    7.110765
     L_gdppc |   .0572257    4.07167     0.01   0.989      -7.9231    8.037551
   d_cefta06 |   .2301055   .0953611     2.41   0.016     .0432013    .4170098
      vat_bh |    -.21459   .1383318    -1.55   0.121    -.4857155    .0565354
FEAR1_resi~2 |   .4166892   .0729594     5.71   0.000     .2736914    .5596871
        dum2 |  -.0861315   .0788807    -1.09   0.275    -.2407348    .0684717
        dum4 |   .0195819   .0775987     0.25   0.801    -.1325088    .1716726
        dum5 |  -.0163149   .0772426    -0.21   0.833    -.1677076    .1350778
       _cons |  -.5873424   .3134372    -1.87   0.061    -1.201668    .0269832
-------------+----------------------------------------------------------------
     sigma_u |          0
     sigma_e |   .2379019
         rho |          0   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. testnl _b[L_bh_exp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

  (1)  _b[L_bh_exp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

               chi2(1) =        0.01
           Prob > chi2 =        0.9365
```

```
. testnl _b[L_bh_exp]*_b[ gdppc] = -_b[ L_gdppc]

  (1)  _b[L_bh_exp]*_b[ gdppc] = -_b[ L_gdppc]

               chi2(1) =        0.28
           Prob > chi2 =        0.5934
```

**. *2a)FE***

```
.  xtreg    bh_exp  L_bh_exp  fbh_gdp  L_fbh_gdp  gdppc  L_gdppc  d_cefta06  vat_bh
FEAR1_resid_stage2 dum2-dum6, fe

Fixed-effects (within) regression               Number of obs      =       105
Group variable: code                            Number of groups   =        21
R-sq:  within  = 0.4992                         Obs per group: min =         5
       between = 0.0106                                        avg =       5.0
       overall = 0.0135                                        max =         5
                                                F(10,74)           =      7.38
corr(u_i, Xb)  = -0.9570                        Prob > F           =    0.0000
------------------------------------------------------------------------------
      bh_exp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    L_bh_exp |   .5052493   .0889572     5.68   0.000     .3279982    .6825004
     fbh_gdp |  -1.990702   7.454679    -0.27   0.790    -16.84447    12.86307
   L_fbh_gdp |   7.242444   7.980146     0.91   0.367    -8.658344    23.14323
       gdppc |   2.728791   6.280668     0.43   0.665    -9.785713    15.24329
     L_gdppc |  -8.748831   6.716645    -1.30   0.197    -22.13204    4.634375
   d_cefta06 |   .1796757   .1288811     1.39   0.167    -.0771254    .4364768
      vat_bh |  -.4515825    .389553    -1.16   0.250    -1.227784    .3246188
FEAR1_resi~2 |  (dropped)
        dum2 |   .0536038    .151723     0.35   0.725    -.2487109    .3559186
        dum3 |  (dropped)
        dum4 |   .2780832   .2200698     1.26   0.210    -.1604156    .7165819
        dum5 |  (dropped)
        dum6 |  -.2089881   .2263395    -0.92   0.359    -.6599795    .2420032
       _cons |  -22.51816   19.97462    -1.13   0.263    -62.31845    17.28213
-------------+----------------------------------------------------------------
     sigma_u |  2.5532779
     sigma_e |   .2379019
         rho |  .99139312   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(20, 74) =     1.06             Prob > F = 0.4055


. testnl _b[L_bh_exp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

  (1)  _b[L_bh_exp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

              F(1, 74) =        1.44
              Prob > F =        0.2337

. testnl _b[L_bh_exp]*_b[ gdppc] = -_b[ L_gdppc]

  (1)  _b[L_bh_exp]*_b[ gdppc] = -_b[ L_gdppc]

              F(1, 74) =        2.82
              Prob > F =        0.0975
```

**. *Prais-Winston for the consistency with the OLS***

```
. prais bh_exp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh FEAR1_resid_stage2
dum2-dum6, rhotype(regress) vce(robust)
note: dum3 dropped because of collinearity
note: dum4 dropped because of collinearity

Number of gaps in sample:  20   (gap count includes panel changes)
(note: computations for rho restarted at each gap)

Iteration 0:  rho = 0.0000
```

```
Iteration 1:  rho = 0.2911
Iteration 2:  rho = 0.3040
Iteration 3:  rho = 0.3048
Iteration 4:  rho = 0.3048
Iteration 5:  rho = 0.3048
Iteration 6:  rho = 0.3048

Prais-Winsten AR(1) regression -- iterated estimates

Linear regression                                      Number of obs =     105
                                                       F( 12,    93) = 1198.70
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.8153
                                                       Root MSE      =   .2635
------------------------------------------------------------------------------
             |             Semi-robust
      bh_exp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   .8574028    .214408     4.00   0.000      .431631    1.283175
       gdppc |  -1.209025   .4403315    -2.75   0.007    -2.083436   -.3346139
    distance |  -.5106712   .5253611    -0.97   0.334    -1.553934    .5325917
        d_cc |   .7457074   .0875721     8.52   0.000     .5718067    .9196082
       d_bor |   .3945591   .1311407     3.01   0.003     .1341396    .6549785
   d_cefta06 |   .0763003   .0818711     0.93   0.354    -.0862795    .2388801
      vat_bh |  -.0053864   .0794051    -0.07   0.946    -.1630693    .1522965
FEAR1_resi~2 |   .7222157    .166889     4.33   0.000     .3908071    1.053624
        dum2 |  -.2240332   .0841672    -2.66   0.009    -.3911726   -.0568939
        dum5 |  -.0143635    .041897    -0.34   0.733    -.0975626    .0688355
        dum6 |  -.0013489   .0637919    -0.02   0.983    -.1280269    .1253291
       _cons |  -.7571078   .8580484    -0.88   0.380    -2.461022    .9468063
-------------+----------------------------------------------------------------
         rho |   .3048398
------------------------------------------------------------------------------
Durbin-Watson statistic (original)    0.786972
Durbin-Watson statistic (transformed) 1.204172
```

## APPENDIX 6.5: Bosnia and Herzegovina Federation imports

```
. *stage one as suggested in the literature, FE model*

. xtreg fbih_imp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh dum2-dum5, fe

Fixed-effects (within) regression               Number of obs      =       105
Group variable: code                            Number of groups   =        21
R-sq:  within  = 0.5988                         Obs per group: min =         5
       between = 0.0007                                        avg =       5.0
       overall = 0.0000                                        max =         5
                                                F(7,77)            =     16.42
corr(u_i, Xb)  = -0.9322                        Prob > F           =    0.0000
------------------------------------------------------------------------------
    fbih_imp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |  -2.994945   2.524436    -1.19   0.239     -8.02174     2.03185
       gdppc |   3.683521   2.310082     1.59   0.115    -.9164401    8.283483
    distance |  (dropped)
        d_cc |  (dropped)
       d_bor |  (dropped)
   d_cefta06 |   .2302563   .0803305     2.87   0.005     .0702979    .3902147
      vat_bh |   .5861121   .2898072     2.02   0.047     .0090322    1.163192
        dum2 |   .1278445   .0965829     1.32   0.190    -.0644767    .3201656
        dum3 |   .4510332   .1625659     2.77   0.007     .1273232    .7747432
        dum4 |  (dropped)
        dum5 |   .2266417   .1383361     1.64   0.105    -.0488206    .5021041
       _cons |   15.36164   12.02722     1.28   0.205    -8.587618    39.31091
-------------+----------------------------------------------------------------
     sigma_u |  2.1695587
     sigma_e |  .16504951
         rho |  .99424587   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(20, 77) =    33.62            Prob > F = 0.0000

. xtreg fbih_imp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh dum2-dum5, fe vce(rob
> ust)

Fixed-effects (within) regression               Number of obs      =       105
Group variable: code                            Number of groups   =        21
R-sq:  within  = 0.5988                         Obs per group: min =         5
       between = 0.0007                                        avg =       5.0
       overall = 0.0000                                        max =         5
                                                F(7,77)            =     15.08
corr(u_i, Xb)  = -0.9322                        Prob > F           =    0.0000
                                  (Std. Err. adjusted for clustering on code)
------------------------------------------------------------------------------
             |               Robust
    fbih_imp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |  -2.994945   2.923741    -1.02   0.309    -8.816857    2.826968
       gdppc |   3.683521   2.751185     1.34   0.185    -1.794787     9.16183
    distance |  (dropped)
        d_cc |  (dropped)
       d_bor |  (dropped)
   d_cefta06 |   .2302563   .1201972     1.92   0.059    -.0090868    .4695995
      vat_bh |   .5861121   .3425056     1.71   0.091    -.0959036    1.268128
        dum2 |   .1278445   .1184622     1.08   0.284    -.1080439    .3637328
        dum3 |   .4510332   .1939424     2.33   0.023     .0648444    .8372219
        dum4 |  (dropped)
        dum5 |   .2266417   .1554747     1.46   0.149     -.082948    .5362314
       _cons |   15.36164   13.87549     1.11   0.272    -12.26798    42.99127
-------------+----------------------------------------------------------------
     sigma_u |  2.1695587
     sigma_e |  .16504951
         rho |  .99424587   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

```
. *stage two, fixed effects obtained from stage one*

. predict Fixed_effects, u


. reg Fixed_effects distance d_cc d_bor

      Source |       SS       df       MS              Number of obs =     105
-------------+------------------------------           F(  3,   101) =   70.48
       Model |  318.543709     3  106.181236           Prob > F      =  0.0000
    Residual |  152.154792   101  1.50648309           R-squared     =  0.6767
-------------+------------------------------           Adj R-squared =  0.6671
       Total |  470.698501   104  4.52594712           Root MSE      =  1.2274

------------------------------------------------------------------------------
Fixed_effe~s |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    distance |   5.396091   .4203259    12.84   0.000     4.562278    6.229905
        d_cc |  -.0185139   .4585315    -0.04   0.968     -.928117    .8910892
       d_bor |   2.339092   .5532666     4.23   0.000     1.241559    3.436624
       _cons |  -16.93456   1.354174   -12.51   0.000    -19.62088   -14.24824
------------------------------------------------------------------------------


. *stage three, residuals obtained from stage two*

. predict resid_stage2, residuals

. reg fbih_imp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh resid_stage2 dum2-dum5

      Source |       SS       df       MS              Number of obs =     105
-------------+------------------------------           F( 11,    93) =  248.57
       Model |  61.6695625    11  5.60632386           Prob > F      =  0.0000
    Residual |  2.09758336    93   .02255466           R-squared     =  0.9671
-------------+------------------------------           Adj R-squared =  0.9632
       Total |  63.7671458   104  .613145633           Root MSE      =  .15018

------------------------------------------------------------------------------
    fbih_imp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |  -2.994945    .155702   -19.24   0.000    -3.304138   -2.685752
       gdppc |   3.683522   .1402184    26.27   0.000     3.405076    3.961967
    distance |   5.396092   .2610128    20.67   0.000     4.877772    5.914411
        d_cc |   -.018514   .0671322    -0.28   0.783    -.1518253    .1147973
       d_bor |   2.339092   .1073749    21.78   0.000     2.125866    2.552317
   d_cefta06 |   .2302563   .0676258     3.40   0.001     .0959648    .3645478
      vat_bh |   .5861122   .0507621    11.55   0.000     .4853087    .6869156
resid_stage2 |          1   .0350907    28.50   0.000     .9303167    1.069683
        dum2 |   .1278445   .0466238     2.74   0.007     .0352589      .22043
        dum3 |   .4510332   .0473298     9.53   0.000     .3570455    .5450209
        dum4 |  (dropped)
        dum5 |   .2266417   .0470177     4.82   0.000      .133274    .3200095
       _cons |  -1.572914   .1778436    -8.84   0.000    -1.926077   -1.219752
------------------------------------------------------------------------------


. lvr2plot

. estat hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of fbih_imp

         chi2(1)      =    80.91
         Prob > chi2  =   0.0000

. estat imtest

Cameron & Trivedi's decomposition of IM-test
```

```
---------------------------------------------------
              Source |       chi2     df      p
---------------------+-----------------------------
  Heteroskedasticity |      72.73     57    0.0782
            Skewness |      14.21     11    0.2216
            Kurtosis |       1.65      1    0.1987
---------------------+-----------------------------
               Total |      88.59     69    0.0562
---------------------------------------------------

. estat ovtest

Ramsey RESET test using powers of the fitted values of fbih_imp
       Ho:  model has no omitted variables
                  F(3, 90) =      7.50
                  Prob > F =      0.0002

. estat vif

    Variable |       VIF       1/VIF
-------------+----------------------
     fbh_gdp |     73.71    0.013567
    distance |     42.02    0.023798
       gdppc |     23.59    0.042397
resid_stage2 |      8.31    0.120383
       d_bor |      4.62    0.216220
        d_cc |      3.24    0.309111
      vat_bh |      2.88    0.347342
   d_cefta06 |      1.83    0.545101
        dum3 |      1.67    0.599318
        dum5 |      1.65    0.607302
        dum2 |      1.62    0.617607
-------------+----------------------
    Mean VIF |     15.01

.
. reg fbih_imp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh resid_stage2 dum2-dum5,
vce(robust)

Linear regression                                      Number of obs =     105
                                                       F( 11,    93) =  143.74
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.9671
                                                       Root MSE      =  .15018

------------------------------------------------------------------------------
             |               Robust
    fbih_imp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |  -2.994945   .2376979   -12.60   0.000    -3.466966   -2.522924
       gdppc |   3.683522   .2326864    15.83   0.000     3.221452    4.145591
    distance |   5.396092   .4363515    12.37   0.000     4.529584    6.262599
        d_cc |   -.018514   .0462763    -0.40   0.690    -.1104095    .0733815
       d_bor |   2.339092   .1477531    15.83   0.000     2.045683      2.6325
   d_cefta06 |   .2302563   .0919857     2.50   0.014      .047591    .4129216
      vat_bh |   .5861122   .0447407    13.10   0.000      .497266    .6749583
resid_stage2 |          1   .0584438    17.11   0.000     .8839422    1.116058
        dum2 |   .1278445   .0440427     2.90   0.005     .0403844    .2153046
        dum3 |   .4510332    .041089    10.98   0.000     .3694385    .5326279
        dum4 |  (dropped)
        dum5 |   .2266417    .049383     4.59   0.000     .1285769    .3247066
       _cons |  -1.572914    .278171    -5.65   0.000    -2.125307   -1.020522
------------------------------------------------------------------------------

. xtserial fbih_imp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh dum2-dum5

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,      20) =     74.776
           Prob > F =      0.0000
```

```
. *Model improvements*
. *Testing and accounting for serial correlation*

. xtreg fbih_imp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh dum2-dum5, fe

Fixed-effects (within) regression               Number of obs      =       105
Group variable: code                            Number of groups   =        21
R-sq:  within  = 0.5988                         Obs per group: min =         5
       between = 0.0007                                        avg =       5.0
       overall = 0.0000                                        max =         5
                                                F(7,77)            =     16.42
corr(u_i, Xb)  = -0.9322                        Prob > F           =    0.0000
------------------------------------------------------------------------------
    fbih_imp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |  -2.994945   2.524436    -1.19   0.239     -8.02174     2.03185
       gdppc |   3.683521   2.310082     1.59   0.115    -.9164401    8.283483
    distance |  (dropped)
        d_cc |  (dropped)
       d_bor |  (dropped)
   d_cefta06 |   .2302563   .0803305     2.87   0.005     .0702979    .3902147
      vat_bh |   .5861121   .2898072     2.02   0.047     .0090322    1.163192
        dum2 |   .1278445   .0965829     1.32   0.190    -.0644767    .3201656
        dum3 |   .4510332   .1625659     2.77   0.007     .1273232    .7747432
        dum4 |  (dropped)
        dum5 |   .2266417   .1383361     1.64   0.105    -.0488206    .5021041
       _cons |   15.36164   12.02722     1.28   0.205    -8.587618    39.31091
-------------+----------------------------------------------------------------
     sigma_u |  2.1695587
     sigma_e |  .16504951
         rho |  .99424587   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(20, 77) =    33.62             Prob > F = 0.0000


. xtserial fbih_imp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh dum2-dum5

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,      20) =     74.776
           Prob > F =      0.0000



. *testing the lagged model for CFR*

. generate float L_fbih_imp = l.fbih_imp
(21 missing values generated)

. generate float L_fbh_gdp = l.fbh_gdp
(21 missing values generated)

. generate float L_gdppc = l.gdppc
(21 missing values generated)


. *1)OLS*

. xtreg  fbih_imp L_fbih_imp fbh_gdp L_fbh_gdp gdppc L_gdppc d_cefta06 vat_bh dum2-dum5
note: dum2 dropped because of collinearity
note: dum5 dropped because of collinearity

Random-effects GLS regression                   Number of obs      =        84
Group variable: code                            Number of groups   =        21
R-sq:  within  = 0.4400                         Obs per group: min =         4
       between = 0.9960                                        avg =       4.0
       overall = 0.9480                                        max =         4
Random effects u_i ~ Gaussian                   Wald chi2(9)       =   1348.44
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000
------------------------------------------------------------------------------
```

```
    fbih_imp |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  L_fbih_imp |   .9232482   .0331959    27.81   0.000     .8581855     .988311
     fbh_gdp |   .4702038   3.906493     0.12   0.904    -7.186381    8.126789
   L_fbh_gdp |  -.4433901   3.912893    -0.11   0.910    -8.112519    7.225739
       gdppc |  -.6300349   3.713893    -0.17   0.865    -7.909131    6.649061
     L_gdppc |   .5638944   3.698716     0.15   0.879    -6.685456    7.813245
   d_cefta06 |  -.0196453   .0804561    -0.24   0.807    -.1773364    .1380458
      vat_bh |   .0513786   .0893594     0.57   0.565    -.1237627    .2265198
        dum3 |   .2259273   .0600087     3.76   0.000     .1083124    .3435422
        dum4 |  -.0380963   .0564005    -0.68   0.499    -.1486392    .0724466
       _cons |   .0416902   .1853102     0.22   0.822    -.3215112    .4048916
-------------+----------------------------------------------------------------
     sigma_u |          0
     sigma_e |  .16453649
         rho |          0   (fraction of variance due to u_i)
------------------------------------------------------------------------------


testnl _b[L_fbih_imp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

  (1)  _b[L_fbih_imp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

               chi2(1) =        0.00
           Prob > chi2 =        0.9764

. testnl _b[L_fbih_imp]*_b[ gdppc] = -_b[ L_gdppc]

  (1)  _b[L_fbih_imp]*_b[ gdppc] = -_b[ L_gdppc]

               chi2(1) =        0.00
           Prob > chi2 =        0.9508

. *2)FE*

. xtreg  fbih_imp L_fbih_imp fbh_gdp L_fbh_gdp gdppc L_gdppc d_cefta06 vat_bh dum2-dum5,
fe

Fixed-effects (within) regression              Number of obs      =        84
Group variable: code                           Number of groups   =        21
R-sq:  within  = 0.5748                        Obs per group: min =         4
       between = 0.3681                                       avg =       4.0
       overall = 0.3832                                       max =         4
                                               F(9,54)            =      8.11
corr(u_i, Xb)  = 0.0163                        Prob > F           =    0.0000
------------------------------------------------------------------------------
    fbih_imp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  L_fbih_imp |   .1392481   .1557789     0.89   0.375    -.1730698     .451566
     fbh_gdp |   12.44569   8.068991     1.54   0.129    -3.731666    28.62304
   L_fbh_gdp |   -11.9442   6.662255    -1.79   0.079    -25.30122    1.412814
       gdppc |  -12.28932   7.180617    -1.71   0.093    -26.68559    2.106949
     L_gdppc |   12.12663   5.986986     2.03   0.048     .1234477    24.12981
   d_cefta06 |   .1117292   .1034031     1.08   0.285    -.0955814    .3190399
      vat_bh |  -.3086888    .453852    -0.68   0.499    -1.218607    .6012297
        dum2 |  -.2936628   .1322401    -2.22   0.031    -.5587881   -.0285374
        dum3 |  (dropped)
        dum4 |  -.0322565   .2202733    -0.15   0.884    -.4738779     .409365
        dum5 |  (dropped)
       _cons |  -1.200934   20.22635    -0.06   0.953    -41.75233    39.35046
-------------+----------------------------------------------------------------
     sigma_u |  .58760073
     sigma_e |  .16453649
         rho |  .92729291   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(20, 54) =     1.83             Prob > F = 0.0407


. testnl _b[L_fbih_imp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

  (1)  _b[L_fbih_imp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]
```

```
             F(1, 54) =        2.29
             Prob > F =        0.1358

. testnl _b[L_fbih_imp]*_b[ gdppc] = -_b[ L_gdppc]

  (1)  _b[L_fbih_imp]*_b[ gdppc] = -_b[ L_gdppc]

             F(1, 54) =        2.74
             Prob > F =        0.1038
```

**. *first stage: AR1 correction***

```
. xtregar fbih_imp fbh_gdp gdppc d_cefta06 vat_bh dum2-dum5,fe rhotype(dw) lbi
note: dum5 dropped because of collinearity

FE (within) regression with AR(1) disturbances  Number of obs      =        84
Group variable: code                            Number of groups   =        21
R-sq:  within  = 0.3653                         Obs per group: min =         4
       between = 0.0141                                        avg =       4.0
       overall = 0.0167                                        max =         4
                                                F(6,57)            =      5.47
corr(u_i, Xb)  = -0.9198                        Prob > F           =    0.0002
------------------------------------------------------------------------------
    fbih_imp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   2.846249   6.135067     0.46   0.644    -9.439011    15.13151
       gdppc |  -2.905459   5.601376    -0.52   0.606    -14.12202    8.311102
   d_cefta06 |    .152524   .0994734     1.53   0.131    -.0466681    .3517161
      vat_bh |  (dropped)
        dum2 |   .0152449   .4620518     0.03   0.974    -.9099979    .9404877
        dum3 |   .2172064   .5146898     0.42   0.675    -.8134422    1.247855
        dum4 |   .0756421   .2890134     0.26   0.794    -.5030974    .6543815
       _cons |  -11.81602    19.8085    -0.60   0.553    -51.48186    27.84981
-------------+----------------------------------------------------------------
      rho_ar |  .34457006
     sigma_u |  1.9072829
     sigma_e |  .16609776
     rho_fov |   .9924731   (fraction of variance because of u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(20,57) =    22.91             Prob > F = 0.0000
modified Bhargava et al. Durbin-Watson = 1.339109
Baltagi-Wu LBI = 1.6874389


. *AR1 correction with two steps*

. xtregar fbih_imp fbh_gdp gdppc d_cefta06 vat_bh dum2-dum5,fe rhotype(dw) twostep lbi
note: dum5 dropped because of collinearity

FE (within) regression with AR(1) disturbances  Number of obs      =        84
Group variable: code                            Number of groups   =        21
R-sq:  within  = 0.3711                         Obs per group: min =         4
       between = 0.0149                                        avg =       4.0
       overall = 0.0177                                        max =         4

                                                F(6,57)            =      5.61
corr(u_i, Xb)  = -0.9143                        Prob > F           =    0.0001
------------------------------------------------------------------------------
    fbih_imp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   2.750793   6.039044     0.46   0.650    -9.342184    14.84377
       gdppc |  -2.782115   5.515327    -0.50   0.616    -13.82637    8.262137
   d_cefta06 |   .1571152   .0989102     1.59   0.118    -.0409491    .3551796
      vat_bh |  (dropped)
        dum2 |   .0100113   .4676188     0.02   0.983    -.9263791    .9464018
        dum3 |   .2103626   .5145299     0.41   0.684    -.8199657    1.240691
        dum4 |   .0712162   .2872867     0.25   0.805    -.5040655    .6464979
       _cons |  -11.36798   19.91678    -0.57   0.570    -51.25065    28.51469
-------------+----------------------------------------------------------------
```

```
      rho_ar |  .33044548
     sigma_u |  1.8464929
     sigma_e |  .16605787
     rho_fov |  .99197721   (fraction of variance because of u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(20,57) =    23.98             Prob > F = 0.0000
modified Bhargava et al. Durbin-Watson = 1.339109
Baltagi-Wu LBI = 1.6874389
```

```
. *FE from AR1 correction with two steps*
```

```
. predict FEAR1_correct, u
(21 missing values generated)
(21 missing values generated)
```

```
. *second stage*
```

```
. reg FEAR1_correct distance d_cc d_bor

      Source |       SS       df       MS              Number of obs =      84
-------------+------------------------------           F(  3,    80) =   68.89
       Model |  192.891604     3  64.2972013           Prob > F      =  0.0000
    Residual |  74.6658434    80  .933323042           R-squared     =  0.7209
-------------+------------------------------           Adj R-squared =  0.7105
       Total |  267.557447    83   3.2235837           Root MSE      =  .96609

------------------------------------------------------------------------------
FEAR1_corr~t |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    distance |  -3.746297   .3698921   -10.13   0.000    -4.482406   -3.010189
        d_cc |   1.033272   .4035135     2.56   0.012     .2302545    1.836289
       d_bor |  -.8616307   .4868816    -1.77   0.081    -1.830556    .1072946
       _cons |   11.49004   1.191691     9.64   0.000     9.118502    13.86158
------------------------------------------------------------------------------

. predict FEAR1_resid_stage2, residuals
(21 missing values generated)
```

```
. *stage 3*
```

```
. reg fbih_imp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh FEAR1_resid_stage2 dum2-
dum5

      Source |       SS       df       MS              Number of obs =      84
-------------+------------------------------           F( 10,    73) =  183.31
       Model |  45.3347936    10  4.53347936           Prob > F      =  0.0000
    Residual |  1.80542092    73  .024731793           R-squared     =  0.9617
-------------+------------------------------           Adj R-squared =  0.9565
       Total |  47.1402146    83  .567954392           Root MSE      =  .15726

------------------------------------------------------------------------------
    fbih_imp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |    2.82527   .1001153    28.22   0.000     2.625741      3.0248
       gdppc |  -2.823999    .135036   -20.91   0.000    -3.093125   -2.554872
    distance |  -3.865305   .1653225   -23.38   0.000    -4.194792   -3.535817
        d_cc |   1.061979    .067997    15.62   0.000      .926461    1.197497
       d_bor |  -.9297452   .1024235    -9.08   0.000    -1.133875   -.7256154
   d_cefta06 |   .2392452   .0770809     3.10   0.003     .0856231    .3928672
      vat_bh |  -.0704849   .0551334    -1.28   0.205    -.1803655    .0393957
FEAR1_resi~2 |    1.03496   .0450479    22.97   0.000     .9451794     1.12474
        dum2 |  (dropped)
        dum3 |   .1761059   .0485987     3.62   0.001     .0792489    .2729629
        dum4 |   .0772365   .0488207     1.58   0.118    -.0200631    .1745361
        dum5 |  (dropped)
       _cons |   .1625954   .2009002     0.81   0.421     -.237798    .5629889
------------------------------------------------------------------------------

. estat hettest
```

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of fbih_imp

         chi2(1)      =   105.39
         Prob > chi2  =   0.0000

. estat imtest

Cameron & Trivedi's decomposition of IM-test

---------------------------------------------------
              Source |       chi2     df      p
---------------------+-----------------------------
  Heteroskedasticity |      67.48     49    0.0411
            Skewness |      17.36     10    0.0668
            Kurtosis |       1.36      1    0.2435
---------------------+-----------------------------
               Total |      86.19     60    0.0150
---------------------------------------------------

. estat ovtest

Ramsey RESET test using powers of the fitted values of fbih_imp
       Ho:  model has no omitted variables
                  F(3, 70) =     19.69
                  Prob > F =      0.0000

. estat vif

    Variable |       VIF       1/VIF
-------------+----------------------
     fbh_gdp |     22.02    0.045415
       gdppc |     15.28    0.065431
    distance |     12.30    0.081308
FEAR1_resi~2 |      6.13    0.163224
       d_bor |      3.07    0.325710
      vat_bh |      2.58    0.387443
        d_cc |      2.42    0.412978
   d_cefta06 |      2.12    0.472508
        dum4 |      1.52    0.658820
        dum3 |      1.50    0.664854
-------------+----------------------
    Mean VIF |      6.89

.
. xtserial fbih_imp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh FEAR1_resid_stage2
dum2-dum5

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,      20) =     16.867
           Prob > F =      0.0005

. reg fbih_imp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh FEAR1_resid_stage2 dum2-
dum5, vce(robust)

Linear regression                                      Number of obs =      84
                                                       F( 10,    73) =   95.79
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.9617
                                                       Root MSE      =  .15726

------------------------------------------------------------------------------
             |               Robust
    fbih_imp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |    2.82527   .1651749    17.10   0.000     2.496077    3.154464
       gdppc |  -2.823999     .20595   -13.71   0.000    -3.234456   -2.413541
    distance |  -3.865305   .2002055   -19.31   0.000    -4.264314   -3.466296
        d_cc |   1.061979   .0766054    13.86   0.000     .9093046    1.214653
```

```
       d_bor |  -.9297452   .1150914    -8.08   0.000    -1.159122   -.7003685
   d_cefta06 |   .2392452   .1061295     2.25   0.027     .0277295    .4507609
      vat_bh |  -.0704849   .0425754    -1.66   0.102    -.1553376    .0143678
FEAR1_resi~2 |    1.03496   .0835641    12.39   0.000     .8684167    1.201503
        dum2 |  (dropped)
        dum3 |   .1761059   .0562852     3.13   0.003     .0639297    .2882822
        dum4 |   .0772365   .0377533     2.05   0.044     .0019943    .1524788
        dum5 |  (dropped)
       _cons |   .1625954   .2735445     0.59   0.554    -.3825779    .7077688
------------------------------------------------------------------------------


. *because of evidence of serial correlation, test for CFR in the third stage*
```

. *1a)OLS*

```
.
.  xtreg    fbih_imp  L_fbih_imp  fbh_gdp  L_fbh_gdp  gdppc  L_gdppc  d_cefta06  vat_bh
FEAR1_resid_stage2 dum2-dum5
note: dum3 dropped because of collinearity
note: dum5 dropped because of collinearity

Random-effects GLS regression                   Number of obs      =        84
Group variable: code                            Number of groups   =        21
R-sq:  within  = 0.4412                         Obs per group: min =         4
       between = 0.9959                                        avg =       4.0
       overall = 0.9480                                        max =         4
Random effects u_i ~ Gaussian                   Wald chi2(10)      =   1331.20
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000
------------------------------------------------------------------------------
    fbih_imp |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  L_fbih_imp |   .9208383   .0350693    26.26   0.000     .8521037    .9895728
     fbh_gdp |   .5326922    3.94148     0.14   0.892    -7.192466    8.257851
   L_fbh_gdp |  -.5004439   3.946297    -0.13   0.899    -8.235043    7.234155
       gdppc |  -.7401632   3.769526    -0.20   0.844    -8.128298    6.647972
     L_gdppc |   .6561523   3.744949     0.18   0.861    -6.683812    7.996117
   d_cefta06 |  -.0157707   .0827698    -0.19   0.849    -.1779965    .1464551
      vat_bh |  -.1776712   .1052381    -1.69   0.091     -.383934    .0285916
FEAR1_resi~2 |   .0094659   .0418591     0.23   0.821    -.0725764    .0915082
        dum2 |  -.2267942   .0605187    -3.75   0.000    -.3454086   -.1081797
        dum4 |  -.0379102   .0567716    -0.67   0.504    -.1491804      .07336
       _cons |   .2521002   .1946293     1.30   0.195    -.1293661    .6335666
-------------+----------------------------------------------------------------
     sigma_u |          0
     sigma_e |  .16453649
         rho |          0   (fraction of variance due to u_i)
------------------------------------------------------------------------------


. testnl _b[L_fbih_imp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

  (1)  _b[L_fbih_imp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

               chi2(1) =        0.00
           Prob > chi2 =        0.9757

. testnl _b[L_fbih_imp]*_b[ gdppc] = -_b[ L_gdppc]

  (1)  _b[L_fbih_imp]*_b[ gdppc] = -_b[ L_gdppc]

               chi2(1) =        0.01
           Prob > chi2 =        0.9329
```

. *2a)FE*

```
.  xtreg    fbih_imp  L_fbih_imp  fbh_gdp  L_fbh_gdp  gdppc  L_gdppc  d_cefta06  vat_bh
FEAR1_resid_stage2 dum2-dum5, fe

Fixed-effects (within) regression               Number of obs      =        84
Group variable: code                            Number of groups   =        21
```

```
R-sq:  within  = 0.5748                         Obs per group: min =         4
       between = 0.3681                                        avg =       4.0
       overall = 0.3832                                        max =         4
                                                F(9,54)            =      8.11
corr(u_i, Xb)  = 0.0163                         Prob > F           =    0.0000
------------------------------------------------------------------------------
    fbih_imp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  L_fbih_imp |   .1392481   .1557789     0.89   0.375    -.1730698     .451566
     fbh_gdp |   12.44569   8.068991     1.54   0.129    -3.731666    28.62304
   L_fbh_gdp |   -11.9442   6.662255    -1.79   0.079    -25.30122    1.412814
       gdppc |  -12.28932   7.180617    -1.71   0.093    -26.68559    2.106949
     L_gdppc |   12.12663   5.986986     2.03   0.048     .1234477    24.12981
   d_cefta06 |   .1117292   .1034031     1.08   0.285    -.0955814    .3190399
      vat_bh |  -.3086888    .453852    -0.68   0.499    -1.218607    .6012297
FEAR1_resi~2 |  (dropped)
        dum2 |  -.2936628   .1322401    -2.22   0.031    -.5587881   -.0285374
        dum3 |  (dropped)
        dum4 |  -.0322565   .2202733    -0.15   0.884    -.4738779     .409365
        dum5 |  (dropped)
       _cons |  -1.200934   20.22635    -0.06   0.953    -41.75233    39.35046
-------------+----------------------------------------------------------------
     sigma_u |  .58760073
     sigma_e |  .16453649
         rho |  .92729291   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(20, 54) =     1.83             Prob > F = 0.0411


. testnl _b[L_fbih_imp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

  (1)  _b[L_fbih_imp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

              F(1, 54) =        2.29
              Prob > F =        0.1358

. testnl _b[L_fbih_imp]*_b[ gdppc] = -_b[ L_gdppc]

  (1)  _b[L_fbih_imp]*_b[ gdppc] = -_b[ L_gdppc]

              F(1, 54) =        2.74
              Prob > F =        0.1038
```

## . *Prais-Winston for the consistency with the OLS*

```
. prais fbih_imp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh FEAR1_resid_stage2
dum2-dum5, rhotype(regress) vce(robust)
note: dum3 dropped because of collinearity
note: dum5 dropped because of collinearity

Number of gaps in sample:  20   (gap count includes panel changes)
(note: computations for rho restarted at each gap)

Iteration 0:  rho = 0.0000
Iteration 1:  rho = -0.0422
Iteration 2:  rho = -0.0452
Iteration 3:  rho = -0.0454
Iteration 4:  rho = -0.0454
Iteration 5:  rho = -0.0454

Prais-Winsten AR(1) regression -- iterated estimates

Linear regression                                      Number of obs =      84
                                                       F( 11,    73) = 5126.54
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.9647
                                                       Root MSE      =  .15704
------------------------------------------------------------------------------
             |             Semi-robust
    fbih_imp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
```

```
-------------+----------------------------------------------------------------
     fbh_gdp |   2.823221   .1568487    18.00   0.000     2.510622     3.13582
       gdppc |  -2.823804   .1956458   -14.43   0.000    -3.213725   -2.433883
    distance |  -3.863419   .1900898   -20.32   0.000    -4.242267    -3.48457
        d_cc |    1.05938   .0726176    14.59   0.000     .9146538    1.204107
       d_bor |  -.9304395   .1100662    -8.45   0.000    -1.149801   -.7110778
   d_cefta06 |   .2418604   .1035414     2.34   0.022     .0355027    .4482181
      vat_bh |  -.2470324   .0463036    -5.34   0.000    -.3393153   -.1547494
FEAR1_resi~2 |   1.034542    .079383    13.03   0.000     .8763317    1.192752
        dum2 |  -.1761896   .0582515    -3.02   0.003    -.2922847   -.0600945
        dum4 |   .0771417   .0388764     1.98   0.051    -.0003387    .1546222
       _cons |   .3442797    .228234     1.51   0.136    -.1105901    .7991495
-------------+----------------------------------------------------------------
         rho |  -.0453838
------------------------------------------------------------------------------
Durbin-Watson statistic (original)    1.413573
Durbin-Watson statistic (transformed) 1.357867
```

## APPENDIX 6.6: Bosnia and Herzegovina Federation exports

***stage one as suggested in the literature, FE model***

```
. xtreg fbih_exp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh dum2-dum5, fe

Fixed-effects (within) regression               Number of obs      =       105
Group variable: code                            Number of groups   =        21

R-sq:  within  = 0.5224                         Obs per group: min =         5
       between = 0.1175                                        avg =       5.0
       overall = 0.1199                                        max =         5
                                                F(7,77)            =     12.03
corr(u_i, Xb)  = -0.9166                        Prob > F           =    0.0000
------------------------------------------------------------------------------
    fbih_exp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |  -2.087641   3.449737    -0.61   0.547    -8.956945    4.781663
       gdppc |    4.93184   3.221398     1.53   0.130    -1.482783    11.34646
    distance |  (dropped)
        d_cc |  (dropped)
       d_bor |  (dropped)
   d_cefta06 |    -.22568   .1264849    -1.78   0.078    -.4775436    .0261836
      vat_bh |   .8104287   .4012862     2.02   0.047     .0113658    1.609492
        dum2 |   .2103247   .1382111     1.52   0.132    -.0648888    .4855381
        dum3 |   .3762527   .2267076     1.66   0.101    -.0751798    .8276853
        dum4 |  (dropped)
        dum5 |   .2037194   .1938902     1.05   0.297    -.1823652    .5898041
       _cons |   8.336546   15.71604     0.53   0.597     -22.9581    39.63119
-------------+----------------------------------------------------------------
     sigma_u |  1.7933135
     sigma_e |   .2417256
         rho |  .98215515   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(20, 77) =     3.90              Prob > F = 0.0000
```

```
.  xtreg  fbih_exp  fbh_gdp  gdppc  distance  d_cc  d_bor  d_cefta06  vat_bh  dum2-dum5,  fe
vce(robust)

Fixed-effects (within) regression               Number of obs      =       105
Group variable: code                            Number of groups   =        21
R-sq:  within  = 0.5224                         Obs per group: min =         5
       between = 0.1175                                        avg =       5.0
       overall = 0.1199                                        max =         5
                                                F(7,77)            =     17.14
corr(u_i, Xb)  = -0.9166                        Prob > F           =    0.0000
                                  (Std. Err. adjusted for clustering on code)
------------------------------------------------------------------------------
             |               Robust
    fbih_exp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |  -2.087641    2.87006    -0.73   0.469    -7.802661    3.627379
       gdppc |    4.93184   2.410494     2.05   0.044     .1319336    9.731746
    distance |  (dropped)
        d_cc |  (dropped)
       d_bor |  (dropped)
   d_cefta06 |    -.22568   .0834079    -2.71   0.008    -.3917664   -.0595935
      vat_bh |   .8104287   .3306915     2.45   0.017     .1519379     1.46892
        dum2 |   .2103247   .1218069     1.73   0.088    -.0322239    .4528733
        dum3 |   .3762527   .1966906     1.91   0.059    -.0154084    .7679138
        dum4 |  (dropped)
        dum5 |   .2037194    .156672     1.30   0.197    -.1082544    .5156933
       _cons |   8.336546   13.32842     0.63   0.534    -18.20373    34.87682
-------------+----------------------------------------------------------------
     sigma_u |  1.7933135
     sigma_e |   .2417256
         rho |  .98215515   (fraction of variance due to u_i)
```

```
. *stage two, fixed effects obtained from stage one*

. predict Fixed_effects, u


. reg Fixed_effects distance d_cc d_bor

      Source |       SS       df       MS              Number of obs =     105
-------------+------------------------------           F(  3,   101) =    3.09
       Model |  27.0611524     3  9.02038412           Prob > F      =  0.0304
    Residual |  294.536175   101  2.91619975           R-squared     =  0.0841
-------------+------------------------------           Adj R-squared =  0.0569
       Total |  321.597327   104  3.09228199           Root MSE      =  1.7077

------------------------------------------------------------------------------
Fixed_effe~s |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    distance |  -.4242726   .6943314    -0.61   0.543    -1.801639    .9530942
        d_cc |  -.0556913   .6411195    -0.09   0.931      -1.3275    1.216117
       d_bor |   1.510246   .7722422     1.96   0.053    -.0216745    3.042167
       _cons |   1.158118   2.187643     0.53   0.598    -3.181577    5.497814
------------------------------------------------------------------------------

. *stage three, residuals obtained from stage two*

. predict resid_stage2, residuals

. reg fbih_exp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh resid_stage2 dum2-dum5

      Source |       SS       df       MS              Number of obs =     105
-------------+------------------------------           F( 11,    93) =  110.94
       Model |  59.0357034    11  5.36688213           Prob > F      =  0.0000
    Residual |  4.49920756    93  .048378576           R-squared     =  0.9292
-------------+------------------------------           Adj R-squared =  0.9208
       Total |   63.534911   104  .610912606           Root MSE      =  .21995

------------------------------------------------------------------------------
    fbih_exp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |  -2.087641   .3006709    -6.94   0.000    -2.684714   -1.490568
       gdppc |   4.931839   .4477519    11.01   0.000     4.042693    5.820986
    distance |  -.4242726   .2321949    -1.83   0.071    -.8853657    .0368205
        d_cc |  -.0556912   .1121726    -0.50   0.621    -.2784439    .1670614
       d_bor |   1.510246   .1695914     8.91   0.000     1.173471    1.847021
   d_cefta06 |    -.22568   .0960391    -2.35   0.021    -.4163947   -.0349653
      vat_bh |   1.014148    .092227    11.00   0.000     .8310036    1.197293
resid_stage2 |          1   .1030265     9.71   0.000     .7954098     1.20459
        dum2 |   .2103247   .0687425     3.06   0.003     .0738157    .3468337
        dum3 |   .3762527   .0703148     5.35   0.000     .2366214     .515884
        dum4 |  -.2037194   .0702328    -2.90   0.005    -.3431878   -.0642511
        dum5 |  (dropped)
       _cons |   9.494664    .710489    13.36   0.000     8.083773    10.90555
------------------------------------------------------------------------------

. lvr2plot

. estat hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of fbih_exp

         chi2(1)      =     4.31
         Prob > chi2  =   0.0379

. estat imtest

Cameron & Trivedi's decomposition of IM-test

---------------------------------------------------
              Source |       chi2     df      p
---------------------+-----------------------------
  Heteroskedasticity |      63.28     57    0.2645
```

```
           Skewness |       4.67     11    0.9461
           Kurtosis |       4.17      1    0.0412
--------------------+-----------------------------
              Total |      72.12     69    0.3753
---------------------------------------------------

. estat ovtest

Ramsey RESET test using powers of the fitted values of fbih_exp
       Ho:  model has no omitted variables
                 F(3, 90) =      0.13
                 Prob > F =      0.9393

. estat vif

    Variable |       VIF       1/VIF
-------------+----------------------
     fbh_gdp |    125.34    0.007978
       gdppc |    116.57    0.008578
resid_stage2 |     64.62    0.015475
    distance |     11.45    0.087326
       d_bor |      5.38    0.185914
      vat_bh |      4.43    0.225702
        d_cc |      4.21    0.237476
   d_cefta06 |      1.72    0.579725
        dum3 |      1.72    0.582439
        dum4 |      1.71    0.583800
        dum2 |      1.64    0.609387
-------------+----------------------
    Mean VIF |     30.80

.
. reg fbih_exp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh resid_stage2 dum2-dum5,
vce(robust)

Linear regression                                      Number of obs =     105
                                                       F( 11,    93) =  390.84
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.9292
                                                       Root MSE      =  .21995

------------------------------------------------------------------------------
             |               Robust
    fbih_exp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |  -2.087641   .2409425    -8.66   0.000    -2.566105   -1.609177
       gdppc |   4.931839   .3449575    14.30   0.000     4.246822    5.616857
    distance |  -.4242726   .2359832    -1.80   0.075    -.8928885    .0443433
        d_cc |  -.0556912   .0719503    -0.77   0.441    -.1985703    .0871878
       d_bor |   1.510246   .1150133    13.13   0.000     1.281853     1.73864
   d_cefta06 |    -.22568   .0642306    -3.51   0.001    -.3532293   -.0981307
      vat_bh |   1.014148    .091124    11.13   0.000     .8331939    1.195102
resid_stage2 |          1   .0740482    13.50   0.000      .852955    1.147045
        dum2 |   .2103247   .0788858     2.67   0.009     .0536731    .3669762
        dum3 |   .3762527   .0821842     4.58   0.000     .2130511    .5394543
        dum4 |  -.2037194   .0578668    -3.52   0.001    -.3186315   -.0888074
        dum5 |  (dropped)
       _cons |   9.494664   .4906872    19.35   0.000     8.520256    10.46907
------------------------------------------------------------------------------

. xtserial fbih_exp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh dum2-dum5

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,      20) =     12.998
           Prob > F =      0.0018
```

**. *Model improvements***
**. *Testing and accounting for serial correlation***

```
. xtreg fbih_exp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh dum2-dum5, fe
```

```
Fixed-effects (within) regression               Number of obs      =       105
Group variable: code                            Number of groups   =        21
R-sq:  within  = 0.5224                         Obs per group: min =         5
       between = 0.1175                                        avg =       5.0
       overall = 0.1199                                        max =         5
                                                F(7,77)            =     12.03
corr(u_i, Xb)  = -0.9166                        Prob > F           =    0.0000
------------------------------------------------------------------------------
    fbih_exp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |  -2.087641   3.449737    -0.61   0.547    -8.956945    4.781663
       gdppc |    4.93184   3.221398     1.53   0.130    -1.482783    11.34646
    distance |  (dropped)
        d_cc |  (dropped)
       d_bor |  (dropped)
   d_cefta06 |    -.22568   .1264849    -1.78   0.078    -.4775436    .0261836
      vat_bh |   .8104287   .4012862     2.02   0.047     .0113658    1.609492
        dum2 |   .2103247   .1382111     1.52   0.132    -.0648888    .4855381
        dum3 |   .3762527   .2267076     1.66   0.101    -.0751798    .8276853
        dum4 |  (dropped)
        dum5 |   .2037194   .1938902     1.05   0.297    -.1823652    .5898041
       _cons |   8.336546   15.71604     0.53   0.597     -22.9581    39.63119
-------------+----------------------------------------------------------------
     sigma_u |  1.7933135
     sigma_e |   .2417256
         rho |  .98215515   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(20, 77) =     3.90             Prob > F = 0.0000

. xtserial fbih_exp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh dum2-dum5

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,      20) =     12.998
           Prob > F =      0.0018
```

. ***testing the lagged model for CFR***

```
. generate float L_fbih_exp = l.fbih_exp
(21 missing values generated)

. generate float L_fbh_gdp = l.fbh_gdp
(21 missing values generated)

. generate float L_gdppc = l.gdppc
(21 missing values generated)
```

. ***1)OLS***

```
. xtreg  fbih_exp L_fbih_exp fbh_gdp L_fbh_gdp gdppc L_gdppc d_cefta06 vat_bh dum2-dum5
note: dum3 dropped because of collinearity
note: dum5 dropped because of collinearity

Random-effects GLS regression                   Number of obs      =        84
Group variable: code                            Number of groups   =        21
R-sq:  within  = 0.4193                         Obs per group: min =         4
       between = 0.9777                                        avg =       4.0
       overall = 0.8943                                        max =         4
Random effects u_i ~ Gaussian                   Wald chi2(9)       =    511.96
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000
------------------------------------------------------------------------------
    fbih_exp |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  L_fbih_exp |   .9023086   .0450591    20.03   0.000     .8139944    .9906227
     fbh_gdp |   -7.35025   4.695142    -1.57   0.117    -16.55256    1.852059
   L_fbh_gdp |   7.338185   4.688931     1.57   0.118     -1.85195    16.52832
       gdppc |   9.713653   4.771423     2.04   0.042     .3618361    19.06547
```

```
     L_gdppc |  -9.634616   4.727811    -2.04   0.042    -18.90096   -.3682768
   d_cefta06 |  -.1061198   .1135566    -0.93   0.350    -.3286867    .1164471
      vat_bh |   .2238229   .1432993     1.56   0.118    -.0570385    .5046843
        dum2 |   .0603985   .0850881     0.71   0.478    -.1063711    .2271682
        dum4 |   .1428167   .0793771     1.80   0.072    -.0127597     .298393
       _cons |   .4305343   .3232303     1.33   0.183    -.2029855    1.064054
-------------+----------------------------------------------------------------
     sigma_u |  .05478823
     sigma_e |  .19921656
         rho |  .07031673   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. testnl _b[L_fbih_exp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

  (1)  _b[L_fbih_exp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

               chi2(1) =        1.62
           Prob > chi2 =        0.2033

. testnl _b[L_fbih_exp]*_b[ gdppc] = -_b[ L_gdppc]

  (1)  _b[L_fbih_exp]*_b[ gdppc] = -_b[ L_gdppc]

               chi2(1) =        2.30
           Prob > chi2 =        0.1290


. *2)FE*

. xtreg  fbih_exp L_fbih_exp fbh_gdp L_fbh_gdp gdppc L_gdppc d_cefta06 vat_bh dum2-dum5,
fe

Fixed-effects (within) regression               Number of obs      =        84
Group variable: code                            Number of groups   =        21
R-sq:  within  = 0.5773                         Obs per group: min =         4
       between = 0.0506                                        avg =       4.0
       overall = 0.0533                                        max =         4
                                                F(9,54)            =      8.20
corr(u_i, Xb)  = -0.9542                        Prob > F           =    0.0000
------------------------------------------------------------------------------
    fbih_exp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  L_fbih_exp |   .2532103   .1027772     2.46   0.017     .0471544    .4592661
     fbh_gdp |   .0939502   7.034192     0.01   0.989    -14.00876    14.19666
   L_fbh_gdp |   3.261767   5.736043     0.57   0.572    -8.238308    14.76184
       gdppc |   3.982686   6.376955     0.62   0.535    -8.802338    16.76771
     L_gdppc |   -4.81329   5.300854    -0.91   0.368    -15.44086    5.814282
   d_cefta06 |  -.1916046   .1235174    -1.55   0.127    -.4392421    .0560329
      vat_bh |   .0751202   .5015754     0.15   0.882     -.930478    1.080718
        dum2 |   .0519508   .1579861     0.33   0.744    -.2647924    .3686939
        dum3 |  (dropped)
        dum4 |   .1461841    .258618     0.57   0.574    -.3723138    .6646821
        dum5 |  (dropped)
       _cons |  -15.96314   22.22187    -0.72   0.476    -60.51531    28.58902
-------------+----------------------------------------------------------------
     sigma_u |  2.4306409
     sigma_e |  .19921656
         rho |   .9933273   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(20, 54) =     3.55              Prob > F = 0.0001


. testnl _b[L_fbih_exp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

  (1)  _b[L_fbih_exp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

              F(1, 54) =        0.51
              Prob > F =        0.4778

. testnl _b[L_fbih_exp]*_b[ gdppc] = -_b[ L_gdppc]
```

```
 (1)  _b[L_fbih_exp]*_b[ gdppc] = -_b[ L_gdppc]

           F(1, 54) =       0.83
           Prob > F =       0.3668
```

. *first stage: AR1 correction*

```
. xtregar fbih_exp fbh_gdp gdppc d_cefta06 vat_bh dum2-dum5,fe rhotype(dw) lbi
note: dum5 dropped because of collinearity

FE (within) regression with AR(1) disturbances  Number of obs      =        84
Group variable: code                            Number of groups   =        21
R-sq:  within  = 0.3167                         Obs per group: min =         4
       between = 0.1107                                        avg =       4.0
       overall = 0.1069                                        max =         4
                                                F(6,57)            =      4.40
corr(u_i, Xb)  = -0.9134                        Prob > F           =    0.0010
------------------------------------------------------------------------------
    fbih_exp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   .5507854   6.745494     0.08   0.935    -12.95683     14.0584
       gdppc |   2.707064   6.145642     0.44   0.661    -9.599371     15.0135
   d_cefta06 |  -.2481861   .1290027    -1.92   0.059    -.5065097    .0101374
      vat_bh |  (dropped)
        dum2 |  -.2341411   .4370964    -0.54   0.594    -1.109412    .6411293
        dum3 |  -.2920019   .5221661    -0.56   0.578    -1.337622    .7536177
        dum4 |   -.043342    .305431    -0.14   0.888    -.6549571    .5682731
       _cons |   -3.15151   18.61498    -0.17   0.866    -40.42737    34.12435
-------------+----------------------------------------------------------------
      rho_ar |  .41630911
     sigma_u |  1.6933397
     sigma_e |   .2025573
     rho_fov |  .98589291   (fraction of variance because of u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(20,57) =    15.56             Prob > F = 0.0000
modified Bhargava et al. Durbin-Watson = 1.1750949
Baltagi-Wu LBI = 1.63744
```

. *AR1 correction with two steps*

```
. xtregar fbih_exp fbh_gdp gdppc d_cefta06 vat_bh dum2-dum5,fe rhotype(dw) twostep lbi
note: dum5 dropped because of collinearity

FE (within) regression with AR(1) disturbances  Number of obs      =        84
Group variable: code                            Number of groups   =        21
R-sq:  within  = 0.3192                         Obs per group: min =         4
       between = 0.1083                                        avg =       4.0
       overall = 0.1048                                        max =         4
                                                F(6,57)            =      4.45
corr(u_i, Xb)  = -0.9151                        Prob > F           =    0.0009
------------------------------------------------------------------------------
    fbih_exp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   .6387918   6.722674     0.10   0.925    -12.82313    14.10071
       gdppc |    2.62805   6.125611     0.43   0.670    -9.638274    14.89437
   d_cefta06 |  -.2484514   .1287092    -1.93   0.059    -.5061872    .0092844
      vat_bh |  (dropped)
        dum2 |  -.2303774   .4393044    -0.52   0.602    -1.110069    .6493146
        dum3 |  -.2865796   .5230803    -0.55   0.586     -1.33403    .7608705
        dum4 |  -.0399614   .3054809    -0.13   0.896    -.6516765    .5717536
       _cons |  -3.567156   18.67346    -0.19   0.849    -40.96011     33.8258
-------------+----------------------------------------------------------------
      rho_ar |  .41245253
     sigma_u |  1.7127513
     sigma_e |  .20230642
     rho_fov |  .98624016   (fraction of variance because of u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(20,57) =    15.79             Prob > F = 0.0000
modified Bhargava et al. Durbin-Watson = 1.1750949
```

```
Baltagi-Wu LBI = 1.63744
```

. *FE from AR1 correction with two steps*

```
. predict FEAR1_correct, u
(21 missing values generated)
(21 missing values generated)
```

. *second stage*

```
. reg FEAR1_correct distance d_cc d_bor

      Source |       SS       df       MS              Number of obs =      84
-------------+------------------------------           F(  3,    80) =   70.03
       Model |  171.842344     3  57.2807815           Prob > F      =  0.0000
    Residual |  65.4344424    80   .81793053           R-squared     =  0.7242
-------------+------------------------------           Adj R-squared =  0.7139
       Total |  237.276787    83  2.85875647           Root MSE      =   .9044

------------------------------------------------------------------------------
FEAR1_corr~t |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    distance |  -4.095392   .4111227    -9.96   0.000    -4.913552   -3.277232
        d_cc |   .4508381   .3796152     1.19   0.238    -.3046202    1.206296
       d_bor |   .1858474   .4572546     0.41   0.686    -.7241183    1.095813
       _cons |   12.36143   1.295332     9.54   0.000     9.783635    14.93922
------------------------------------------------------------------------------

. predict FEAR1_resid_stage2, residuals
(21 missing values generated)
```

. *stage 3*

```
. reg fbih_exp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh FEAR1_resid_stage2 dum2-
dum5

      Source |       SS       df       MS              Number of obs =      84
-------------+------------------------------           F( 10,    73) =  118.84
       Model |  44.2732385    10  4.42732385           Prob > F      =  0.0000
    Residual |  2.71959725    73  .037254757           R-squared     =  0.9421
-------------+------------------------------           Adj R-squared =  0.9342
       Total |  46.9928357    83  .566178744           Root MSE      =  .19301

------------------------------------------------------------------------------
    fbih_exp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   .6236669   .0558168    11.17   0.000     .5124241    .7349097
       gdppc |   2.458118   .2171036    11.32   0.000     2.025431    2.890805
    distance |  -3.822594    .206038   -18.55   0.000    -4.233228   -3.411961
        d_cc |   .5106808   .0831239     6.14   0.000     .3450152    .6763465
       d_bor |   .2058365   .1042555     1.97   0.052    -.0019443    .4136173
   d_cefta06 |  -.2507961   .0898032    -2.79   0.007    -.4297736   -.0718187
      vat_bh |   .3669737   .0644845     5.69   0.000     .2384562    .4954911
FEAR1_resi~2 |   .9123099   .1006171     9.07   0.000     .7117803    1.112839
        dum2 |   -.089403   .0595902    -1.50   0.138    -.2081661    .0293602
        dum3 |  (dropped)
        dum4 |  -.0626686   .0597369    -1.05   0.298    -.1817241    .0563869
        dum5 |  (dropped)
       _cons |   7.761131   .5445143    14.25   0.000     6.675915    8.846346
------------------------------------------------------------------------------


. estat hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of fbih_exp

         chi2(1)      =    10.00
         Prob > chi2  =   0.0016
```

```
. estat imtest

Cameron & Trivedi's decomposition of IM-test

---------------------------------------------------
              Source |       chi2     df      p
---------------------+-----------------------------
  Heteroskedasticity |      47.48     49    0.5348
            Skewness |       6.23     10    0.7955
            Kurtosis |       3.64      1    0.0563
---------------------+-----------------------------
               Total |      57.36     60    0.5729
---------------------------------------------------

. estat ovtest

Ramsey RESET test using powers of the fitted values of fbih_exp
       Ho:  model has no omitted variables
                  F(3, 70) =      0.57
                  Prob > F =      0.6380
. estat vif

    Variable |       VIF       1/VIF
-------------+----------------------
       gdppc |     27.60    0.036231
FEAR1_resi~2 |     17.78    0.056238
    distance |      9.37    0.106757
     fbh_gdp |      4.42    0.226188
        d_cc |      2.40    0.416275
      vat_bh |      2.34    0.426630
       d_bor |      2.11    0.473544
   d_cefta06 |      1.91    0.524380
        dum4 |      1.51    0.662851
        dum2 |      1.50    0.666118
-------------+----------------------
    Mean VIF |      7.09


. xtserial fbih_exp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh FEAR1_resid_stage2
dum2-dum5

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,      20) =      7.478
           Prob > F =      0.0128


. reg fbih_exp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh FEAR1_resid_stage2 dum2-
dum5, vce(robust)

Linear regression                                      Number of obs =      84
                                                       F( 10,    73) =  348.34
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.9421
                                                       Root MSE      =  .19301

------------------------------------------------------------------------------
             |               Robust
    fbih_exp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   .6236669   .0673935     9.25   0.000     .4893519    .7579819
       gdppc |   2.458118   .2322955    10.58   0.000     1.995153    2.921082
    distance |  -3.822594   .2150966   -17.77   0.000    -4.251281   -3.393908
        d_cc |   .5106808   .0589339     8.67   0.000     .3932258    .6281359
       d_bor |   .2058365   .0449805     4.58   0.000     .1161905    .2954825
   d_cefta06 |  -.2507961   .0569646    -4.40   0.000    -.3643264   -.1372658
      vat_bh |   .3669737   .0465517     7.88   0.000     .2741962    .4597512
FEAR1_resi~2 |   .9123099   .1003552     9.09   0.000     .7123023    1.112317
        dum2 |   -.089403   .0746364    -1.20   0.235    -.2381531    .0593471
        dum3 |  (dropped)
        dum4 |  -.0626686   .0402972    -1.56   0.124    -.1429807    .0176435
        dum5 |  (dropped)
```

```
       _cons |   7.761131   .5471865    14.18   0.000     6.670589    8.851672
------------------------------------------------------------------------------
```

. *because of evidence of serial correlation, test for CFR in the third stage*

. *1a)OLS*

```
.  xtreg    fbih_exp  L_fbih_exp  fbh_gdp  L_fbh_gdp  gdppc  L_gdppc  d_cefta06  vat_bh
FEAR1_resid_stage2 dum2-dum5
note: dum3 dropped because of collinearity
note: dum5 dropped because of collinearity

Random-effects GLS regression                   Number of obs      =        84
Group variable: code                            Number of groups   =        21
R-sq:  within  = 0.4319                         Obs per group: min =         4
       between = 0.9753                                        avg =       4.0
       overall = 0.8995                                        max =         4
Random effects u_i ~ Gaussian                   Wald chi2(10)      =    513.92
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000
------------------------------------------------------------------------------
    fbih_exp |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  L_fbih_exp |   .8464859   .0513496    16.48   0.000     .7458425    .9471292
     fbh_gdp |   -10.5957   4.871299    -2.18   0.030    -20.14327   -1.048126
   L_fbh_gdp |   10.71777   4.885905     2.19   0.028     1.141574    20.29397
       gdppc |   12.10667   4.817461     2.51   0.012     2.664616    21.54872
     L_gdppc |  -12.42145    4.82316    -2.58   0.010    -21.87467   -2.968233
   d_cefta06 |  -.0501366   .1144364    -0.44   0.661    -.2744278    .1741545
      vat_bh |   .2824984    .142814     1.98   0.048     .0025882    .5624086
FEAR1_resi~2 |  -.2163692   .1051531    -2.06   0.040    -.4224655   -.0102729
        dum2 |   .0712857   .0831028     0.86   0.391    -.0915927    .2341641
        dum4 |   .1338017   .0773978     1.73   0.084    -.0178953    .2854987
       _cons |   .1625323   .3488547     0.47   0.641    -.5212104    .8462749
-------------+----------------------------------------------------------------
     sigma_u |  .06179821
     sigma_e |  .19921656
         rho |  .08778091   (fraction of variance due to u_i)
------------------------------------------------------------------------------


. testnl _b[L_fbih_exp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

  (1)  _b[L_fbih_exp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

               chi2(1) =        3.01
           Prob > chi2 =        0.0830

. testnl _b[L_fbih_exp]*_b[ gdppc] = -_b[ L_gdppc]

  (1)  _b[L_fbih_exp]*_b[ gdppc] = -_b[ L_gdppc]

               chi2(1) =        4.23
           Prob > chi2 =        0.0397
```

. *2a)FE*

```
.  xtreg    fbih_exp  L_fbih_exp  fbh_gdp  L_fbh_gdp  gdppc  L_gdppc  d_cefta06  vat_bh
FEAR1_resid_stage2 dum2-dum5, fe

Fixed-effects (within) regression               Number of obs      =        84
Group variable: code                            Number of groups   =        21
R-sq:  within  = 0.5773                         Obs per group: min =         4
       between = 0.0506                                        avg =       4.0
       overall = 0.0533                                        max =         4
                                                F(9,54)            =      8.20
corr(u_i, Xb)  = -0.9542                        Prob > F           =    0.0000
------------------------------------------------------------------------------
    fbih_exp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  L_fbih_exp |   .2532103   .1027772     2.46   0.017     .0471544    .4592661
     fbh_gdp |   .0939502   7.034192     0.01   0.989    -14.00876    14.19666
```

```
   L_fbh_gdp |   3.261767   5.736043     0.57   0.572    -8.238308    14.76184
       gdppc |   3.982686   6.376955     0.62   0.535    -8.802338    16.76771
     L_gdppc |   -4.81329   5.300854    -0.91   0.368    -15.44086    5.814282
   d_cefta06 |  -.1916046   .1235174    -1.55   0.127    -.4392421    .0560329
      vat_bh |   .0751202   .5015754     0.15   0.882     -.930478    1.080718
FEAR1_resi~2 |  (dropped)
        dum2 |   .0519508   .1579861     0.33   0.744    -.2647924    .3686939
        dum3 |  (dropped)
        dum4 |   .1461841    .258618     0.57   0.574    -.3723138    .6646821
        dum5 |  (dropped)
       _cons |  -15.96314   22.22187    -0.72   0.476    -60.51531    28.58902
-------------+----------------------------------------------------------------
     sigma_u |  2.4306409
     sigma_e |  .19921656
         rho |   .9933273   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(20, 54) =     3.23             Prob > F = 0.0003


. testnl _b[L_fbih_exp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

  (1)  _b[L_fbih_exp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

              F(1, 54) =        0.51
              Prob > F =        0.4778

. testnl _b[L_fbih_exp]*_b[ gdppc] = -_b[ L_gdppc]

  (1)  _b[L_fbih_exp]*_b[ gdppc] = -_b[ L_gdppc]

              F(1, 54) =        0.83
              Prob > F =        0.3668
```

## . *Prais-Winston for the consistency with the OLS*

```
. prais fbih_exp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh FEAR1_resid_stage2
dum2-dum5, rhotype(regress) vce(robust)
note: dum3 dropped because of collinearity
note: dum5 dropped because of collinearity

Number of gaps in sample:  20   (gap count includes panel changes)
(note: computations for rho restarted at each gap)

Iteration 0:  rho = 0.0000
Iteration 1:  rho = -0.0488
Iteration 2:  rho = -0.0504
Iteration 3:  rho = -0.0504
Iteration 4:  rho = -0.0504
Iteration 5:  rho = -0.0504

Prais-Winsten AR(1) regression -- iterated estimates

Linear regression                                      Number of obs =      84
                                                       F( 11,    73) = 4185.98
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.9469
                                                       Root MSE      =  .19265
------------------------------------------------------------------------------
             |             Semi-robust
    fbih_exp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   .6255269   .0629007     9.94   0.000     .5001659    .7508878
       gdppc |   2.458423   .2205385    11.15   0.000     2.018891    2.897956
    distance |  -3.831026   .2012597   -19.04   0.000    -4.232136   -3.429916
        d_cc |    .510519   .0554326     9.21   0.000     .4000421     .620996
       d_bor |   .2045994   .0422783     4.84   0.000     .1203387      .28886
   d_cefta06 |  -.2532189    .055484    -4.56   0.000    -.3637984   -.1426394
      vat_bh |   .3674221   .0465952     7.89   0.000      .274558    .4602862
FEAR1_resi~2 |   .9138426   .0950343     9.62   0.000     .7244395    1.103246
        dum2 |  -.0893385   .0775389    -1.15   0.253    -.2438733    .0651963
```

```
        dum4 |  -.0626001   .0412632    -1.52   0.134    -.1448376    .0196374
       _cons |   7.776984   .5119517    15.19   0.000     6.756666    8.797303
-------------+----------------------------------------------------------------
         rho |  -.0504226
------------------------------------------------------------------------------
Durbin-Watson statistic (original)    1.411569
Durbin-Watson statistic (transformed) 1.332818
```

## APPENDIX 6.7: Republika Srpska imports

Table A6.5: Test diagnostics for RS import and export flows with FEVD and FEVDA procedure

| Estimation technique: | | FEVD | FEVDA | FEVD | FEVDA |
|---|---|---|---|---|---|
| Hypothesis | Diagnostic tests: | RS imports | RS imports | RS exports | RS exports |
| | | 1 | 2 | 3 | 4 |
| Ho: constant variance | Breusch-Pagan/ Cook-Weinsberg Prob>Chi sqr. | 0,00 | 0,00 | 0,00 | 0,00 |
| Ho: normal distribution | Cameron & Trivedi's IM-test | | | | |
| | Heteroscedasticity | 0.03 | 0.11 | 0.01 | 0.00 |
| | Skewness | 0.02 | 0.56 | 0.25 | 0.15 |
| | Kurtosis | 0.11 | 0.18 | 0.04 | 0.08 |
| Ho: model has no omitted variables | Ramsey RESET Prob>F | 0,00 | 0,16 | 0,58 | 0,05 |
| Ho: no first-order autocorrelation | Wooldridge test Prob>F | 0,00 | 0,00 | 0,00 | 0,00 |
| | Mean VIF | 6,77 | 9,33 | 1025,14 | 223,77 |
| R-squared | | 0,94 | 0,94 | 0,67 | 0,58 |
| observations | | 100,00 | 80,00 | 100,00 | 80,00 |

Table A6.6: RS import and export flows with FEVD and FEVDA procedure

| Estimation technique: | | FEVD | FEVDA | FEVD | FEVDA |
|---|---|---|---|---|---|
| Descripiton | Variables | RS imports | RS imports | RS exports | RS exports |
| | | 1 | 2 | 3 | 4 |
| Income | log(fbh_gdp) | -1.65 ***<br>(0.13) | 3.02 ***<br>(0.14) | 30.36 ***<br>(4.33) | 14.51 ***<br>(3.55) |
| Linder | log(gdppc) | 1.60 ***<br>(0.10) | -3.54 ***<br>(0.21) | -26.10 ***<br>(3.96) | 13.78 ***<br>(3.64) |
| Distance | log(distance) | 2.66 ***<br>(0.19) | -4.34 ***<br>(0.24) | -40.88 ***<br>(5.72) | -18.00 ***<br>(4.42) |
| Common country | d_cc | -0.27 ***<br>(0.08) | 1.02 ***<br>(0.06) | 8.23 ***<br>(1.06) | 4.14 ***<br>(0.83) |
| Border | d_bor | 1.73 ***<br>(0.10) | -0.77 ***<br>(0.09) | -14.36 ***<br>(2.17) | -6.30 ***<br>(1.77) |
| CEFTA | cefta06 | 0.21 **<br>(0.08) | 0.09<br>(0.06) | -0.23<br>(0.14) | -0.01<br>(0.14) |
| VAT | vat_bh | 0.26 ***<br>(0.06) | -0.21 ***<br>(0.05) | -2.77 ***<br>(0.51) | -1.50 ***<br>(0.43) |
| Unit effect | unit effect | 1.00 ***<br>(0.17) | 1.00 ***<br>(0.07) | 0.99 ***<br>(0.15) | 0.51 ***<br>(0.13) |
| time effect | 2004 | 0.26 ***<br>(0.05) | 0.03<br>(0.05) | -0.70 ***<br>(0.18) | -0.13<br>(0.18) |
| time effect | 2005 | 0.45 ***<br>(0.04) | | -1.29 ***<br>(0.30) | |
| time effect | 2006 | | | | 0.73 ***<br>(0.21) |
| time effect | 2007 | 0.15 **<br>(0.05) | -0.08 **<br>(0.04) | -1.51 ***<br>(0.28) | |
| time effect | 2008 | n/a | n/a | n/a | n/a |
| constant | _cons | 0.84 ***<br>(0.21) | 0.64 **<br>(0.28) | -15.69 ***<br>(2.65) | 11.35 ***<br>(2.98) |

```
. *stage one as suggested in the literature, FE model*
.
. xtreg rs_imp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh dum2-dum5, fe

Fixed-effects (within) regression               Number of obs      =       100
Group variable: code                            Number of groups   =        20
R-sq:  within  = 0.1956                         Obs per group: min =         5
       between = 0.0000                                        avg =       5.0
       overall = 0.0003                                        max =         5
                                                F(7,73)            =      2.54
corr(u_i, Xb)  = -0.8673                        Prob > F           =    0.0216
------------------------------------------------------------------------------
      rs_imp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   -1.65387   3.813143    -0.43   0.666    -9.253453    5.945712
       gdppc |   1.597527   3.532495     0.45   0.652    -5.442726     8.63778
```

```
    distance |  (dropped)
        d_cc |  (dropped)
       d_bor |  (dropped)
   d_cefta06 |   .2143265   .0940919     2.28   0.026     .0268016    .4018515
      vat_bh |   .2630794    .436403     0.60   0.548    -.6066705    1.132829
        dum2 |   .1714832   .1414016     1.21   0.229    -.1103298    .4532962
        dum3 |   .2582847   .2475919     1.04   0.300    -.2351653    .7517348
        dum4 |  (dropped)
        dum5 |   .1547726   .2061619     0.75   0.455    -.2561075    .5656528
       _cons |   9.192517   18.14362     0.51   0.614    -26.96766     45.3527
-------------+----------------------------------------------------------------
     sigma_u |  1.2414364
     sigma_e |  .18385746
         rho |  .97853698   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(19, 73) =    21.35            Prob > F = 0.0000

.  xtreg  rs_imp  fbh_gdp  gdppc  distance  d_cc  d_bor  d_cefta06  vat_bh  dum2-dum5,  fe
vce(robust)

Fixed-effects (within) regression               Number of obs      =       100
Group variable: code                            Number of groups   =        20
R-sq:  within  = 0.1956                         Obs per group: min =         5
       between = 0.0000                                        avg =       5.0
       overall = 0.0003                                        max =         5
                                                F(7,73)            =      2.19
corr(u_i, Xb)  = -0.8673                        Prob > F           =    0.0449
                                   (Std. Err. adjusted for clustering on code)
------------------------------------------------------------------------------
             |               Robust
      rs_imp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   -1.65387   5.271072    -0.31   0.755     -12.1591    8.851362
       gdppc |   1.597527   4.852706     0.33   0.743    -8.073902    11.26896
    distance |  (dropped)
        d_cc |  (dropped)
       d_bor |  (dropped)
   d_cefta06 |   .2143265    .095978     2.23   0.029     .0230427    .4056104
      vat_bh |   .2630794   .6153638     0.43   0.670    -.9633388    1.489498
        dum2 |   .1714832   .2107008     0.81   0.418    -.2484429    .5914093
        dum3 |   .2582847   .3608837     0.72   0.476    -.4609555    .9775249
        dum4 |  (dropped)
        dum5 |   .1547726   .2669712     0.58   0.564    -.3773003    .6868455
       _cons |   9.192517   25.06451     0.37   0.715    -40.76098    59.14602
-------------+----------------------------------------------------------------
     sigma_u |  1.2414364
     sigma_e |  .18385746
         rho |  .97853698   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

```
. *stage two, fixed effects obtained from stage one*
```

```
. predict Fixed_effects, u


. reg Fixed_effects distance d_cc d_bor

      Source |       SS       df       MS              Number of obs =     100
-------------+------------------------------           F(  3,    96) =   47.09
       Model |  87.1694004     3  29.0564668           Prob > F      =  0.0000
    Residual |  59.2412064    96    .6170959           R-squared     =  0.5954
-------------+------------------------------           Adj R-squared =  0.5827
       Total |  146.410607    99  1.47889502           Root MSE      =  .78555
------------------------------------------------------------------------------
Fixed_effe~s |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    distance |    2.66485   .2585157    10.31   0.000       2.1517       3.178
        d_cc |  -.2684474    .291588    -0.92   0.360     -.847245    .3103502
       d_bor |    1.73053   .3538893     4.89   0.000     1.028065    2.432995
       _cons |    -8.3518   .8325147   -10.03   0.000    -10.00433   -6.699271
```

```
. *stage three, residuals obtained from stage two*

. predict resid_stage2, residuals

. reg rs_imp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh resid_stage2 dum2-dum5

      Source |       SS       df       MS              Number of obs =     100
-------------+------------------------------           F( 11,    88) =  117.63
       Model |  36.2825895    11  3.29841723           Prob > F      =  0.0000
    Residual |  2.46766034    88  .028041595           R-squared     =  0.9363
-------------+------------------------------           Adj R-squared =  0.9284
       Total |  38.7502498    99  .391416665           Root MSE      =  .16746

------------------------------------------------------------------------------
      rs_imp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   -1.65387    .130451   -12.68   0.000    -1.913114   -1.394627
       gdppc |   1.597527   .0991934    16.11   0.000     1.400401    1.794653
    distance |    2.66485   .1882051    14.16   0.000     2.290832    3.038868
        d_cc |  -.2684474   .0844194    -3.18   0.002    -.4362133   -.1006815
       d_bor |    1.73053   .0974179    17.76   0.000     1.536932    1.924127
   d_cefta06 |   .2143265   .0825155     2.60   0.011     .0503442    .3783088
      vat_bh |   .2630794   .0566179     4.65   0.000     .1505633    .3755955
resid_stage2 |          1   .0452177    22.12   0.000     .9101392    1.089861
        dum2 |   .1714832   .0531672     3.23   0.002     .0658247    .2771418
        dum3 |   .2582847   .0537822     4.80   0.000     .1514039    .3651655
        dum4 |  (dropped)
        dum5 |   .1547726    .053402     2.90   0.005     .0486474    .2608978
       _cons |   .8407175   .2146136     3.92   0.000      .414218    1.267217
------------------------------------------------------------------------------


. lvr2plot

. estat hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of rs_imp

         chi2(1)      =    39.11
         Prob > chi2  =   0.0000

. estat imtest

Cameron & Trivedi's decomposition of IM-test

---------------------------------------------------
              Source |       chi2     df      p
---------------------+-----------------------------
  Heteroskedasticity |      76.80     56    0.0340
            Skewness |      22.55     11    0.0205
            Kurtosis |       2.51      1    0.1129
---------------------+-----------------------------
               Total |     101.86     68    0.0049
---------------------------------------------------

. estat ovtest

Ramsey RESET test using powers of the fitted values of rs_imp
       Ho:  model has no omitted variables
                  F(3, 85) =      6.51
                  Prob > F =      0.0005

. estat vif

    Variable |       VIF       1/VIF
-------------+----------------------
     fbh_gdp |     28.49    0.035098
    distance |     18.30    0.054640
       gdppc |      6.79    0.147188
resid_stage2 |      4.32    0.231505
```

```
        d_cc |      4.07    0.245922
       d_bor |      3.05    0.328309
      vat_bh |      2.74    0.364489
   d_cefta06 |      1.79    0.559569
        dum3 |      1.65    0.605907
        dum5 |      1.63    0.614565
        dum2 |      1.61    0.620006
-------------+----------------------
    Mean VIF |      6.77
```

```
. reg rs_imp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh resid_stage2 dum2-dum5,
vce(robust)

Linear regression                                      Number of obs =     100
                                                       F( 11,    88) =  131.12
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.9363
                                                       Root MSE      =  .16746

------------------------------------------------------------------------------
             |               Robust
      rs_imp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   -1.65387   .1674518    -9.88   0.000    -1.986646   -1.321095
       gdppc |   1.597527   .1468418    10.88   0.000      1.30571    1.889344
    distance |    2.66485   .2741729     9.72   0.000     2.119989    3.209711
        d_cc |  -.2684474   .0603191    -4.45   0.000    -.3883189   -.1485759
       d_bor |    1.73053    .089144    19.41   0.000     1.553375    1.907685
   d_cefta06 |   .2143265   .0877488     2.44   0.017     .0399443    .3887087
      vat_bh |   .2630794   .0625876     4.20   0.000     .1386996    .3874592
resid_stage2 |          1   .0671037    14.90   0.000     .8666456    1.133354
        dum2 |   .1714832   .0557614     3.08   0.003     .0606692    .2822972
        dum3 |   .2582847   .0623399     4.14   0.000     .1343973    .3821721
        dum4 |  (dropped)
        dum5 |   .1547726   .0572737     2.70   0.008     .0409532     .268592
       _cons |   .8407175   .2419689     3.47   0.001     .3598551     1.32158
------------------------------------------------------------------------------


. xtserial rs_imp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh dum2-dum5

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,      19) =     67.114
           Prob > F =      0.0000
```

**. *Model improvements***
**. *Testing and accounting for serial correlation***

```
. xtreg rs_imp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh dum2-dum5, fe

Fixed-effects (within) regression               Number of obs      =       100
Group variable: code                            Number of groups   =        20
R-sq:  within  = 0.1956                         Obs per group: min =         5
       between = 0.0000                                        avg =       5.0
       overall = 0.0003                                        max =         5
                                                F(7,73)            =      2.54
corr(u_i, Xb)  = -0.8673                        Prob > F           =    0.0216
------------------------------------------------------------------------------
      rs_imp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   -1.65387   3.813143    -0.43   0.666    -9.253453    5.945712
       gdppc |   1.597527   3.532495     0.45   0.652    -5.442726     8.63778
    distance |  (dropped)
        d_cc |  (dropped)
       d_bor |  (dropped)
   d_cefta06 |   .2143265   .0940919     2.28   0.026     .0268016    .4018515
      vat_bh |   .2630794    .436403     0.60   0.548    -.6066705    1.132829
        dum2 |   .1714832   .1414016     1.21   0.229    -.1103298    .4532962
```

```
        dum3 |   .2582847   .2475919     1.04   0.300    -.2351653    .7517348
        dum4 |  (dropped)
        dum5 |   .1547726   .2061619     0.75   0.455    -.2561075    .5656528
       _cons |   9.192517   18.14362     0.51   0.614    -26.96766     45.3527
-------------+----------------------------------------------------------------
     sigma_u |  1.2414364
     sigma_e |  .18385746
         rho |  .97853698   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(19, 73) =    21.35             Prob > F = 0.0000
```

```
. xtserial rs_imp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh dum2-dum5

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,      19) =     67.114
           Prob > F =      0.0000
```

**. *testing the lagged model for CFR***

```
. generate float L_rs_imp = l.rs_imp
(20 missing values generated)

. generate float L_fbh_gdp = l.fbh_gdp
(20 missing values generated)

. generate float L_gdppc = l.gdppc
(20 missing values generated)
```

**. *1)OLS***

```
. xtreg rs_imp L_rs_imp fbh_gdp L_fbh_gdp gdppc L_gdppc d_cefta06 vat_bh dum2-dum5
note: dum2 dropped because of collinearity
note: dum5 dropped because of collinearity

Random-effects GLS regression                   Number of obs      =        80
Group variable: code                            Number of groups   =        20
R-sq:  within  = 0.1607                         Obs per group: min =         4
       between = 0.9871                                        avg =       4.0
       overall = 0.9214                                        max =         4
Random effects u_i ~ Gaussian                   Wald chi2(9)       =    820.03
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000
------------------------------------------------------------------------------
      rs_imp |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    L_rs_imp |   .9022715   .0336793    26.79   0.000     .8362613    .9682816
     fbh_gdp |  -9.673844   4.904131    -1.97   0.049    -19.28576   -.0619239
   L_fbh_gdp |   9.713861   4.915827     1.98   0.048     .0790178     19.3487
       gdppc |    6.79964   4.477305     1.52   0.129    -1.975716      15.575
     L_gdppc |  -6.974308   4.477098    -1.56   0.119    -15.74926    1.800644
   d_cefta06 |     .02089   .0833692     0.25   0.802    -.1425107    .1842907
      vat_bh |   .1220753    .102838     1.19   0.235    -.0794835     .323634
        dum3 |   -.079448   .0607457    -1.31   0.191    -.1985074    .0396113
        dum4 |  -.1303135   .0566033    -2.30   0.021    -.2412539    -.019373
       _cons |    .476079   .2171363     2.19   0.028     .0504997    .9016584
-------------+----------------------------------------------------------------
     sigma_u |          0
     sigma_e |  .15537673
         rho |          0   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

```
. testnl _b[L_rs_imp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

  (1)  _b[L_rs_imp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

               chi2(1) =        2.55
           Prob > chi2 =        0.1105
```

```
. testnl _b[L_rs_imp]*_b[ gdppc] = -_b[ L_gdppc]

  (1)  _b[L_rs_imp]*_b[ gdppc] = -_b[ L_gdppc]

               chi2(1) =        2.66
           Prob > chi2 =        0.1031
```

. *2)FE*

```
. xtreg  rs_imp L_rs_imp fbh_gdp L_fbh_gdp gdppc L_gdppc d_cefta06 vat_bh dum2-dum5, fe

Fixed-effects (within) regression               Number of obs      =        80
Group variable: code                            Number of groups   =        20
R-sq:  within  = 0.2234                         Obs per group: min =         4
       between = 0.0013                                        avg =       4.0
       overall = 0.0013                                        max =         4
                                                F(9,51)            =      1.63
corr(u_i, Xb)  = -0.9896                        Prob > F           =    0.1317
------------------------------------------------------------------------------
      rs_imp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    L_rs_imp |   .3416084   .1306127     2.62   0.012     .0793925    .6038244
     fbh_gdp |   1.442397   8.281874     0.17   0.862    -15.18416    18.06895
   L_fbh_gdp |   4.865101   7.476053     0.65   0.518     -10.1437     19.8739
       gdppc |  -2.449191   7.275359    -0.34   0.738    -17.05508     12.1567
     L_gdppc |  -3.776883   6.626055    -0.57   0.571    -17.07924    9.525478
   d_cefta06 |   .0852588   .0963736     0.88   0.380    -.1082193     .278737
      vat_bh |  -.5306878   .4979504    -1.07   0.292    -1.530365    .4689893
        dum2 |   .1856768   .1654229     1.12   0.267    -.1464235    .5177772
        dum3 |  (dropped)
        dum4 |   .2304627   .2590558     0.89   0.378    -.2896135    .7505389
        dum5 |  (dropped)
       _cons |  -29.01326   23.65692    -1.23   0.226    -76.50651    18.47999
-------------+----------------------------------------------------------------
     sigma_u |  4.0828724
     sigma_e |  .15537673
         rho |  .99855386   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(19, 51) =     2.01             Prob > F = 0.0244

. testnl _b[L_rs_imp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

  (1)  _b[L_rs_imp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

              F(1, 51) =        0.94
              Prob > F =        0.3364

. testnl _b[L_rs_imp]*_b[ gdppc] = -_b[ L_gdppc]

  (1)  _b[L_rs_imp]*_b[ gdppc] = -_b[ L_gdppc]

              F(1, 51) =        0.84
              Prob > F =        0.3649
```

. *first stage: AR1 correction*

```
. xtregar rs_imp fbh_gdp gdppc d_cefta06 vat_bh dum2-dum5,fe rhotype(dw) lbi
note: dum4 dropped because of collinearity

FE (within) regression with AR(1) disturbances  Number of obs      =        80
Group variable: code                            Number of groups   =        20
R-sq:  within  = 0.0921                         Obs per group: min =         4
       between = 0.0042                                        avg =       4.0
       overall = 0.0037                                        max =         4
                                                F(6,54)            =      0.91
corr(u_i, Xb)  = -0.9552                        Prob > F           =    0.4931
------------------------------------------------------------------------------
      rs_imp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
```

```
-------------+----------------------------------------------------------------
     fbh_gdp |   2.728924   7.090309     0.38   0.702    -11.48629    16.94414
       gdppc |   -3.41993   6.509848    -0.53   0.601    -16.47139     9.63153
   d_cefta06 |   .0743599   .1071549     0.69   0.491    -.1404728    .2891925
      vat_bh |  (dropped)
        dum2 |   .1356718   .2365424     0.57   0.569    -.3385672    .6099108
        dum3 |    .166422   .2495468     0.67   0.508    -.3338893    .6667332
        dum5 |  -.0577953   .3221581    -0.18   0.858    -.7036834    .5880929
       _cons |  -11.36929    18.4251    -0.62   0.540    -48.30938    25.57081
-------------+----------------------------------------------------------------
      rho_ar |  .46841674
     sigma_u |  1.9792982
     sigma_e |  .15566255
     rho_fov |  .99385293   (fraction of variance because of u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(19,54) =    13.62             Prob > F = 0.0000
modified Bhargava et al. Durbin-Watson = 1.0774385
Baltagi-Wu LBI = 1.6419
```

. *AR1 correction with two steps*

```
. xtregar rs_imp fbh_gdp gdppc d_cefta06 vat_bh dum2-dum5,fe rhotype(dw) twostep lbi
note: dum4 dropped because of collinearity

FE (within) regression with AR(1) disturbances  Number of obs      =        80
Group variable: code                            Number of groups   =        20

R-sq:  within  = 0.0920                         Obs per group: min =         4
       between = 0.0035                                        avg =       4.0
       overall = 0.0031                                        max =         4
                                                F(6,54)            =      0.91
corr(u_i, Xb)  = -0.9609                        Prob > F           =    0.4932
------------------------------------------------------------------------------
      rs_imp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   2.968478   7.045013     0.42   0.675    -11.15592    17.09288
       gdppc |    -3.6241   6.469988    -0.56   0.578    -16.59564    9.347445
   d_cefta06 |   .0741431   .1067064     0.69   0.490    -.1397904    .2880767
      vat_bh |  (dropped)
        dum2 |    .144713   .2389289     0.61   0.547    -.3343107    .6237366
        dum3 |   .1753221   .2503502     0.70   0.487    -.3265997     .677244
        dum5 |  -.0690629   .3219037    -0.21   0.831     -.714441    .5763151
       _cons |   -12.5466   18.55007    -0.68   0.502    -49.73726    24.64406
-------------+----------------------------------------------------------------
      rho_ar |  .46128074
     sigma_u |  2.1180826
     sigma_e |    .155397
     rho_fov |  .99464613   (fraction of variance because of u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(19,54) =    14.05             Prob > F = 0.0000
modified Bhargava et al. Durbin-Watson = 1.0774385
Baltagi-Wu LBI = 1.6419
```

. *FE from AR1 correction with two steps*

```
. predict FEAR1_correct, u
(20 missing values generated)
(20 missing values generated)
```

. *second stage*

```
. reg FEAR1_correct distance d_cc d_bor

      Source |       SS       df       MS              Number of obs =      80
-------------+------------------------------           F(  3,    76) =   79.73
       Model |  252.592288     3  84.1974292           Prob > F      =  0.0000
    Residual |  80.2605743    76  1.05606019           R-squared     =  0.7589
```

```
-------------+------------------------------           Adj R-squared =  0.7494
       Total |  332.852862    79  4.21332737           Root MSE      =  1.0276
------------------------------------------------------------------------------
FEAR1_corr~t |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    distance |  -4.304953   .3781028   -11.39   0.000    -5.058011   -3.551896
        d_cc |   .9316115   .4264741     2.18   0.032     .0822148    1.781008
       d_bor |  -.7204206   .5175955    -1.39   0.168    -1.751301    .3104601
       _cons |   13.18488   1.217629    10.83   0.000     10.75976    15.60999
------------------------------------------------------------------------------

. predict FEAR1_resid_stage2, residuals
(20 missing values generated)


. *stage 3*

. reg rs_imp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh FEAR1_resid_stage2 dum2-
dum5

      Source |       SS       df       MS              Number of obs =      80
-------------+------------------------------           F( 10,    69) =  105.33
       Model |  25.7182235    10  2.57182235           Prob > F      =  0.0000
    Residual |  1.68471193    69  .024416115           R-squared     =  0.9385
-------------+------------------------------           Adj R-squared =  0.9296
       Total |  27.4029354    79    .3468726           Root MSE      =  .15626
------------------------------------------------------------------------------
      rs_imp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   3.011919   .1322329    22.78   0.000     2.748121    3.275716
       gdppc |    -3.5413   .1903468   -18.60   0.000    -3.921031   -3.161568
    distance |  -4.343699   .2139529   -20.30   0.000    -4.770523   -3.916875
        d_cc |   1.014193   .0722772    14.03   0.000     .8700038    1.158382
       d_bor |  -.7685524   .1146535    -6.70   0.000    -.9972798    -.539825
   d_cefta06 |   .0804504   .0817739     0.98   0.329     -.082684    .2435848
      vat_bh |  -.2873058   .0549177    -5.23   0.000    -.3968635   -.1777481
FEAR1_resi~2 |   1.002134   .0525331    19.08   0.000     .8973333    1.106935
        dum2 |   .0285371   .0494999     0.58   0.566    -.0702126    .1272868
        dum3 |  (dropped)
        dum4 |    .083523   .0498534     1.68   0.098    -.0159318    .1829778
        dum5 |  (dropped)
       _cons |   .6946688   .2198206     3.16   0.002     .2561388    1.133199
------------------------------------------------------------------------------


. estat hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of rs_imp

         chi2(1)      =     9.77
         Prob > chi2  =   0.0018

. estat imtest

Cameron & Trivedi's decomposition of IM-test

---------------------------------------------------
              Source |       chi2     df      p
---------------------+-----------------------------
  Heteroskedasticity |      58.92     47    0.1139
            Skewness |       8.71     10    0.5597
            Kurtosis |       1.83      1    0.1756
---------------------+-----------------------------
               Total |      69.46     58    0.1440
---------------------------------------------------

. estat ovtest

Ramsey RESET test using powers of the fitted values of rs_imp
```

```
       Ho:  model has no omitted variables
                 F(3, 66) =      1.80
                 Prob > F =      0.1558

. estat vif

    Variable |       VIF       1/VIF  
-------------+----------------------
     fbh_gdp |     26.72    0.037423
    distance |     21.73    0.046017
       gdppc |     21.70    0.046082
FEAR1_resi~2 |      9.07    0.110232
       d_bor |      3.88    0.257970
        d_cc |      2.74    0.365144
      vat_bh |      2.47    0.404783
   d_cefta06 |      1.97    0.507125
        dum4 |      1.53    0.654931
        dum2 |      1.51    0.664318
-------------+----------------------
    Mean VIF |      9.33

.
. xtserial rs_imp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh FEAR1_resid_stage2
dum2-dum5

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,      19) =     35.879
           Prob > F =      0.0000


. reg rs_imp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh FEAR1_resid_stage2 dum2-
dum5, vce(robust)

Linear regression                                      Number of obs =      80
                                                       F( 10,    69) =  437.24
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.9385
                                                       Root MSE      =  .15626

------------------------------------------------------------------------------
             |               Robust
      rs_imp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   3.011919    .121234    24.84   0.000     2.770064    3.253774
       gdppc |    -3.5413   .1825998   -19.39   0.000    -3.905576   -3.177023
    distance |  -4.343699   .1982691   -21.91   0.000    -4.739235   -3.948163
        d_cc |   1.014193   .0496818    20.41   0.000     .9150804    1.113305
       d_bor |  -.7685524   .0777597    -9.88   0.000    -.9236788    -.613426
   d_cefta06 |   .0804504   .0567427     1.42   0.161    -.0327481    .1936489
      vat_bh |  -.2873058   .0538986    -5.33   0.000    -.3948306    -.179781
FEAR1_resi~2 |   1.002134    .055481    18.06   0.000     .8914525    1.112816
        dum2 |   .0285371   .0562491     0.51   0.614    -.0836769    .1407511
        dum3 |  (dropped)
        dum4 |    .083523    .042237     1.98   0.052    -.0007374    .1677834
        dum5 |  (dropped)
       _cons |   .6946688   .2294346     3.03   0.003     .2369593    1.152378
------------------------------------------------------------------------------


. *because of evidence of serial correlation, test for CFR in the third stage*
```

. *1a)OLS*

```
.   xtreg     rs_imp   L_rs_imp   fbh_gdp   L_fbh_gdp   gdppc   L_gdppc   d_cefta06   vat_bh
FEAR1_resid_stage2 dum2-dum5
note: dum2 dropped because of collinearity
note: dum4 dropped because of collinearity

Random-effects GLS regression                   Number of obs      =        80
Group variable: code                            Number of groups   =        20
```

```
R-sq:  within  = 0.1667                         Obs per group: min =         4
       between = 0.9905                                        avg =       4.0
       overall = 0.9264                                        max =         4
Random effects u_i ~ Gaussian                   Wald chi2(10)      =    869.08
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000
------------------------------------------------------------------------------
      rs_imp |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    L_rs_imp |   .8857917   .0336606    26.32   0.000     .8198181    .9517654
     fbh_gdp |  -13.89148   5.151847    -2.70   0.007    -23.98892   -3.794046
   L_fbh_gdp |   13.98346   5.171343     2.70   0.007     3.847809     24.1191
       gdppc |    9.57728   4.542496     2.11   0.035     .6741506    18.48041
     L_gdppc |  -9.952663    4.56884    -2.18   0.029    -18.90742   -.9979006
   d_cefta06 |    .067173   .0839213     0.80   0.423    -.0973096    .2316557
      vat_bh |   .0414778   .0958696     0.43   0.665    -.1464231    .2293788
FEAR1_resi~2 |   .0762753   .0348935     2.19   0.029     .0078853    .1446652
        dum3 |  -.0815167   .0591774    -1.38   0.168    -.1975022    .0344688
        dum5 |   .1417476   .0553824     2.56   0.010        .0332    .2502951
       _cons |   .4805775   .2115132     2.27   0.023     .0660192    .8951358
-------------+----------------------------------------------------------------
     sigma_u |          0
     sigma_e |  .15537673
         rho |          0   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. testnl _b[L_rs_imp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

  (1)  _b[L_rs_imp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

               chi2(1) =        4.07
           Prob > chi2 =        0.0437

. testnl _b[L_rs_imp]*_b[ gdppc] = -_b[ L_gdppc]

  (1)  _b[L_rs_imp]*_b[ gdppc] = -_b[ L_gdppc]

               chi2(1) =        4.56
           Prob > chi2 =        0.0328
```

. ***2a)FE***

```
.  xtreg   rs_imp  L_rs_imp  fbh_gdp  L_fbh_gdp  gdppc  L_gdppc  d_cefta06  vat_bh
FEAR1_resid_stage2 dum2-dum5, fe

Fixed-effects (within) regression               Number of obs      =        80
Group variable: code                            Number of groups   =        20
R-sq:  within  = 0.2234                         Obs per group: min =         4
       between = 0.0013                                        avg =       4.0
       overall = 0.0013                                        max =         4
                                                F(9,51)            =      1.63
corr(u_i, Xb)  = -0.9896                        Prob > F           =    0.1317
------------------------------------------------------------------------------
      rs_imp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    L_rs_imp |   .3416084   .1306127     2.62   0.012     .0793925    .6038244
     fbh_gdp |   1.442397   8.281874     0.17   0.862    -15.18416    18.06895
   L_fbh_gdp |   4.865101   7.476053     0.65   0.518     -10.1437     19.8739
       gdppc |  -2.449191   7.275359    -0.34   0.738    -17.05508     12.1567
     L_gdppc |  -3.776883   6.626055    -0.57   0.571    -17.07924    9.525478
   d_cefta06 |   .0852588   .0963736     0.88   0.380    -.1082193     .278737
      vat_bh |  -.5306878   .4979504    -1.07   0.292    -1.530365    .4689893
FEAR1_resi~2 |  (dropped)
        dum2 |   .1856768   .1654229     1.12   0.267    -.1464235    .5177772
        dum3 |  (dropped)
        dum4 |   .2304627   .2590558     0.89   0.378    -.2896135    .7505389
        dum5 |  (dropped)
       _cons |  -29.01326   23.65692    -1.23   0.226    -76.50651    18.47999
-------------+----------------------------------------------------------------
     sigma_u |  4.0828724
     sigma_e |  .15537673
         rho |  .99855386   (fraction of variance due to u_i)
```

```
------------------------------------------------------------------------------
F test that all u_i=0:     F(19, 51) =     1.71              Prob > F = 0.0655


. testnl _b[L_rs_imp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

  (1)  _b[L_rs_imp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

              F(1, 51) =        0.94
              Prob > F =        0.3364

. testnl _b[L_rs_imp]*_b[ gdppc] = -_b[ L_gdppc]

  (1)  _b[L_rs_imp]*_b[ gdppc] = -_b[ L_gdppc]

              F(1, 51) =        0.84
              Prob > F =        0.3649
```

## . *Prais-Winston for the consistency with the OLS*

```
. prais rs_imp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh FEAR1_resid_stage2
dum2-dum5, rhotype(regress) vce(robust)
note: dum3 dropped because of collinearity
note: dum4 dropped because of collinearity

Number of gaps in sample:  19   (gap count includes panel changes)
(note: computations for rho restarted at each gap)

Iteration 0:  rho = 0.0000
Iteration 1:  rho = 0.2156
Iteration 2:  rho = 0.2212
Iteration 3:  rho = 0.2214
Iteration 4:  rho = 0.2214
Iteration 5:  rho = 0.2214

Prais-Winsten AR(1) regression -- iterated estimates

Linear regression                                      Number of obs =      80
                                                       F( 11,    69) = 4748.80
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.9224
                                                       Root MSE      =  .15183
------------------------------------------------------------------------------
             |               Semi-robust
      rs_imp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |    3.01976    .142245    21.23   0.000      2.73599    3.303531
       gdppc |  -3.543893   .2166108   -16.36   0.000     -3.97602   -3.111766
    distance |   -4.34056   .2351057   -18.46   0.000    -4.809583   -3.871537
        d_cc |   1.022459   .0606563    16.86   0.000      .901453    1.143465
       d_bor |  -.7706517   .0907517    -8.49   0.000    -.9516964   -.5896071
   d_cefta06 |   .0927332   .0640518     1.45   0.152    -.0350466     .220513
      vat_bh |  -.2066217   .0483329    -4.27   0.000    -.3030433   -.1102002
FEAR1_resi~2 |   1.004835   .0653671    15.37   0.000     .8744314    1.135239
        dum2 |   .0288808   .0456862     0.63   0.529    -.0622607    .1200222
        dum5 |    -.08395   .0400359    -2.10   0.040    -.1638194   -.0040807
       _cons |   .6432989   .2775573     2.32   0.023     .0895873    1.197011
-------------+----------------------------------------------------------------
         rho |   .2213922
------------------------------------------------------------------------------
Durbin-Watson statistic (original)    1.107607
Durbin-Watson statistic (transformed) 1.295082
```

## APPENDIX 6.8: Republika Srpska exports

```
. *stage one as suggested in the literature, FE model*

. xtreg rs_exp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh dum2-dum5, fe

Fixed-effects (within) regression               Number of obs      =       100
Group variable: code                            Number of groups   =        20
R-sq:  within  = 0.2363                         Obs per group: min =         5
       between = 0.0221                                        avg =       5.0
       overall = 0.0135                                        max =         5
                                                F(7,73)            =      3.23
corr(u_i, Xb)  = -0.9993                        Prob > F           =    0.0049
------------------------------------------------------------------------------
      rs_exp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   30.35949   13.79084     2.20   0.031     2.874398    57.84459
       gdppc |  -26.10254   12.05008    -2.17   0.034    -50.11832   -2.086761
    distance |  (dropped)
        d_cc |  (dropped)
       d_bor |  (dropped)
   d_cefta06 |  -.2281656   .2723688    -0.84   0.405    -.7709958    .3146645
      vat_bh |  -2.773553   1.520879    -1.82   0.072     -5.80466    .2575549
        dum2 |  -.7006758   .4810123    -1.46   0.149    -1.659332    .2579803
        dum3 |   -1.29581   .8612164    -1.50   0.137    -3.012212    .4205916
        dum4 |  (dropped)
        dum5 |  -1.507955   .7121674    -2.12   0.038    -2.927303   -.0886078
       _cons |  -140.2169   63.92637    -2.19   0.031    -267.6219   -12.81177
-------------+----------------------------------------------------------------
     sigma_u |  16.616515
     sigma_e |   .5148228
         rho |    .999041   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(19, 73) =     1.67             Prob > F = 0.0624

. xtreg rs_exp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh dum2-dum5, fe
vce(robust)

Fixed-effects (within) regression               Number of obs      =       100
Group variable: code                            Number of groups   =        20
R-sq:  within  = 0.2363                         Obs per group: min =         5
       between = 0.0221                                        avg =       5.0
       overall = 0.0135                                        max =         5
                                                F(7,73)            =      3.26
corr(u_i, Xb)  = -0.9993                        Prob > F           =    0.0046
                                   (Std. Err. adjusted for clustering on code)
------------------------------------------------------------------------------
             |               Robust
      rs_exp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   30.35949   19.09121     1.59   0.116    -7.689227    68.40822
       gdppc |  -26.10254   17.76531    -1.47   0.146    -61.50876    9.303679
    distance |  (dropped)
        d_cc |  (dropped)
       d_bor |  (dropped)
   d_cefta06 |  -.2281656   .2001963    -1.14   0.258    -.6271562    .1708249
      vat_bh |  -2.773553   2.125083    -1.31   0.196    -7.008837    1.461731
        dum2 |  -.7006758   .6075768    -1.15   0.253    -1.911575    .5102229
        dum3 |   -1.29581   1.163085    -1.11   0.269    -3.613836    1.022215
        dum4 |  (dropped)
        dum5 |  -1.507955   1.039435    -1.45   0.151    -3.579547    .5636359
       _cons |  -140.2169   87.75639    -1.60   0.114    -315.1151    34.68139
-------------+----------------------------------------------------------------
     sigma_u |  16.616515
     sigma_e |   .5148228
         rho |    .999041   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

```
. *stage two, fixed effects obtained from stage one*
.
. predict Fixed_effects, u


. reg Fixed_effects distance d_cc d_bor

      Source |       SS       df       MS              Number of obs =     100
-------------+------------------------------           F(  3,    96) =   63.75
       Model |  17463.7589     3  5821.25297           Prob > F      =  0.0000
    Residual |  8766.55703    96  91.3183024           R-squared     =  0.6658
-------------+------------------------------           Adj R-squared =  0.6553
       Total |  26230.3159    99  264.952686           Root MSE      =  9.5561

------------------------------------------------------------------------------
Fixed_effe~s |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    distance |  -40.88624   4.054371   -10.08   0.000     -48.9341   -32.83838
        d_cc |   8.229497   3.658226     2.25   0.027     .9679754    15.49102
       d_bor |  -14.36441   4.325615    -3.32   0.001    -22.95069   -5.778133
       _cons |   124.5216   12.83271     9.70   0.000     99.04891    149.9944
------------------------------------------------------------------------------


. *stage three, residuals obtained from stage two*

. predict resid_stage2, residuals

. reg rs_exp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh resid_stage2 dum2-dum5

      Source |       SS       df       MS              Number of obs =     100
-------------+------------------------------           F( 11,    88) =   15.94
       Model |  38.5564239    11  3.50512945           Prob > F      =  0.0000
    Residual |  19.3481034    88  .219864811           R-squared     =  0.6659
-------------+------------------------------           Adj R-squared =  0.6241
       Total |  57.9045273    99  .584894216           Root MSE      =   .4689

------------------------------------------------------------------------------
      rs_exp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   30.35949   4.805209     6.32   0.000     20.81015    39.90884
       gdppc |  -26.10254    4.26738    -6.12   0.000    -34.58306   -17.62202
    distance |  -40.88624   6.439629    -6.35   0.000    -53.68365   -28.08883
        d_cc |   8.229497   1.221582     6.74   0.000     5.801858    10.65713
       d_bor |  -14.36441   2.428216    -5.92   0.000    -19.18998   -9.538838
   d_cefta06 |  -.2281655   .2212213    -1.03   0.305    -.6677964    .2114654
      vat_bh |  -2.773553   .5580154    -4.97   0.000    -3.882491   -1.664614
resid_stage2 |   .9999999   .1617723     6.18   0.000     .6785115    1.321488
        dum2 |  -.7006758   .2168956    -3.23   0.002     -1.13171   -.2696414
        dum3 |   -1.29581   .3298006    -3.93   0.000     -1.95122   -.6404008
        dum4 |  (dropped)
        dum5 |  -1.507955   .2844899    -5.30   0.000    -2.073319   -.9425915
       _cons |  -15.69521   2.653484    -5.91   0.000    -20.96846   -10.42197
------------------------------------------------------------------------------


. lvr2plot

. estat hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of rs_exp

         chi2(1)      =    21.86
         Prob > chi2  =   0.0000

. estat imtest

Cameron & Trivedi's decomposition of IM-test
```

```
---------------------------------------------------
              Source |       chi2     df      p
---------------------+-----------------------------
  Heteroskedasticity |      81.81     56    0.0138
            Skewness |      13.62     11    0.2548
            Kurtosis |       4.41      1    0.0357
---------------------+-----------------------------
               Total |      99.84     68    0.0072
---------------------------------------------------

. estat ovtest

Ramsey RESET test using powers of the fitted values of rs_exp
       Ho:  model has no omitted variables
                  F(3, 85) =      0.66
                  Prob > F =      0.5780

. estat vif

    Variable |       VIF       1/VIF
-------------+----------------------
     fbh_gdp |   6529.37    0.000153
    distance |   1881.31    0.000532
       gdppc |   1419.53    0.000704
resid_stage2 |   1043.47    0.000958
       d_bor |    241.36    0.004143
        d_cc |    108.59    0.009209
      vat_bh |     33.99    0.029421
        dum3 |      7.92    0.126338
        dum5 |      5.89    0.169786
        dum2 |      3.42    0.292102
   d_cefta06 |      1.64    0.610413
-------------+----------------------
    Mean VIF |   1025.14

.
. reg rs_exp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh resid_stage2 dum2-dum5,
vce(robust)

Linear regression                                      Number of obs =     100
                                                       F( 11,    88) =   48.23
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.6659
                                                       Root MSE      =   .4689

------------------------------------------------------------------------------
             |               Robust
      rs_exp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   30.35949   4.338253     7.00   0.000     21.73813    38.98086
       gdppc |  -26.10254   3.957474    -6.60   0.000    -33.96719   -18.23789
    distance |  -40.88624   5.725215    -7.14   0.000     -52.2639   -29.50858
        d_cc |   8.229497   1.064824     7.73   0.000     6.113384    10.34561
       d_bor |  -14.36441   2.167225    -6.63   0.000    -18.67131    -10.0575
   d_cefta06 |  -.2281655   .1414285    -1.61   0.110    -.5092249    .0528939
      vat_bh |  -2.773553   .5114469    -5.42   0.000    -3.789946   -1.757159
resid_stage2 |   .9999999   .1498261     6.67   0.000      .702252    1.297748
        dum2 |  -.7006758   .1836019    -3.82   0.000    -1.065546   -.3358055
        dum3 |   -1.29581   .2953474    -4.39   0.000    -1.882751   -.7088692
        dum4 |  (dropped)
        dum5 |  -1.507955   .2788354    -5.41   0.000    -2.062082   -.9538287
       _cons |  -15.69521   2.652674    -5.92   0.000    -20.96684   -10.42358
------------------------------------------------------------------------------

.
. xtserial rs_exp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh dum2-dum5

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,      19) =    105.129
           Prob > F =      0.0000
```

```
. *Model improvements*
. *Testing and accounting for serial correlation*

. xtreg rs_exp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh dum2-dum5, fe

Fixed-effects (within) regression               Number of obs      =       100
Group variable: code                            Number of groups   =        20
R-sq:  within  = 0.2363                         Obs per group: min =         5
       between = 0.0221                                        avg =       5.0
       overall = 0.0135                                        max =         5
                                                F(7,73)            =      3.23
corr(u_i, Xb)  = -0.9993                        Prob > F           =    0.0049
------------------------------------------------------------------------------
      rs_exp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   30.35949   13.79084     2.20   0.031     2.874398    57.84459
       gdppc |  -26.10254   12.05008    -2.17   0.034    -50.11832   -2.086761
    distance |  (dropped)
        d_cc |  (dropped)
       d_bor |  (dropped)
   d_cefta06 |  -.2281656   .2723688    -0.84   0.405    -.7709958    .3146645
      vat_bh |  -2.773553   1.520879    -1.82   0.072     -5.80466    .2575549
        dum2 |  -.7006758   .4810123    -1.46   0.149    -1.659332    .2579803
        dum3 |   -1.29581   .8612164    -1.50   0.137    -3.012212    .4205916
        dum4 |  (dropped)
        dum5 |  -1.507955   .7121674    -2.12   0.038    -2.927303   -.0886078
       _cons |  -140.2169   63.92637    -2.19   0.031    -267.6219   -12.81177
-------------+----------------------------------------------------------------
     sigma_u |  16.616515
     sigma_e |   .5148228
         rho |    .999041   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(19, 73) =     1.67             Prob > F = 0.0624


. xtserial rs_exp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh dum2-dum5

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,      19) =    105.129
           Prob > F =      0.0000


. *testing the lagged model for CFR*

. generate float L_rs_exp = l.rs_exp
(20 missing values generated)

. generate float L_fbh_gdp = l.fbh_gdp
(20 missing values generated)

. generate float L_gdppc = l.gdppc
(20 missing values generated)

. *1)OLS*

. xtreg rs_exp L_rs_exp fbh_gdp L_fbh_gdp gdppc L_gdppc d_cefta06 vat_bh dum2-dum5
note: dum3 dropped because of collinearity
note: dum5 dropped because of collinearity

Random-effects GLS regression                   Number of obs      =        80
Group variable: code                            Number of groups   =        20
R-sq:  within  = 0.3995                         Obs per group: min =         4
       between = 0.8623                                        avg =       4.0
       overall = 0.6800                                        max =         4
Random effects u_i ~ Gaussian                   Wald chi2(9)       =    105.70
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000
------------------------------------------------------------------------------
```

```
      rs_exp |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    L_rs_exp |   .7701072   .0808802     9.52   0.000      .611585    .9286294
     fbh_gdp |   8.762347    15.5614     0.56   0.573    -21.73744    39.26214
   L_fbh_gdp |  -8.533353   15.55723    -0.55   0.583    -39.02496    21.95826
       gdppc |  -6.592546    13.5523    -0.49   0.627    -33.15458    19.96948
     L_gdppc |   6.451997   13.51979     0.48   0.633    -20.04629    32.95029
   d_cefta06 |   .2323669   .2076008     1.12   0.263    -.1745231    .6392569
      vat_bh |  -.4388758   .3571815    -1.23   0.219    -1.138939     .261187
        dum2 |  -.0629508   .1479597    -0.43   0.671    -.3529464    .2270448
        dum4 |  -.0231861   .1302032    -0.18   0.859    -.2783796    .2320074
       _cons |  -.8873566   .7911681    -1.12   0.262    -2.438018    .6633044
-------------+----------------------------------------------------------------
     sigma_u |  .18150983
     sigma_e |  .36769212
         rho |  .19593892   (fraction of variance due to u_i)
------------------------------------------------------------------------------


. testnl _b[L_rs_exp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

  (1)  _b[L_rs_exp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

               chi2(1) =        0.25
           Prob > chi2 =        0.6145

. testnl _b[L_rs_exp]*_b[ gdppc] = -_b[ L_gdppc]

  (1)  _b[L_rs_exp]*_b[ gdppc] = -_b[ L_gdppc]

               chi2(1) =        0.20
           Prob > chi2 =        0.6540


. *2)FE*

. xtreg  rs_exp L_rs_exp fbh_gdp L_fbh_gdp gdppc L_gdppc d_cefta06 vat_bh dum2-dum5, fe

Fixed-effects (within) regression               Number of obs      =        80
Group variable: code                            Number of groups   =        20
R-sq:  within  = 0.5168                         Obs per group: min =         4
       between = 0.0522                                        avg =       4.0
       overall = 0.0376                                        max =         4
                                                F(9,51)            =      6.06
corr(u_i, Xb)  = -0.9992                        Prob > F           =    0.0000
------------------------------------------------------------------------------
      rs_exp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    L_rs_exp |   .5845494   .1039406     5.62   0.000     .3758799     .793219
     fbh_gdp |   33.48108   19.86619     1.69   0.098    -6.401962    73.36413
   L_fbh_gdp |  -.0515665   18.89184    -0.00   0.998    -37.97852    37.87538
       gdppc |   -26.7852   16.73395    -1.60   0.116    -60.37999    6.809603
     L_gdppc |  -6.948302   15.92919    -0.44   0.665    -38.92748    25.03088
   d_cefta06 |   .1835705   .2339338     0.78   0.436    -.2860712    .6532122
      vat_bh |  -3.512419   1.373248    -2.56   0.014     -6.26933   -.7555082
        dum2 |   .9086634   .4683558     1.94   0.058    -.0316002    1.848927
        dum3 |  (dropped)
        dum4 |    1.71978   .7483668     2.30   0.026     .2173712    3.222189
        dum5 |  (dropped)
       _cons |  -152.8194   69.35641    -2.20   0.032    -292.0582   -13.58059
-------------+----------------------------------------------------------------
     sigma_u |  17.143525
     sigma_e |  .36769212
         rho |   .9995402   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(19, 51) =     2.61              Prob > F = 0.0033


. testnl _b[L_rs_exp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

  (1)  _b[L_rs_exp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]
```

```
              F(1, 51) =        2.18
              Prob > F =        0.1460

. testnl _b[L_rs_exp]*_b[ gdppc] = -_b[ L_gdppc]

  (1)  _b[L_rs_exp]*_b[ gdppc] = -_b[ L_gdppc]

              F(1, 51) =        3.88
              Prob > F =        0.0544
```

. *first stage: AR1 correction*

```
. xtregar rs_exp fbh_gdp gdppc d_cefta06 vat_bh dum2-dum5,fe rhotype(dw) lbi
note: dum5 dropped because of collinearity

FE (within) regression with AR(1) disturbances  Number of obs      =        80
Group variable: code                            Number of groups   =        20
R-sq:  within  = 0.1202                         Obs per group: min =         4
       between = 0.0461                                        avg =       4.0
       overall = 0.0341                                        max =         4
                                                F(6,54)            =      1.23
corr(u_i, Xb)  = -0.9970                        Prob > F           =    0.3058
------------------------------------------------------------------------------
      rs_exp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   27.69857   19.90808     1.39   0.170    -12.21473    67.61188
       gdppc |  -27.42757   17.45414    -1.57   0.122    -62.42102    7.565874
   d_cefta06 |   .1187874   .2848065     0.42   0.678    -.4522153    .6897901
      vat_bh |  (dropped)
        dum2 |   1.214439   .8111881     1.50   0.140    -.4118954    2.840773
        dum3 |   1.828134   1.119965     1.63   0.108    -.4172598    4.073528
        dum4 |   1.020295   .6921552     1.47   0.146    -.3673926    2.407983
       _cons |  -129.8185   38.39059    -3.38   0.001     -206.787   -52.84997
-------------+----------------------------------------------------------------
      rho_ar |  .59984746
     sigma_u |  14.326971
     sigma_e |  .38725995
     rho_fov |  .99926991   (fraction of variance because of u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(19,54) =     2.69             Prob > F = 0.0023
modified Bhargava et al. Durbin-Watson = .81560345
Baltagi-Wu LBI = 1.3647729
```

. *AR1 correction with two steps*

```
. xtregar rs_exp fbh_gdp gdppc d_cefta06 vat_bh dum2-dum5,fe rhotype(dw) twostep lbi
note: dum5 dropped because of collinearity

FE (within) regression with AR(1) disturbances  Number of obs      =        80
Group variable: code                            Number of groups   =        20
R-sq:  within  = 0.1203                         Obs per group: min =         4
       between = 0.0462                                        avg =       4.0
       overall = 0.0341                                        max =         4
                                                F(6,54)            =      1.23
corr(u_i, Xb)  = -0.9971                        Prob > F           =    0.3054
------------------------------------------------------------------------------
      rs_exp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |    28.1353   19.86221     1.42   0.162    -11.68604    67.95665
       gdppc |  -27.80542   17.41553    -1.60   0.116    -62.72145    7.110609
   d_cefta06 |   .1161774   .2842856     0.41   0.684     -.453781    .6861358
      vat_bh |  (dropped)
        dum2 |   1.253865   .8261898     1.52   0.135    -.4025456    2.910276
        dum3 |   1.872801   1.133199     1.65   0.104    -.3991256    4.144728
        dum4 |   1.046149   .6989444     1.50   0.140    -.3551507    2.447448
       _cons |  -131.8877    39.0219    -3.38   0.001    -210.1219   -53.65354
-------------+----------------------------------------------------------------
      rho_ar |  .59219828
```

```
     sigma_u |  14.565328
     sigma_e |  .38687271
     rho_fov |    .999295   (fraction of variance because of u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(19,54) =     2.75             Prob > F = 0.0019
modified Bhargava et al. Durbin-Watson = .81560345
Baltagi-Wu LBI = 1.3647729
```

```
. *FE from AR1 correction with two steps*
```

```
. predict FEAR1_correct, u
(20 missing values generated)
(20 missing values generated)
```

```
. *second stage*
```

```
. reg FEAR1_correct distance d_cc d_bor

      Source |       SS       df       MS              Number of obs =      80
-------------+------------------------------           F(  3,    76) =   42.97
       Model |  9998.81458     3  3332.93819           Prob > F      =  0.0000
    Residual |  5894.70892    76  77.5619594           R-squared     =  0.6291
-------------+------------------------------           Adj R-squared =  0.6145
       Total |  15893.5235    79  201.183842           Root MSE      =  8.8069
------------------------------------------------------------------------------
FEAR1_corr~t |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    distance |  -34.59774   4.177572    -8.28   0.000     -42.9181   -26.27739
        d_cc |   7.213444    3.76939     1.91   0.059    -.2939458    14.72083
       d_bor |  -12.82779   4.457058    -2.88   0.005    -21.70479   -3.950788
       _cons |    105.387   13.22266     7.97   0.000     79.05174    131.7222
------------------------------------------------------------------------------
```

```
. predict FEAR1_resid_stage2, residuals
(20 missing values generated)
```

```
. *stage 3*
```

```
. reg rs_exp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh FEAR1_resid_stage2 dum2-
dum5

      Source |       SS       df       MS              Number of obs =      80
-------------+------------------------------           F( 10,    69) =   14.17
       Model |  28.6870574    10  2.86870574           Prob > F      =  0.0000
    Residual |  13.9738109    69  .202518999           R-squared     =  0.6724
-------------+------------------------------           Adj R-squared =  0.6250
       Total |  42.6608684    79  .540010992           Root MSE      =  .45002
------------------------------------------------------------------------------
      rs_exp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   14.98489   2.295911     6.53   0.000     10.40467    19.56511
       gdppc |  -14.30502   2.324218    -6.15   0.000    -18.94171   -9.668328
    distance |  -18.52655   2.842483    -6.52   0.000    -24.19715   -12.85595
        d_cc |   4.249858    .586315     7.25   0.000     3.080191    5.419524
       d_bor |  -6.525946    1.16565    -5.60   0.000    -8.851354   -4.200538
   d_cefta06 |  -.0255966   .2300161    -0.11   0.912    -.4844661    .4332728
      vat_bh |  -1.544727   .2889592    -5.35   0.000    -2.121185   -.9682694
FEAR1_resi~2 |   .5272154   .0849903     6.20   0.000     .3576644    .6967665
        dum2 |   .1468899   .1557476     0.94   0.349     -.163818    .4575978
        dum3 |  (dropped)
        dum4 |   .7541257   .1858317     4.06   0.000     .3834016     1.12485
        dum5 |  (dropped)
       _cons |  -11.87607   2.039086    -5.82   0.000    -15.94393   -7.808202
------------------------------------------------------------------------------
```

```
. estat hettest
```

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of rs_exp

         chi2(1)      =    53.95
         Prob > chi2  =   0.0000

. estat imtest

Cameron & Trivedi's decomposition of IM-test

---------------------------------------------------
              Source |       chi2     df      p
---------------------+-----------------------------
  Heteroskedasticity |      76.44     47    0.0043
            Skewness |      14.44     10    0.1539
            Kurtosis |       2.98      1    0.0841
---------------------+-----------------------------
               Total |      93.86     58    0.0020
---------------------------------------------------

. estat ovtest

Ramsey RESET test using powers of the fitted values of rs_exp
       Ho:  model has no omitted variables
                  F(3, 66) =      2.76
                  Prob > F =      0.0488

. estat vif

    Variable |       VIF       1/VIF
-------------+----------------------
     fbh_gdp |   1273.60    0.000785
       gdppc |    351.01    0.002849
    distance |    318.36    0.003141
FEAR1_resi~2 |    210.25    0.004756
       d_bor |     48.31    0.020701
        d_cc |     21.73    0.046025
      vat_bh |      8.25    0.121273
        dum4 |      2.56    0.390962
   d_cefta06 |      1.88    0.531639
        dum2 |      1.80    0.556586
-------------+----------------------
    Mean VIF |    223.77


. xtserial rs_exp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh FEAR1_resid_stage2
dum2-dum5

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,      19) =     38.280
           Prob > F =      0.0000


. reg rs_exp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh FEAR1_resid_stage2 dum2-
dum5, vce(robust)

Linear regression                                      Number of obs =      80
                                                       F( 10,    69) =   47.64
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.6724
                                                       Root MSE      =  .45002

------------------------------------------------------------------------------
             |               Robust
      rs_exp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   14.98489   2.605764     5.75   0.000     9.786534    20.18325
       gdppc |  -14.30502   2.642531    -5.41   0.000    -19.57672   -9.033312
    distance |  -18.52655    3.27107    -5.66   0.000    -25.05215   -12.00094
```

```
        d_cc |   4.249858   .6160318     6.90   0.000     3.020908    5.478807
       d_bor |  -6.525946   1.309554    -4.98   0.000    -9.138436   -3.913457
   d_cefta06 |  -.0255966   .1315971    -0.19   0.846    -.2881258    .2369325
      vat_bh |  -1.544727   .3273972    -4.72   0.000    -2.197867   -.8915878
FEAR1_resi~2 |   .5272154   .0925822     5.69   0.000     .3425191    .7119118
        dum2 |   .1468899   .2071211     0.71   0.481    -.2663054    .5600853
        dum3 |  (dropped)
        dum4 |   .7541257   .1924066     3.92   0.000      .370285    1.137966
        dum5 |  (dropped)
       _cons |  -11.87607    2.15823    -5.50   0.000    -16.18162   -7.570516
------------------------------------------------------------------------------
```

. *because of evidence of serial correlation, test for CFR in the third stage*

. *1a)OLS*

```
. xtreg  rs_exp L_rs_exp fbh_gdp L_fbh_gdp gdppc L_gdppc d_cefta06 vat_bh
FEAR1_resid_stage2 dum2-dum5
note: dum3 dropped because of collinearity
note: dum5 dropped because of collinearity

Random-effects GLS regression                   Number of obs      =        80
Group variable: code                            Number of groups   =        20
R-sq:  within  = 0.3955                         Obs per group: min =         4
       between = 0.8654                                        avg =       4.0
       overall = 0.6871                                        max =         4
Random effects u_i ~ Gaussian                   Wald chi2(10)      =    104.67
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000
------------------------------------------------------------------------------
      rs_exp |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    L_rs_exp |   .7427472   .0843743     8.80   0.000     .5773767    .9081178
     fbh_gdp |   7.008214   15.66951     0.45   0.655    -23.70345    37.71988
   L_fbh_gdp |  -6.956053   15.64919    -0.44   0.657     -37.6279    23.71579
       gdppc |  -4.294089   13.74161    -0.31   0.755    -31.22715    22.63897
     L_gdppc |   4.477816   13.66332     0.33   0.743    -22.30179    31.25742
   d_cefta06 |   .2099406   .2088095     1.01   0.315    -.1993186    .6191998
      vat_bh |  -.3599719    .364901    -0.99   0.324    -1.075165    .3552208
FEAR1_resi~2 |  -.0123892   .0121623    -1.02   0.308    -.0362269    .0114485
        dum2 |  -.0605733   .1475592    -0.41   0.681     -.349784    .2286373
        dum4 |  -.0334242   .1300126    -0.26   0.797    -.2882443    .2213959
       _cons |  -.1181368   1.094036    -0.11   0.914    -2.262407    2.026134
-------------+----------------------------------------------------------------
     sigma_u |  .18932088
     sigma_e |  .36769212
         rho |  .20955576   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. testnl _b[L_rs_exp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

  (1)  _b[L_rs_exp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

               chi2(1) =        0.19
           Prob > chi2 =        0.6593

. testnl _b[L_rs_exp]*_b[ gdppc] = -_b[ L_gdppc]

  (1)  _b[L_rs_exp]*_b[ gdppc] = -_b[ L_gdppc]

               chi2(1) =        0.14
           Prob > chi2 =        0.7082
```

. *2a)FE*

```
. xtreg  rs_exp L_rs_exp fbh_gdp L_fbh_gdp gdppc L_gdppc d_cefta06 vat_bh
FEAR1_resid_stage2 dum2-dum5, fe

Fixed-effects (within) regression               Number of obs      =        80
```

```
Group variable: code                            Number of groups   =        20
R-sq:  within  = 0.5168                         Obs per group: min =         4
       between = 0.0522                                        avg =       4.0
       overall = 0.0376                                        max =         4
                                                F(9,51)            =      6.06
corr(u_i, Xb)  = -0.9992                        Prob > F           =    0.0000
------------------------------------------------------------------------------
      rs_exp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    L_rs_exp |   .5845494   .1039406     5.62   0.000     .3758799     .793219
     fbh_gdp |   33.48108   19.86619     1.69   0.098    -6.401962    73.36413
   L_fbh_gdp |  -.0515665   18.89184    -0.00   0.998    -37.97852    37.87538
       gdppc |   -26.7852   16.73395    -1.60   0.116    -60.37999    6.809603
     L_gdppc |  -6.948302   15.92919    -0.44   0.665    -38.92748    25.03088
   d_cefta06 |   .1835705   .2339338     0.78   0.436    -.2860712    .6532122
      vat_bh |  -3.512419   1.373248    -2.56   0.014     -6.26933   -.7555082
FEAR1_resi~2 |  (dropped)
        dum2 |   .9086634   .4683558     1.94   0.058    -.0316002    1.848927
        dum3 |  (dropped)
        dum4 |    1.71978   .7483668     2.30   0.026     .2173712    3.222189
        dum5 |  (dropped)
       _cons |  -152.8194   69.35641    -2.20   0.032    -292.0582   -13.58059
-------------+----------------------------------------------------------------
     sigma_u |  17.143525
     sigma_e |  .36769212
         rho |   .9995402   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(19, 51) =     2.49              Prob > F = 0.0050


. testnl _b[L_rs_exp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

  (1)  _b[L_rs_exp]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

              F(1, 51) =        2.18
              Prob > F =        0.1460

. testnl _b[L_rs_exp]*_b[ gdppc] = -_b[ L_gdppc]

  (1)  _b[L_rs_exp]*_b[ gdppc] = -_b[ L_gdppc]

              F(1, 51) =        3.88
              Prob > F =        0.0544
```

. *Prais-Winston for the consistency with the OLS*

```
. prais rs_exp fbh_gdp gdppc distance d_cc d_bor d_cefta06 vat_bh FEAR1_resid_stage2 dum2-
dum5, rhotype(regress) vce(robust)
note: dum3 dropped because of collinearity
note: dum5 dropped because of collinearity

Number of gaps in sample:  19   (gap count includes panel changes)
(note: computations for rho restarted at each gap)

Iteration 0:  rho = 0.0000
Iteration 1:  rho = 0.3081
Iteration 2:  rho = 0.3157
Iteration 3:  rho = 0.3159
Iteration 4:  rho = 0.3159
Iteration 5:  rho = 0.3159

Prais-Winsten AR(1) regression -- iterated estimates

Linear regression                                      Number of obs =      80
                                                       F( 11,    69) =  164.18
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.5709
                                                       Root MSE      =  .42089
```

```
------------------------------------------------------------------------------
             |             Semi-robust
      rs_exp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   14.51414    3.54803     4.09   0.000     7.436016    21.59227
       gdppc |  -13.77933    3.63929    -3.79   0.000    -21.03951   -6.519141
    distance |  -18.00285   4.419847    -4.07   0.000    -26.82021     -9.1855
        d_cc |   4.139774   .8334915     4.97   0.000     2.477004    5.802544
       d_bor |  -6.299223   1.772443    -3.55   0.001    -9.835149   -2.763297
   d_cefta06 |    -.00724   .1408943    -0.05   0.959    -.2883164    .2738365
      vat_bh |  -1.498455   .4315067    -3.47   0.001    -2.359287    -.637623
FEAR1_resi~2 |   .5095201   .1271892     4.01   0.000     .2557845    .7632556
        dum2 |   .1342477   .1762088     0.76   0.449    -.2172792    .4857746
        dum4 |   .7289988   .2140331     3.41   0.001     .3020144    1.155983
       _cons |  -11.35147   2.979589    -3.81   0.000    -17.29558   -5.407348
-------------+----------------------------------------------------------------
         rho |   .3159247
------------------------------------------------------------------------------
Durbin-Watson statistic (original)    0.837390
Durbin-Watson statistic (transformed) 1.133673
```

# APPENDIX 6.9: Western Balkans imports

```
*stage one as suggested in the literature, FE model*

. xtreg imports fbh_gdp gdppc distance d_cc d_bor cefta06 vat_bh d_bhcefta d_bh d_cro
d_smk d_mace d_eu dum2-dum6, fe

Fixed-effects (within) regression               Number of obs      =       660
Group variable: code                            Number of groups   =       110
R-sq:  within  = 0.5128                         Obs per group: min =         6
       between = 0.1006                                        avg =       6.0
       overall = 0.1111                                        max =         6
                                                F(11,539)          =     51.57
corr(u_i, Xb)  = -0.6457                        Prob > F           =    0.0000
------------------------------------------------------------------------------
     imports |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   1.223387   .2989228     4.09   0.000       .63619    1.810583
       gdppc |  -.4082162   .2274222    -1.79   0.073    -.8549586    .0385263
    distance |  (dropped)
        d_cc |  (dropped)
       d_bor |  (dropped)
     cefta06 |   .1409487   .0330331     4.27   0.000     .0760594     .205838
      vat_bh |  -.0011559   .0278678    -0.04   0.967    -.0558988    .0535869
   d_bhcefta |   -.042761   .0451207    -0.95   0.344     -.131395     .045873
        d_bh |  (dropped)
       d_cro |  (dropped)
       d_smk |  (dropped)
      d_mace |  (dropped)
        d_eu |  -.1583838   .0363914    -4.35   0.000    -.2298702   -.0868974
        dum2 |   .0358309   .0211074     1.70   0.090     -.005632    .0772938
        dum3 |   .0635373   .0276685     2.30   0.022     .0091859    .1178887
        dum4 |   .0499403   .0378221     1.32   0.187    -.0243566    .1242371
        dum5 |   .0841768   .0516091     1.63   0.103    -.0172029    .1855564
        dum6 |   .1135291   .0637474     1.78   0.075    -.0116947    .2387529
       _cons |  -4.369359   1.479469    -2.95   0.003    -7.275591   -1.463126
-------------+----------------------------------------------------------------
     sigma_u |  .81083642
     sigma_e |  .13440749
         rho |  .97325713   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(109, 539) =    40.20           Prob > F = 0.0000

. xtreg imports fbh_gdp gdppc distance d_cc d_bor cefta06 vat_bh d_bhcefta d_bh d_eu d_cro
d_smk d_mace dum2-dum6, fe vce(robust)

Fixed-effects (within) regression               Number of obs      =       660
Group variable: code                            Number of groups   =       110
R-sq:  within  = 0.5128                         Obs per group: min =         6
       between = 0.1006                                        avg =       6.0
       overall = 0.1111                                        max =         6
                                                F(11,539)          =     38.86
corr(u_i, Xb)  = -0.6457                        Prob > F           =    0.0000
                                   (Std. Err. adjusted for clustering on code)
------------------------------------------------------------------------------
             |               Robust
     imports |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   1.223387   .3750733     3.26   0.001     .4866019    1.960171
       gdppc |  -.4082162   .3347882    -1.22   0.223    -1.065866    .2494333
    distance |  (dropped)
        d_cc |  (dropped)
       d_bor |  (dropped)
     cefta06 |   .1409487   .0364623     3.87   0.000      .069323    .2125744
      vat_bh |  -.0011559   .0270158    -0.04   0.966     -.054225    .0519132
   d_bhcefta |   -.042761   .0517593    -0.83   0.409    -.1444357    .0589137
        d_bh |  (dropped)
```

```
       d_eu |  -.1583838   .0416819    -3.80   0.000    -.2402628   -.0765049
      d_cro |  (dropped)
      d_smk |  (dropped)
     d_mace |  (dropped)
       dum2 |   .0358309   .0239287     1.50   0.135     -.011174    .0828358
       dum3 |   .0635373   .0315462     2.01   0.044     .0015688    .1255058
       dum4 |   .0499403   .0455745     1.10   0.274    -.0395851    .1394656
       dum5 |   .0841768   .0649805     1.30   0.196    -.0434692    .2118227
       dum6 |   .1135291   .0759093     1.50   0.135    -.0355853    .2626435
      _cons |  -4.369359    1.83086    -2.39   0.017    -7.965855   -.7728628
-------------+----------------------------------------------------------------
     sigma_u |  .81083642
     sigma_e |  .13440749
         rho |  .97325713   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

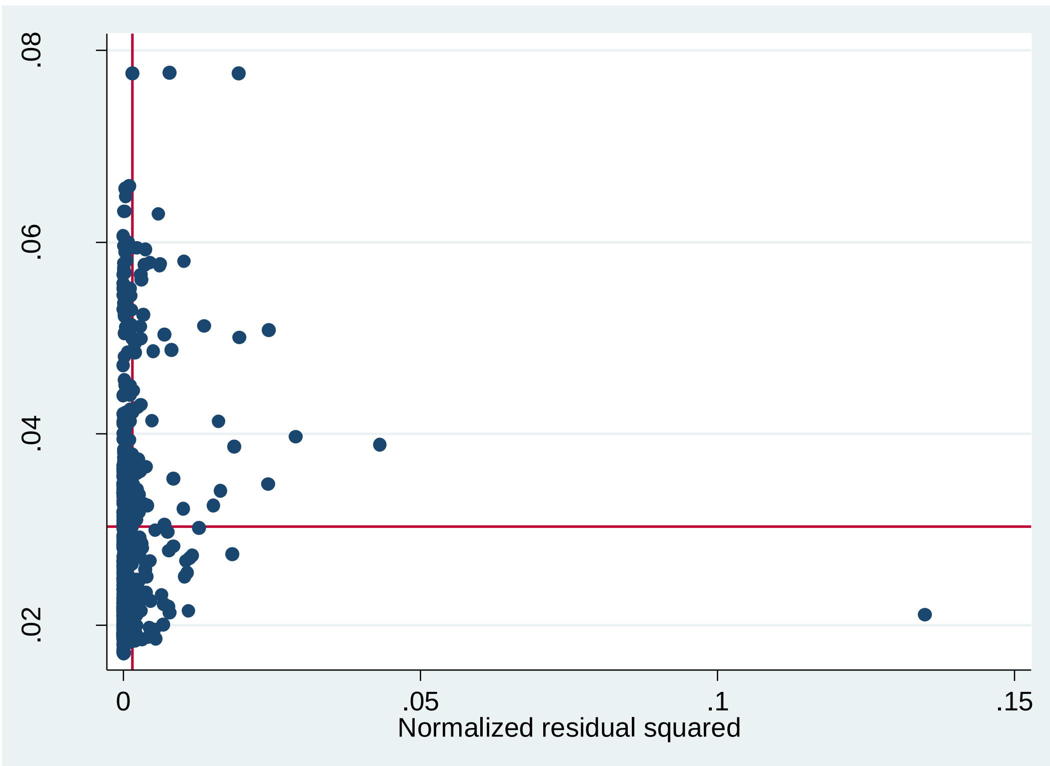
. *stage two, fixed effects obtained from stage one*

```
. predict Fixed_effects, u


. reg Fixed_effects distance d_cc d_bor d_cro d_smk d_mace d_bh

      Source |       SS       df       MS              Number of obs =     660
-------------+------------------------------           F(  7,   652) =  240.81
       Model |   310.05236     7  44.2931942           Prob > F      =  0.0000
    Residual |  119.923672   652  .183932012           R-squared     =  0.7211
-------------+------------------------------           Adj R-squared =  0.7181
       Total |  429.976032   659  .652467423           Root MSE      =  .42887

------------------------------------------------------------------------------
Fixed_effe~s |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    distance |  -1.825122   .0705518   -25.87   0.000    -1.963658   -1.686586
        d_cc |   .3388574   .0512623     6.61   0.000     .2381983    .4395166
       d_bor |  -.1785144   .0582888    -3.06   0.002    -.2929708   -.0640581
       d_cro |   .2781848   .0536861     5.18   0.000     .1727663    .3836033
       d_smk |   .4635577   .0538617     8.61   0.000     .3577944     .569321
      d_mace |   .1909357    .053007     3.60   0.000     .0868507    .2950207
        d_bh |   .3203266   .0533013     6.01   0.000     .2156636    .4249895
       _cons |   5.304858   .2331122    22.76   0.000     4.847117      5.7626
------------------------------------------------------------------------------
```

. *stage three, residuals obtained from stage two*

```
. predict resid_stage2, residuals

. reg imports fbh_gdp gdppc distance d_cc d_bor cefta06 vat_bh  resid_stage2 d_bh
d_bhcefta d_cro d_smk d_mace d_eu dum2-dum6

      Source |       SS       df       MS              Number of obs =     660
-------------+------------------------------           F( 19,   640) =  979.93
       Model |  283.273301    19  14.9091211           Prob > F      =  0.0000
    Residual |  9.73723675   640  .015214432           R-squared     =  0.9668
-------------+------------------------------           Adj R-squared =  0.9658
       Total |  293.010537   659   .44462904           Root MSE      =  .12335

------------------------------------------------------------------------------
     imports |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   1.223387   .0147848    82.75   0.000     1.194354    1.252419
       gdppc |  -.4082161   .0231798   -17.61   0.000    -.4537338   -.3626985
    distance |  -1.825122   .0310933   -58.70   0.000    -1.886179   -1.764065
        d_cc |   .3388574   .0170666    19.86   0.000     .3053442    .3723707
       d_bor |  -.1785144   .0178335   -10.01   0.000    -.2135337   -.1434951
     cefta06 |   .1409487   .0244327     5.77   0.000     .0929708    .1889266
      vat_bh |  -.0011559   .0209552    -0.06   0.956    -.0423052    .0399934
resid_stage2 |          1   .0138641    72.13   0.000     .9727753    1.027225
        d_bh |   .3203266   .0182852    17.52   0.000     .2844202    .3562329
   d_bhcefta |   -.042761   .0333581    -1.28   0.200    -.1082656    .0227436
```

```
     d_cro |   .2781848   .0212812    13.07   0.000     .2363955    .3199742
     d_smk |   .4635577   .0160346    28.91   0.000     .4320709    .4950445
    d_mace |   .1909357   .0152817    12.49   0.000     .1609273    .2209441
      d_eu |  -.1583838   .0143776   -11.02   0.000    -.1866169   -.1301508
      dum2 |   .0358309   .0167014     2.15   0.032     .0030347    .0686271
      dum3 |   .0635373   .0167315     3.80   0.000      .030682    .0963925
      dum4 |   .0499403   .0179246     2.79   0.005     .0147422    .0851383
      dum5 |   .0841768   .0182899     4.60   0.000     .0482614    .1200921
      dum6 |   .1135291   .0184826     6.14   0.000     .0772352     .149823
     _cons |   .9354997   .0773155    12.10   0.000      .783677    1.087323
------------------------------------------------------------------------------

. lvr2plot
```




```
. estat hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of imports

         chi2(1)      =   137.48
         Prob > chi2  =   0.0000

. estat imtest

Cameron & Trivedi's decomposition of IM-test

---------------------------------------------------
              Source |       chi2     df      p
---------------------+-----------------------------
  Heteroskedasticity |     179.91    159    0.1227
            Skewness |      14.45     19    0.7567
            Kurtosis |       1.76      1    0.1842
---------------------+-----------------------------
               Total |     196.12    179    0.1807
---------------------------------------------------
```

```
. estat ovtest

Ramsey RESET test using powers of the fitted values of imports
       Ho:  model has no omitted variables
                 F(3, 637) =      5.15
                  Prob > F =      0.0016

. estat vif

    Variable |       VIF       1/VIF  
-------------+----------------------
       gdppc |      5.66    0.176556
     fbh_gdp |      4.92    0.203249
    distance |      4.79    0.208977
       d_cro |      3.14    0.318127
     cefta06 |      2.70    0.370544
        d_bh |      2.32    0.430914
        d_eu |      2.14    0.467081
   d_bhcefta |      2.09    0.477457
        dum6 |      2.06    0.485866
       d_bor |      2.05    0.487247
        dum5 |      2.02    0.496162
        d_cc |      1.95    0.512383
        dum4 |      1.94    0.516592
       d_smk |      1.78    0.560369
        dum3 |      1.69    0.592892
        dum2 |      1.68    0.595027
      d_mace |      1.62    0.616944
      vat_bh |      1.57    0.635203
resid_stage2 |      1.52    0.660031
-------------+----------------------
    Mean VIF |      2.51

.
. reg imports  fbh_gdp gdppc distance d_cc d_bor cefta06 vat_bh resid_stage2 d_bh
d_bhcefta d_cro d_smk d_mace d_eu dum2-dum6, vce(robust)

Linear regression                                      Number of obs =     660
                                                       F( 19,   640) = 1386.59
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.9668
                                                       Root MSE      =  .12335

------------------------------------------------------------------------------
             |               Robust
     imports |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   1.223387   .0162426    75.32   0.000     1.191491    1.255282
       gdppc |  -.4082161   .0252544   -16.16   0.000    -.4578077   -.3586246
    distance |  -1.825122   .0264621   -68.97   0.000    -1.877085   -1.773159
        d_cc |   .3388574   .0177563    19.08   0.000     .3039898    .3737251
       d_bor |  -.1785144   .0190179    -9.39   0.000    -.2158595   -.1411693
     cefta06 |   .1409487    .027764     5.08   0.000     .0864292    .1954682
      vat_bh |  -.0011559   .0214304    -0.05   0.957    -.0432383    .0409264
resid_stage2 |          1   .0188529    53.04   0.000     .9629791    1.037021
        d_bh |   .3203266   .0185886    17.23   0.000     .2838246    .3568286
   d_bhcefta |   -.042761   .0403843    -1.06   0.290    -.1220627    .0365407
       d_cro |   .2781848   .0183543    15.16   0.000     .2421429    .3142267
       d_smk |   .4635577   .0196676    23.57   0.000     .4249369    .5021785
      d_mace |   .1909357   .0150637    12.68   0.000     .1613555    .2205158
        d_eu |  -.1583838   .0168988    -9.37   0.000    -.1915677      -.1252
        dum2 |   .0358309   .0170985     2.10   0.037     .0022549    .0694069
        dum3 |   .0635373   .0150509     4.22   0.000     .0339822    .0930923
        dum4 |   .0499403   .0172238     2.90   0.004     .0161182    .0837623
        dum5 |   .0841768   .0177621     4.74   0.000     .0492978    .1190557
        dum6 |   .1135291   .0227231     5.00   0.000     .0689084    .1581498
       _cons |   .9354997   .0835186    11.20   0.000     .7714962    1.099503
------------------------------------------------------------------------------

. lincom cefta06+d_bhcefta

 ( 1)  cefta06 + d_bhcefta = 0
```

```
------------------------------------------------------------------------------
     imports |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         (1) |   .0981877   .0330738     2.97   0.003     .0332413    .1631341
------------------------------------------------------------------------------

.
. xtserial imports fbh_gdp gdppc distance d_cc d_bor cefta06 vat_bh resid_stage2 d_bh
d_bhcefta d_cro d_smk d_mace d_eu dum2-dum6

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,     109) =     20.862
           Prob > F =      0.0000
```

```
. *Model improvements*
. *Testing and accounting for serial correlation*
```

```
. xtreg imports  fbh_gdp gdppc distance d_cc d_bor cefta06 vat_bh d_bh d_bhcefta d_cro
d_smk d_mace d_eu dum2-dum6, fe

Fixed-effects (within) regression               Number of obs      =       660
Group variable: code                            Number of groups   =       110

R-sq:  within  = 0.5128                         Obs per group: min =         6
       between = 0.1006                                        avg =       6.0
       overall = 0.1111                                        max =         6
                                                F(11,539)          =     51.57
corr(u_i, Xb)  = -0.6457                        Prob > F           =    0.0000
------------------------------------------------------------------------------
     imports |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   1.223387   .2989228     4.09   0.000       .63619    1.810583
       gdppc |  -.4082162   .2274222    -1.79   0.073    -.8549586    .0385263
    distance |  (dropped)
        d_cc |  (dropped)
       d_bor |  (dropped)
     cefta06 |   .1409487   .0330331     4.27   0.000     .0760594     .205838
      vat_bh |  -.0011559   .0278678    -0.04   0.967    -.0558988    .0535869
        d_bh |  (dropped)
   d_bhcefta |   -.042761   .0451207    -0.95   0.344     -.131395     .045873
       d_cro |  (dropped)
       d_smk |  (dropped)
      d_mace |  (dropped)
        d_eu |  -.1583838   .0363914    -4.35   0.000    -.2298702   -.0868974
        dum2 |   .0358309   .0211074     1.70   0.090     -.005632    .0772938
        dum3 |   .0635373   .0276685     2.30   0.022     .0091859    .1178887
        dum4 |   .0499403   .0378221     1.32   0.187    -.0243566    .1242371
        dum5 |   .0841768   .0516091     1.63   0.103    -.0172029    .1855564
        dum6 |   .1135291   .0637474     1.78   0.075    -.0116947    .2387529
       _cons |  -4.369359   1.479469    -2.95   0.003    -7.275591   -1.463126
-------------+----------------------------------------------------------------
     sigma_u |  .81083642
     sigma_e |  .13440749
         rho |  .97325713   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(109, 539) =    40.20            Prob > F = 0.0000


. xtserial imports fbh_gdp gdppc distance d_cc d_bor cefta06 vat_bh d_bh d_bhcefta d_cro
d_smk d_mace d_eu dum2-dum6

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,     109) =     20.862
           Prob > F =      0.0000
```

```
. *testing the lagged model for CFR*
```

```
. generate float L_imports = l.imports
(110 missing values generated)

. generate float L_fbh_gdp = l.fbh_gdp
(110 missing values generated)

. generate float L_gdppc = l.gdppc
(110 missing values generated)
```

```
. *1)OLS*
```

```
. xtreg  imports L_imports fbh_gdp L_fbh_gdp gdppc L_gdppc cefta06 vat_bh d_bh d_bhcefta
d_cro d_smk d_mace d_eu dum2-dum6
note: dum6 dropped because of collinearity

Random-effects GLS regression                   Number of obs      =       550
Group variable: code                            Number of groups   =       110
R-sq:  within  = 0.3261                         Obs per group: min =         5
       between = 0.9947                                        avg =       5.0
       overall = 0.9490                                        max =         5
Random effects u_i ~ Gaussian                   Wald chi2(17)      =   9890.90
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000
------------------------------------------------------------------------------
     imports |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   L_imports |   .9447534   .0119468    79.08   0.000     .9213382    .9681686
     fbh_gdp |   .0759667   .5456539     0.14   0.889    -.9934954    1.145429
   L_fbh_gdp |  -.0773753   .5440434    -0.14   0.887    -1.143681    .9889302
       gdppc |   -1.05333   .3908345    -2.70   0.007    -1.819351   -.2873082
     L_gdppc |   .9967813   .3864353     2.58   0.010      .239382    1.754181
     cefta06 |  -.0459713   .0288065    -1.60   0.111    -.1024311    .0104885
      vat_bh |  -.0487616   .0265092    -1.84   0.066    -.1007187    .0031956
        d_bh |   .0676486   .0261013     2.59   0.010      .016491    .1188062
   d_bhcefta |  -.0184015   .0411215    -0.45   0.655    -.0989981    .0621952
       d_cro |   .0141138   .0302998     0.47   0.641    -.0452726    .0735003
       d_smk |    .041736   .0238653     1.75   0.080    -.0050391     .088511
      d_mace |    .024127   .0208222     1.16   0.247    -.0166837    .0649378
        d_eu |  -.0553281   .0183989    -3.01   0.003    -.0913893   -.0192669
        dum2 |  -.0295191    .022909    -1.29   0.198      -.07442    .0153817
        dum3 |  -.0141364   .0231469    -0.61   0.541    -.0595036    .0312307
        dum4 |  -.0074578   .0210633    -0.35   0.723    -.0487411    .0338254
        dum5 |   .0065399   .0211403     0.31   0.757    -.0348942    .0479741
       _cons |   .2263077    .079466     2.85   0.004     .0705573    .3820581
-------------+----------------------------------------------------------------
     sigma_u |          0
     sigma_e |   .1283807
         rho |          0   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

```
. testnl _b[L_imports]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

  (1)  _b[L_imports]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

               chi2(1) =        0.03
           Prob > chi2 =        0.8602

. testnl _b[L_imports]*_b[ gdppc] = -_b[ L_gdppc]

  (1)  _b[L_imports]*_b[ gdppc] = -_b[ L_gdppc]

               chi2(1) =        0.00
           Prob > chi2 =        0.9640
```

```
. *2)FE*
```

```
. xtreg imports L_imports fbh_gdp L_fbh_gdp gdppc L_gdppc cefta06 vat_bh d_bh d_bhcefta
d_cro d_smk d_mace d_eu dum2-dum6, fe
```

```
Fixed-effects (within) regression               Number of obs      =       550
Group variable: code                            Number of groups   =       110
R-sq:  within  = 0.4809                         Obs per group: min =         5
       between = 0.2637                                        avg =       5.0
       overall = 0.2703                                        max =         5
                                                F(13,427)          =     30.42
corr(u_i, Xb)  = -0.4617                        Prob > F           =    0.0000
------------------------------------------------------------------------------
     imports |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   L_imports |    .215958   .0519061     4.16   0.000     .1139347    .3179813
     fbh_gdp |   .9459448   .5555624     1.70   0.089    -.1460325    2.037922
   L_fbh_gdp |   .0171072   .5895088     0.03   0.977    -1.141593    1.175807
       gdppc |  -.9252889   .3678592    -2.52   0.012    -1.648329   -.2022487
     L_gdppc |    .459541   .4221875     1.09   0.277    -.3702835    1.289365
    cefta06 |   .1008719   .0372228     2.71   0.007     .0277092    .1740347
      vat_bh |  -.0257454   .0300777    -0.86   0.392    -.0848642    .0333734
        d_bh |  (dropped)
  d_bhcefta |  -.0588017   .0486407    -1.21   0.227    -.1544067    .0368033
       d_cro |  (dropped)
       d_smk |  (dropped)
      d_mace |  (dropped)
        d_eu |  -.2079087   .0517815    -4.02   0.000     -.309687   -.1061303
        dum2 |  -.0606836   .0655391    -0.93   0.355    -.1895029    .0681357
        dum3 |  -.0358428   .0530701    -0.68   0.500     -.140154    .0684683
        dum4 |  -.0459723   .0399396    -1.15   0.250    -.1244751    .0325304
        dum5 |  -.0147279   .0260883    -0.56   0.573    -.0660052    .0365495
        dum6 |  (dropped)
       _cons |   -3.20325    1.99267    -1.61   0.109    -7.119913    .7134143
-------------+----------------------------------------------------------------
     sigma_u |  .61865698
     sigma_e |   .1283807
         rho |  .95871528   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(109, 427) =     2.75            Prob > F = 0.0000


. testnl _b[L_imports]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

  (1)  _b[L_imports]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

             F(1, 427) =        0.19
              Prob > F =        0.6606

. testnl _b[L_imports]*_b[ gdppc] = -_b[ L_gdppc]

  (1)  _b[L_imports]*_b[ gdppc] = -_b[ L_gdppc]

             F(1, 427) =        0.50
              Prob > F =        0.4812
```

```
. *first stage: AR1 correction*
.
. xtregar imports fbh_gdp gdppc cefta06 vat_bh d_bhcefta d_eu dum2-dum6,fe rhotype(dw) lbi

FE (within) regression with AR(1) disturbances  Number of obs      =       550
Group variable: code                            Number of groups   =       110
R-sq:  within  = 0.2967                         Obs per group: min =         5
       between = 0.1170                                        avg =       5.0
       overall = 0.1244                                        max =         5
                                                F(10,430)          =     18.14
corr(u_i, Xb)  = -0.5407                        Prob > F           =    0.0000
------------------------------------------------------------------------------
     imports |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   1.101913   .4233319     2.60   0.010     .2698561    1.933971
       gdppc |    -.85951   .3145335    -2.73   0.007    -1.477724   -.2412956
     cefta06 |    .109168   .0417659     2.61   0.009     .0270772    .1912587
      vat_bh |  -.0315593   .0367144    -0.86   0.390    -.1037213    .0406026
```

```
   d_bhcefta |   -.059594   .0590653    -1.01   0.314    -.1756867    .0564987
        d_eu |  -.2071611   .0496706    -4.17   0.000    -.3047885   -.1095336
        dum2 |  -.0391429   .0430423    -0.91   0.364    -.1237424    .0454567
        dum3 |  -.0371629   .0486355    -0.76   0.445    -.1327557      .05843
        dum4 |   -.048605   .0394846    -1.23   0.219    -.1262119    .0290019
        dum5 |  -.0184074    .022549    -0.82   0.415    -.0627273    .0259126
        dum6 |  (dropped)
       _cons |  -3.274201   1.433513    -2.28   0.023    -6.091765   -.4566369
-------------+----------------------------------------------------------------
      rho_ar |  .34802347
     sigma_u |  .71493916
     sigma_e |  .12908958
     rho_fov |  .96842734   (fraction of variance because of u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(109,430) =    41.73             Prob > F = 0.0000
modified Bhargava et al. Durbin-Watson = 1.3165168
Baltagi-Wu LBI = 1.8146777
```

```
. *AR1 correction with two steps*
```

```
. xtregar imports fbh_gdp gdppc cefta06 vat_bh d_bhcefta d_eu dum2-dum6,fe rhotype(dw)
twostep lbi

FE (within) regression with AR(1) disturbances  Number of obs      =       550
Group variable: code                            Number of groups   =       110
R-sq:  within  = 0.2999                         Obs per group: min =         5
       between = 0.1169                                        avg =       5.0
       overall = 0.1243                                        max =         5
                                                F(10,430)          =     18.42
corr(u_i, Xb)  = -0.5447                        Prob > F           =    0.0000
------------------------------------------------------------------------------
     imports |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   1.109134    .421487     2.63   0.009     .2807025    1.937565
       gdppc |  -.8551128    .313306    -2.73   0.007    -1.470915   -.2393111
     cefta06 |   .1096613    .041658     2.63   0.009     .0277826      .19154
      vat_bh |  -.0312084   .0365774    -0.85   0.394     -.103101    .0406843
   d_bhcefta |  -.0595262   .0588509    -1.01   0.312    -.1751975    .0561451
        d_eu |  -.2070377    .049756    -4.16   0.000     -.304833   -.1092425
        dum2 |   -.039394   .0433626    -0.91   0.364     -.124623     .045835
        dum3 |  -.0371541   .0487696    -0.76   0.447    -.1330106    .0587024
        dum4 |  -.0486164   .0394914    -1.23   0.219    -.1262365    .0290037
        dum5 |  -.0184332   .0225537    -0.82   0.414    -.0627624     .025896
        dum6 |  (dropped)
       _cons |  -3.316789   1.440855    -2.30   0.022    -6.148784   -.4847947
-------------+----------------------------------------------------------------
      rho_ar |  .34174159
     sigma_u |  .71725256
     sigma_e |  .12900657
     rho_fov |  .96866337   (fraction of variance because of u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(109,430) =    42.60             Prob > F = 0.0000
modified Bhargava et al. Durbin-Watson = 1.3165168
Baltagi-Wu LBI = 1.8146777
```

```
. *FE from AR1 correction with two steps*
```

```
. predict FEAR1_correct, u
(110 missing values generated)
(110 missing values generated)
```

```
. *second stage*
```

```
. reg FEAR1_correct distance d_cc d_bor d_cro d_smk d_mace d_bh

      Source |       SS       df       MS              Number of obs =     550
-------------+------------------------------           F(  7,   542) =   75.55
```

```
       Model |  137.671416     7  19.6673452           Prob > F      =  0.0000
    Residual |  141.095771   542    .2603243           R-squared     =  0.4939
-------------+------------------------------           Adj R-squared =  0.4873
       Total |  278.767187   549  .507772654           Root MSE      =  .51022

------------------------------------------------------------------------------
FEAR1_corr~t |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    distance |  -1.417375   .0919448   -15.42   0.000    -1.597987   -1.236763
        d_cc |    .168221   .0668063     2.52   0.012       .03699     .299452
       d_bor |  -.2361055   .0759634    -3.11   0.002    -.3853242   -.0868869
       d_cro |   .0660875    .069965     0.94   0.345    -.0713484    .2035233
       d_smk |   .4568476   .0701939     6.51   0.000     .3189621     .594733
      d_mace |   .1932356     .06908     2.80   0.005     .0575383     .328933
        d_bh |   .3578651   .0694636     5.15   0.000     .2214142     .494316
       _cons |   4.135364   .3037976    13.61   0.000     3.538599    4.732129
------------------------------------------------------------------------------


. predict FEAR1_resid_stage2, residuals
(110 missing values generated)


. *stage 3*

. reg imports fbh_gdp gdppc distance d_cc d_bor cefta06 vat_bh FEAR1_resid_stage2 d_bh
d_bhcefta d_cro d_smk d_mace d_eu dum2-dum6

      Source |       SS       df       MS              Number of obs =     550
-------------+------------------------------           F( 18,   531) =  868.13
       Model |  226.863757    18  12.6035421           Prob > F      =  0.0000
    Residual |   7.7090723   531  .014518027           R-squared     =  0.9671
-------------+------------------------------           Adj R-squared =  0.9660
       Total |   234.57283   549  .427272914           Root MSE      =  .12049

------------------------------------------------------------------------------
     imports |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   1.121235   .0156306    71.73   0.000      1.09053    1.151941
       gdppc |  -.8386667   .0286121   -29.31   0.000    -.8948735   -.7824598
    distance |  -1.412858   .0344668   -40.99   0.000    -1.480566    -1.34515
        d_cc |   .1886805   .0190779     9.89   0.000     .1512031    .2261579
       d_bor |   -.231824   .0193448   -11.98   0.000    -.2698258   -.1938222
     cefta06 |   .1491369   .0255779     5.83   0.000     .0988905    .1993832
      vat_bh |  -.0196682   .0214827    -0.92   0.360    -.0618698    .0225333
FEAR1_resi~2 |   1.003896   .0154633    64.92   0.000     .9735193    1.034273
        d_bh |   .3416177   .0206458    16.55   0.000     .3010601    .3821753
   d_bhcefta |   -.062572   .0340777    -1.84   0.067    -.1295156    .0043716
       d_cro |   .0767415   .0238546     3.22   0.001     .0298804    .1236025
       d_smk |   .4548917   .0171902    26.46   0.000     .4211226    .4886608
      d_mace |   .1887376   .0163451    11.55   0.000     .1566287    .2208466
        d_eu |  -.1847409    .015645   -11.81   0.000    -.2154746   -.1540073
        dum2 |  -.0659685   .0180303    -3.66   0.000     -.101388   -.0305489
        dum3 |  -.0372517   .0179274    -2.08   0.038    -.0724691   -.0020343
        dum4 |  -.0508535   .0164786    -3.09   0.002    -.0832246   -.0184823
        dum5 |  -.0196691   .0162787    -1.21   0.227    -.0516477    .0123095
        dum6 |  (dropped)
       _cons |   .6993847   .0881757     7.93   0.000     .5261687    .8726007
------------------------------------------------------------------------------


. estat hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of imports

         chi2(1)      =    89.63
         Prob > chi2  =   0.0000

. estat imtest

Cameron & Trivedi's decomposition of IM-test
```

```
---------------------------------------------------
              Source |       chi2     df      p
---------------------+-----------------------------
  Heteroskedasticity |     216.10    147    0.0002
            Skewness |      12.42     18    0.8248
            Kurtosis |       3.14      1    0.0765
---------------------+-----------------------------
               Total |     231.66    166    0.0006
---------------------------------------------------

. estat ovtest

Ramsey RESET test using powers of the fitted values of imports
       Ho:  model has no omitted variables
                 F(3, 528) =      2.43
                  Prob > F =      0.0648

. estat vif

    Variable |       VIF       1/VIF  
-------------+----------------------
       gdppc |      7.28    0.137384
    distance |      5.13    0.194743
     fbh_gdp |      4.71    0.212193
       d_cro |      3.45    0.289921
     cefta06 |      3.02    0.331515
        d_bh |      2.58    0.387043
FEAR1_resi~2 |      2.32    0.430320
   d_bhcefta |      2.27    0.440764
        d_eu |      2.17    0.461262
        d_cc |      2.13    0.469527
       d_bor |      2.11    0.474164
        dum2 |      1.97    0.507478
        dum3 |      1.95    0.513320
       d_smk |      1.79    0.558295
      vat_bh |      1.70    0.588497
        dum4 |      1.65    0.607557
      d_mace |      1.62    0.617520
        dum5 |      1.61    0.622565
-------------+----------------------
    Mean VIF |      2.75


. xtserial imports fbh_gdp gdppc distance d_cc d_bor cefta06 vat_bh FEAR1_resid_stage2
d_bh d_bhcefta d_cro d_smk d_mace d_eu dum2-dum6

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,     109) =     23.280
           Prob > F =      0.0000


. reg imports fbh_gdp gdppc distance d_cc d_bor cefta06 vat_bh FEAR1_resid_stage2 d_bh
d_bhcefta d_cro d_smk d_mace d_eu dum2-dum6, robust

Linear regression                                      Number of obs =     550
                                                       F( 18,   531) = 1384.41
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.9671
                                                       Root MSE      =  .12049

------------------------------------------------------------------------------
             |               Robust
     imports |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   1.121235   .0167766    66.83   0.000     1.088279    1.154192
       gdppc |  -.8386667   .0293058   -28.62   0.000    -.8962362   -.7810972
    distance |  -1.412858   .0298079   -47.40   0.000    -1.471414   -1.354302
        d_cc |   .1886805   .0203561     9.27   0.000     .1486922    .2286689
       d_bor |   -.231824   .0206986   -11.20   0.000    -.2724851   -.1911629
     cefta06 |   .1491369   .0273349     5.46   0.000     .0954391    .2028346
```

```
      vat_bh |  -.0196682   .0201877    -0.97   0.330    -.0593258    .0199894
FEAR1_resi~2 |   1.003896   .0221148    45.39   0.000     .9604528    1.047339
        d_bh |   .3416177   .0212455    16.08   0.000     .2998822    .3833531
   d_bhcefta |   -.062572   .0380359    -1.65   0.101    -.1372913    .0121473
       d_cro |   .0767415   .0201008     3.82   0.000     .0372545    .1162284
       d_smk |   .4548917     .02221    20.48   0.000     .4112614     .498522
      d_mace |   .1887376   .0155134    12.17   0.000     .1582624    .2192128
        d_eu |  -.1847409   .0179385   -10.30   0.000    -.2199801   -.1495018
        dum2 |  -.0659685   .0193946    -3.40   0.001    -.1040681   -.0278688
        dum3 |  -.0372517   .0178285    -2.09   0.037    -.0722748   -.0022286
        dum4 |  -.0508535   .0169755    -3.00   0.003    -.0842009    -.017506
        dum5 |  -.0196691   .0163697    -1.20   0.230    -.0518264    .0124882
        dum6 |  (dropped)
       _cons |   .6993847   .0927201     7.54   0.000     .5172415    .8815279
------------------------------------------------------------------------------


. *because of evidence of serial correlation, test for CFR in the third stage*

. *1a)OLS*

. xtreg  imports L_imports fbh_gdp L_fbh_gdp gdppc L_gdppc cefta06 vat_bh
FEAR1_resid_stage2 d_bh d_bhcefta d_cro d_smk d_mace d_eu dum2-dum6
note: dum6 dropped because of collinearity

Random-effects GLS regression                   Number of obs      =       550
Group variable: code                            Number of groups   =       110
R-sq:  within  = 0.3669                         Obs per group: min =         5
       between = 0.9931                                        avg =       5.0
       overall = 0.9532                                        max =         5
Random effects u_i ~ Gaussian                   Wald chi2(18)      =  10822.21
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000
------------------------------------------------------------------------------
     imports |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   L_imports |   .7995528   .0237881    33.61   0.000     .7529289    .8461767
     fbh_gdp |  -.0702218   .5232414    -0.13   0.893    -1.095756    .9553126
   L_fbh_gdp |   .1983052   .5227783     0.38   0.704    -.8263215    1.222932
       gdppc |  -1.137451   .3746742    -3.04   0.002    -1.871799   -.4031033
     L_gdppc |   .8420739   .3709303     2.27   0.023     .1150639    1.569084
     cefta06 |   .0161872   .0290088     0.56   0.577     -.040669    .0730433
      vat_bh |  -.0271497   .0255888    -1.06   0.289    -.0773029    .0230036
FEAR1_resi~2 |   .2339484   .0335985     6.96   0.000     .1680966    .2998001
        d_bh |   .1149261   .0259143     4.43   0.000     .0641349    .1657172
   d_bhcefta |  -.0518117   .0396918    -1.31   0.192    -.1296062    .0259828
       d_cro |  -.0176055   .0293871    -0.60   0.549    -.0752031     .039992
       d_smk |   .1061771   .0246684     4.30   0.000      .057828    .1545263
      d_mace |   .0508404   .0203164     2.50   0.012      .011021    .0906598
        d_eu |  -.0541054   .0176298    -3.07   0.002    -.0886592   -.0195515
        dum2 |  -.0208444   .0219857    -0.95   0.343    -.0639355    .0222468
        dum3 |  -.0019976   .0222467    -0.09   0.928    -.0456003    .0416052
        dum4 |    -.00709   .0201819    -0.35   0.725    -.0466458    .0324658
        dum5 |    .008159    .020257     0.40   0.687    -.0315439    .0478619
       _cons |  -.0697054   .0872046    -0.80   0.424    -.2406233    .1012125
-------------+----------------------------------------------------------------
     sigma_u |          0
     sigma_e |   .1283807
         rho |          0   (fraction of variance due to u_i)
------------------------------------------------------------------------------


. testnl _b[L_imports]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

  (1)  _b[L_imports]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

               chi2(1) =        1.77
           Prob > chi2 =        0.1831

. testnl _b[L_imports]*_b[ gdppc] = -_b[ L_gdppc]

  (1)  _b[L_imports]*_b[ gdppc] = -_b[ L_gdppc]
```

```
              chi2(1) =        0.77
          Prob > chi2 =        0.3788


. *2a)FE*

. xtreg  imports L_imports fbh_gdp L_fbh_gdp gdppc L_gdppc cefta06 vat_bh
FEAR1_resid_stage2 d_bh d_bhcefta d_cro d_smk d_mace d_eu dum2-dum6, fe

Fixed-effects (within) regression               Number of obs      =       550
Group variable: code                            Number of groups   =       110
R-sq:  within  = 0.4809                         Obs per group: min =         5
       between = 0.2637                                        avg =       5.0
       overall = 0.2703                                        max =         5
                                                F(13,427)          =     30.42
corr(u_i, Xb)  = -0.4617                        Prob > F           =    0.0000
------------------------------------------------------------------------------
     imports |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   L_imports |    .215958   .0519061     4.16   0.000     .1139347    .3179813
     fbh_gdp |   .9459448   .5555624     1.70   0.089    -.1460325    2.037922
   L_fbh_gdp |   .0171072   .5895088     0.03   0.977    -1.141593    1.175807
       gdppc |  -.9252889   .3678592    -2.52   0.012    -1.648329   -.2022487
     L_gdppc |    .459541   .4221875     1.09   0.277    -.3702835    1.289365
     cefta06 |   .1008719   .0372228     2.71   0.007     .0277092    .1740347
      vat_bh |  -.0257454   .0300777    -0.86   0.392    -.0848642    .0333734
FEAR1_resi~2 |  (dropped)
        d_bh |  (dropped)
   d_bhcefta |  -.0588017   .0486407    -1.21   0.227    -.1544067    .0368033
       d_cro |  (dropped)
       d_smk |  (dropped)
      d_mace |  (dropped)
        d_eu |  -.2079087   .0517815    -4.02   0.000     -.309687   -.1061303
        dum2 |  -.0606836   .0655391    -0.93   0.355    -.1895029    .0681357
        dum3 |  -.0358428   .0530701    -0.68   0.500     -.140154    .0684683
        dum4 |  -.0459723   .0399396    -1.15   0.250    -.1244751    .0325304
        dum5 |  -.0147279   .0260883    -0.56   0.573    -.0660052    .0365495
        dum6 |  (dropped)
       _cons |   -3.20325    1.99267    -1.61   0.109    -7.119913    .7134143
-------------+----------------------------------------------------------------
     sigma_u |  .61865698
     sigma_e |   .1283807
         rho |  .95871528   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(109, 427) =     2.19            Prob > F = 0.0000


. testnl _b[L_imports]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

  (1)  _b[L_imports]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

             F(1, 427) =        0.19
              Prob > F =        0.6606

. testnl _b[L_imports]*_b[ gdppc] = -_b[ L_gdppc]

  (1)  _b[L_imports]*_b[ gdppc] = -_b[ L_gdppc]

             F(1, 427) =        0.50
              Prob > F =        0.4812
```

. *Prais-Winston for the consistency with the OLS*

```
. prais imports fbh_gdp gdppc distance d_cc d_bor cefta06 vat_bh FEAR1_resid_stage2 d_bh
d_bhcefta d_cro d_smk d_mace d_eu dum2-dum6, rhotype(regress)
note: dum6 dropped because of collinearity

Number of gaps in sample:  109   (gap count includes panel changes)
(note: computations for rho restarted at each gap)
```

```
Iteration 0:  rho = 0.0000
Iteration 1:  rho = 0.0645
Iteration 2:  rho = 0.0670
Iteration 3:  rho = 0.0671
Iteration 4:  rho = 0.0671
Iteration 5:  rho = 0.0671

Prais-Winsten AR(1) regression -- iterated estimates

      Source |       SS       df       MS              Number of obs =     550
-------------+------------------------------           F( 18,   531) =  774.17
       Model |  201.368763    18  11.1871535           Prob > F      =  0.0000
    Residual |  7.67322985   531  .014450527           R-squared     =  0.9633
-------------+------------------------------           Adj R-squared =  0.9620
       Total |  209.041993   549  .380768657           Root MSE      =  .12021
------------------------------------------------------------------------------
     imports |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   1.121295    .016477    68.05   0.000     1.088927    1.153663
       gdppc |  -.8367021   .0301143   -27.78   0.000      -.89586   -.7775443
    distance |  -1.412372   .0363139   -38.89   0.000    -1.483708   -1.341035
        d_cc |   .1894099   .0200323     9.46   0.000     .1500575    .2287622
       d_bor |   -.231592   .0203811   -11.36   0.000    -.2716295   -.1915544
     cefta06 |   .1473248   .0263938     5.58   0.000     .0954757     .199174
      vat_bh |  -.0191971   .0222164    -0.86   0.388      -.06284    .0244458
FEAR1_resi~2 |   1.005101    .016257    61.83   0.000     .9731655    1.037037
        d_bh |   .3412612   .0215468    15.84   0.000     .2989338    .3835885
   d_bhcefta |  -.0620432   .0352908    -1.76   0.079    -.1313699    .0072834
       d_cro |   .0780261   .0251348     3.10   0.002     .0286503    .1274018
       d_smk |    .456122   .0181274    25.16   0.000     .4205118    .4917322
      d_mace |   .1898326   .0172345    11.01   0.000     .1559764    .2236889
        d_eu |  -.1859371   .0163964   -11.34   0.000    -.2181468   -.1537274
        dum2 |  -.0665021   .0181461    -3.66   0.000    -.1021491   -.0308551
        dum3 |   -.037777   .0180312    -2.10   0.037    -.0731982   -.0023559
        dum4 |  -.0510566   .0164653    -3.10   0.002    -.0834016   -.0187115
        dum5 |  -.0197234   .0157274    -1.25   0.210    -.0506189    .0111722
       _cons |   .6966886   .0927767     7.51   0.000     .5144343     .878943
-------------+----------------------------------------------------------------
         rho |   .0671415
------------------------------------------------------------------------------
Durbin-Watson statistic (original)    1.343318
Durbin-Watson statistic (transformed) 1.406236
```

. *Prais-Winston robust se*

```
. prais imports fbh_gdp gdppc distance d_cc d_bor cefta06 vat_bh FEAR1_resid_stage2 d_bh
d_bhcefta d_cro d_smk d_mace d_eu dum2-dum6, rhotype(regress) vce(robust)
note: dum6 dropped because of collinearity

Number of gaps in sample:  109   (gap count includes panel changes)
(note: computations for rho restarted at each gap)

Iteration 0:  rho = 0.0000
Iteration 1:  rho = 0.0645
Iteration 2:  rho = 0.0670
Iteration 3:  rho = 0.0671
Iteration 4:  rho = 0.0671
Iteration 5:  rho = 0.0671

Prais-Winsten AR(1) regression -- iterated estimates

Linear regression                                      Number of obs =     550
                                                       F( 19,   531) =28363.14
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.9633
                                                       Root MSE      =  .12021
------------------------------------------------------------------------------
             |               Semi-robust
     imports |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
```

```
-------------+----------------------------------------------------------------
     fbh_gdp |   1.121295   .0178395    62.85   0.000      1.08625     1.15634
       gdppc |  -.8367021   .0311034   -26.90   0.000     -.897803   -.7756013
    distance |  -1.412372   .0316515   -44.62   0.000    -1.474549   -1.350194
        d_cc |   .1894099   .0215462     8.79   0.000     .1470837     .231736
       d_bor |   -.231592   .0223506   -10.36   0.000    -.2754985   -.1876854
     cefta06 |   .1473248   .0282057     5.22   0.000     .0919165    .2027332
      vat_bh |  -.0191971   .0212427    -0.90   0.367    -.0609271     .022533
FEAR1_resi~2 |   1.005101   .0238429    42.16   0.000     .9582634    1.051939
        d_bh |   .3412612   .0224528    15.20   0.000     .2971539    .3853684
   d_bhcefta |  -.0620432   .0398107    -1.56   0.120    -.1402491    .0161626
       d_cro |   .0780261    .021367     3.65   0.000     .0360519    .1200002
       d_smk |    .456122   .0234723    19.43   0.000     .4100121     .502232
      d_mace |   .1898326   .0163568    11.61   0.000     .1577007    .2219646
        d_eu |  -.1859371   .0186686    -9.96   0.000    -.2226105   -.1492637
        dum2 |  -.0665021   .0196406    -3.39   0.001    -.1050849   -.0279194
        dum3 |   -.037777   .0180115    -2.10   0.036    -.0731596   -.0023945
        dum4 |  -.0510566   .0171298    -2.98   0.003     -.084707   -.0174061
        dum5 |  -.0197234    .016193    -1.22   0.224    -.0515336    .0120869
       _cons |   .6966886   .0980353     7.11   0.000      .504104    .8892733
-------------+----------------------------------------------------------------
         rho |   .0671415
------------------------------------------------------------------------------
Durbin-Watson statistic (original)    1.343318
Durbin-Watson statistic (transformed) 1.406236


. lincom cefta06+d_bhcefta

 ( 1)  cefta06 + d_bhcefta = 0

------------------------------------------------------------------------------
     imports |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         (1) |   .0852816   .0328227     2.60   0.010     .0208034    .1497599
------------------------------------------------------------------------------


. lincom d_bh2005+dum3

 ( 1)  d_bh2005 + dum3 = 0

------------------------------------------------------------------------------
     imports |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         (1) |   .0721273   .0316786     2.28   0.023      .009896    .1343587
------------------------------------------------------------------------------
```

## APPENDIX 6.10: Western Balkans exports

```
. *stage one as suggested in the literature, FE model*
.
. xtreg export fbh_gdp gdppc distance d_cc d_bor cefta06 vat_bh d_bh d_cro d_smk d_mace
d_bhcefta d_eu dum2-dum6, fe

Fixed-effects (within) regression               Number of obs      =       660
Group variable: code                            Number of groups   =       110
R-sq:  within  = 0.4522                         Obs per group: min =         6
       between = 0.0149                                        avg =       6.0
       overall = 0.0200                                        max =         6
                                                F(11,539)          =     40.45
corr(u_i, Xb)  = -0.8258                        Prob > F           =    0.0000
------------------------------------------------------------------------------
      export |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   2.033679   .4931255     4.12   0.000     1.064995    3.002362
       gdppc |  -.2295869   .3734067    -0.61   0.539    -.9630977     .503924
    distance |  (dropped)
        d_cc |  (dropped)
       d_bor |  (dropped)
     cefta06 |  -.0319756   .0542773    -0.59   0.556    -.1385966    .0746454
      vat_bh |   .1189016   .0494983     2.40   0.017     .0216683    .2161349
        d_bh |  (dropped)
       d_cro |  (dropped)
       d_smk |  (dropped)
      d_mace |  (dropped)
   d_bhcefta |  -.1364586   .1073856    -1.27   0.204    -.3474042     .074487
        d_eu |   .0439913   .0603023     0.73   0.466    -.0744651    .1624476
        dum2 |   .0239113   .0346713     0.69   0.491    -.0441962    .0920188
        dum3 |   .0915622    .045489     2.01   0.045     .0022049    .1809196
        dum4 |   .1193621   .0621792     1.92   0.055    -.0027812    .2415053
        dum5 |    .113973   .0849019     1.34   0.180    -.0528062    .2807523
        dum6 |   .1258102    .104892     1.20   0.231    -.0802371    .3318575
       _cons |  -9.507393   2.441845    -3.89   0.000    -14.30409   -4.710695
-------------+----------------------------------------------------------------
     sigma_u |  1.5627343
     sigma_e |  .22075474
         rho |   .9804355   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(109, 539) =    17.42            Prob > F = 0.0000

. xtreg export fbh_gdp gdppc distance d_cc d_bor cefta06 vat_bh d_bh d_cro d_smk d_mace
d_bhcefta d_eu dum2-dum6, fe vce(robust)

Fixed-effects (within) regression               Number of obs      =       660
Group variable: code                            Number of groups   =       110
R-sq:  within  = 0.4522                         Obs per group: min =         6
       between = 0.0149                                        avg =       6.0
       overall = 0.0200                                        max =         6
                                                F(11,539)          =     55.06
corr(u_i, Xb)  = -0.8258                        Prob > F           =    0.0000
                                   (Std. Err. adjusted for clustering on code)
------------------------------------------------------------------------------
             |               Robust
      export |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   2.033679   .6048641     3.36   0.001     .8454987    3.221859
       gdppc |  -.2295869    .448997    -0.51   0.609    -1.111585    .6524115
    distance |  (dropped)
        d_cc |  (dropped)
       d_bor |  (dropped)
     cefta06 |  -.0319756   .0554654    -0.58   0.565    -.1409305    .0769793
      vat_bh |   .1189016   .0497184     2.39   0.017     .0212359    .2165672
        d_bh |  (dropped)
```

```
       d_cro |  (dropped)
       d_smk |  (dropped)
      d_mace |  (dropped)
   d_bhcefta |  -.1364586   .0665915    -2.05   0.041    -.2672692    -.005648
        d_eu |   .0439913   .0757733     0.58   0.562    -.1048559    .1928384
        dum2 |   .0239113   .0373789     0.64   0.523    -.0495148    .0973375
        dum3 |   .0915622   .0471272     1.94   0.053    -.0010133    .1841378
        dum4 |   .1193621   .0679328     1.76   0.079    -.0140835    .2528076
        dum5 |    .113973    .097317     1.17   0.242     -.077194    .3051401
        dum6 |   .1258102   .1152632     1.09   0.276    -.1006099    .3522303
       _cons |  -9.507393   3.027937    -3.14   0.002     -15.4554    -3.55939
-------------+----------------------------------------------------------------
     sigma_u |  1.5627343
     sigma_e |  .22075474
         rho |   .9804355   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

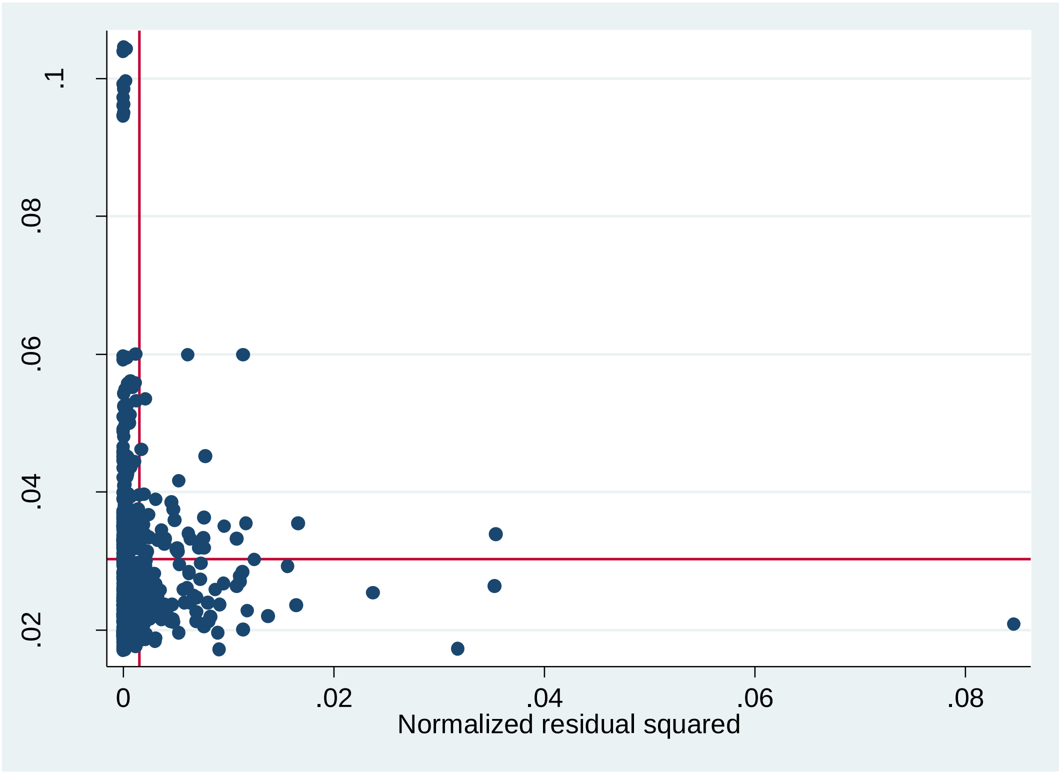
. *stage two, fixed effects obtained from stage one*

```
. predict Fixed_effects, u


. reg Fixed_effects distance d_cc d_bor d_bh d_cro d_smk d_mace

      Source |       SS       df       MS              Number of obs =     660
-------------+------------------------------           F(  7,   652) =  825.68
       Model |  1435.25185     7  205.035978           Prob > F      =  0.0000
    Residual |  161.906777   652  .248323278           R-squared     =  0.8986
-------------+------------------------------           Adj R-squared =  0.8975
       Total |  1597.15863   659  2.42360945           Root MSE      =  .49832
------------------------------------------------------------------------------
Fixed_effe~s |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    distance |  -3.212195   .0819762   -39.18   0.000    -3.373164   -3.051226
        d_cc |   1.036192   .0595632    17.40   0.000     .9192331    1.153151
       d_bor |   .1647164   .0677275     2.43   0.015     .0317261    .2977067
        d_bh |   .8953622   .0619324    14.46   0.000     .7737511    1.016973
       d_cro |    .957747   .0623795    15.35   0.000     .8352581    1.080236
       d_smk |   1.066629   .0625835    17.04   0.000     .9437389    1.189518
      d_mace |   1.037321   .0615904    16.84   0.000     .9163812     1.15826
       _cons |   8.815103   .2708601    32.54   0.000     8.283239    9.346966
------------------------------------------------------------------------------
```

. *stage three, residuals obtained from stage two*

```
. predict resid_stage2, residuals

. reg export fbh_gdp gdppc distance d_cc d_bor cefta06 vat_bh resid_stage2 d_bh d_cro
d_smk d_mace d_bhcefta d_eu dum2-dum6

      Source |       SS       df       MS              Number of obs =     660
-------------+------------------------------           F( 19,   640) =  665.36
       Model |  518.848881    19  27.3078358           Prob > F      =  0.0000
    Residual |  26.2669023   640  .041042035           R-squared     =  0.9518
-------------+------------------------------           Adj R-squared =  0.9504
       Total |  545.115783   659  .827186317           Root MSE      =  .20259
------------------------------------------------------------------------------
      export |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   2.033679   .0304365    66.82   0.000     1.973911    2.093446
       gdppc |  -.2295869   .0349938    -6.56   0.000    -.2983035   -.1608703
    distance |  -3.212195   .0588423   -54.59   0.000    -3.327742   -3.096648
        d_cc |   1.036192   .0287763    36.01   0.000     .9796846    1.092699
       d_bor |   .1647165   .0291974     5.64   0.000     .1073821    .2220508
     cefta06 |  -.0319756   .0394807    -0.81   0.418    -.1095029    .0455517
      vat_bh |   .1189016   .0364653     3.26   0.001     .0472954    .1905077
resid_stage2 |          1   .0210613    47.48   0.000     .9586424    1.041358
        d_bh |   .8953622   .0283598    31.57   0.000     .8396727    .9510516
       d_cro |    .957747    .034439    27.81   0.000     .8901199    1.025374
```

```
     d_smk |   1.066629   .0265974    40.10   0.000       1.0144    1.118857
    d_mace |   1.037321   .0251069    41.32   0.000     .9880188    1.086622
 d_bhcefta |  -.1364586   .0708495    -1.93   0.055    -.2755842     .002667
      d_eu |   .0439913   .0235347     1.87   0.062    -.0022233    .0902058
      dum2 |   .0239113   .0274368     0.87   0.384    -.0299657    .0777884
      dum3 |   .0915622   .0275043     3.33   0.001     .0375527    .1455718
      dum4 |   .1193621   .0288314     4.14   0.000     .0627465    .1759776
      dum5 |    .113973   .0294237     3.87   0.000     .0561943    .1717517
      dum6 |   .1258102   .0297424     4.23   0.000     .0674057    .1842147
     _cons |  -.6922902   .1262849    -5.48   0.000    -.9402731   -.4443073
------------------------------------------------------------------------------

. lvr2plot
```




```
. estat hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of export

         chi2(1)      =   152.37
         Prob > chi2  =   0.0000

. estat imtest

Cameron & Trivedi's decomposition of IM-test

---------------------------------------------------
              Source |       chi2     df      p
---------------------+-----------------------------
  Heteroskedasticity |     150.39    156    0.6117
            Skewness |      18.88     19    0.4643
            Kurtosis |       3.10      1    0.0784
---------------------+-----------------------------
               Total |     172.37    176    0.5633
---------------------------------------------------
```

```
. estat ovtest

Ramsey RESET test using powers of the fitted values of export
       Ho:  model has no omitted variables
                 F(3, 637) =      1.69
                  Prob > F =      0.1675

. estat vif

    Variable |       VIF       1/VIF  
-------------+----------------------
     fbh_gdp |      7.73    0.129373
    distance |      6.35    0.157408
       gdppc |      4.79    0.208974
       d_cro |      3.05    0.327691
        d_eu |      2.13    0.470242
     cefta06 |      2.07    0.482727
        d_bh |      2.07    0.483236
        d_cc |      2.06    0.486174
       d_bor |      2.04    0.490353
        dum6 |      1.98    0.506134
        dum5 |      1.93    0.517157
        dum4 |      1.86    0.538625
       d_smk |      1.82    0.549398
      vat_bh |      1.77    0.565861
resid_stage2 |      1.75    0.571471
        dum3 |      1.69    0.591858
        dum2 |      1.68    0.594772
      d_mace |      1.62    0.616566
   d_bhcefta |      1.44    0.693974
-------------+----------------------
    Mean VIF |      2.62

.
. reg export fbh_gdp gdppc distance d_cc d_bor cefta06 vat_bh resid_stage2 d_bh d_cro
d_smk d_mace d_bhcefta d_eu dum2-dum6, vce(robust)

Linear regression                                      Number of obs =     660
                                                       F( 19,   640) =  707.27
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.9518
                                                       Root MSE      =  .20259

------------------------------------------------------------------------------
             |               Robust
      export |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   2.033679   .0256431    79.31   0.000     1.983324    2.084034
       gdppc |  -.2295869   .0352764    -6.51   0.000    -.2988583   -.1603155
    distance |  -3.212195   .0488844   -65.71   0.000    -3.308188   -3.116202
        d_cc |   1.036192    .025196    41.13   0.000     .9867152    1.085669
       d_bor |   .1647165   .0242186     6.80   0.000     .1171589     .212274
     cefta06 |  -.0319756   .0325074    -0.98   0.326    -.0958097    .0318585
      vat_bh |   .1189016   .0353586     3.36   0.001     .0494687    .1883344
resid_stage2 |          1   .0200047    49.99   0.000     .9607172    1.039283
        d_bh |   .8953622   .0340947    26.26   0.000     .8284112    .9623131
       d_cro |    .957747   .0317433    30.17   0.000     .8954134    1.020081
       d_smk |   1.066629   .0286466    37.23   0.000     1.010376    1.122881
      d_mace |   1.037321   .0284463    36.47   0.000     .9814613     1.09318
   d_bhcefta |  -.1364586   .0395507    -3.45   0.001    -.2141234   -.0587938
        d_eu |   .0439913   .0237813     1.85   0.065    -.0027076    .0906901
        dum2 |   .0239113   .0311448     0.77   0.443     -.037247    .0850696
        dum3 |   .0915622   .0299121     3.06   0.002     .0328246    .1502999
        dum4 |   .1193621   .0298852     3.99   0.000     .0606771     .178047
        dum5 |    .113973   .0305456     3.73   0.000     .0539913    .1739548
        dum6 |   .1258102   .0371756     3.38   0.001     .0528094    .1988111
       _cons |  -.6922902   .1427193    -4.85   0.000    -.9725448   -.4120355
------------------------------------------------------------------------------


. lincom cefta06+d_bhcefta
```

```
 ( 1)  cefta06 + d_bhcefta = 0

------------------------------------------------------------------------------
      export |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         (1) |  -.1684342   .0368284    -4.57   0.000    -.2407532   -.0961151
------------------------------------------------------------------------------


. xtserial export fbh_gdp gdppc distance d_cc d_bor cefta06 vat_bh resid_stage2 d_bh d_cro
d_smk d_mace d_bhcefta d_eu dum2-dum6

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,     109) =     10.252
           Prob > F =      0.0018
```

```
. *Model improvements*
. *Testing and accounting for serial correlation*
```

```
. xtreg export fbh_gdp gdppc distance d_cc d_bor cefta06 vat_bh d_bh d_cro d_smk d_mace
d_bhcefta d_eu dum2-dum6, fe

Fixed-effects (within) regression               Number of obs      =       660
Group variable: code                            Number of groups   =       110
R-sq:  within  = 0.4522                         Obs per group: min =         6
       between = 0.0149                                        avg =       6.0
       overall = 0.0200                                        max =         6
                                                F(11,539)          =     40.45
corr(u_i, Xb)  = -0.8258                        Prob > F           =    0.0000
------------------------------------------------------------------------------
      export |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   2.033679   .4931255     4.12   0.000     1.064995    3.002362
       gdppc |  -.2295869   .3734067    -0.61   0.539    -.9630977     .503924
    distance |  (dropped)
        d_cc |  (dropped)
       d_bor |  (dropped)
     cefta06 |  -.0319756   .0542773    -0.59   0.556    -.1385966    .0746454
      vat_bh |   .1189016   .0494983     2.40   0.017     .0216683    .2161349
        d_bh |  (dropped)
       d_cro |  (dropped)
       d_smk |  (dropped)
      d_mace |  (dropped)
   d_bhcefta |  -.1364586   .1073856    -1.27   0.204    -.3474042     .074487
        d_eu |   .0439913   .0603023     0.73   0.466    -.0744651    .1624476
        dum2 |   .0239113   .0346713     0.69   0.491    -.0441962    .0920188
        dum3 |   .0915622    .045489     2.01   0.045     .0022049    .1809196
        dum4 |   .1193621   .0621792     1.92   0.055    -.0027812    .2415053
        dum5 |    .113973   .0849019     1.34   0.180    -.0528062    .2807523
        dum6 |   .1258102    .104892     1.20   0.231    -.0802371    .3318575
       _cons |  -9.507393   2.441845    -3.89   0.000    -14.30409   -4.710695
-------------+----------------------------------------------------------------
     sigma_u |  1.5627343
     sigma_e |  .22075474
         rho |   .9804355   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(109, 539) =    17.42            Prob > F = 0.0000


. xtserial export fbh_gdp gdppc distance d_cc d_bor cefta06 vat_bh d_bh d_cro d_smk d_mace
d_bhcefta d_eu dum2-dum6

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,     109) =     10.252
           Prob > F =      0.0018
```

```
. *testing the lagged model for CFR*

. generate float L_export = l.export
(110 missing values generated)

. generate float L_fbh_gdp = l.fbh_gdp
(110 missing values generated)

. generate float L_gdppc = l.gdppc
(110 missing values generated)


. *1)OLS*

. xtreg  export L_export fbh_gdp L_fbh_gdp gdppc L_gdppc d_bh cefta06 vat_bh d_bhcefta
d_eu dum2-dum6
note: dum6 dropped because of collinearity

Random-effects GLS regression                   Number of obs      =       550
Group variable: code                            Number of groups   =       110
R-sq:  within  = 0.2573                         Obs per group: min =         5
       between = 0.9914                                        avg =       5.0
       overall = 0.9258                                        max =         5
Random effects u_i ~ Gaussian                   Wald chi2(14)      =   6673.35
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000
------------------------------------------------------------------------------
      export |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    L_export |   .9310344   .0133347    69.82   0.000     .9048988    .9571699
     fbh_gdp |   2.186269    .806544     2.71   0.007     .6054718    3.767066
   L_fbh_gdp |  -2.168821   .8018128    -2.70   0.007    -3.740345   -.5972969
       gdppc |  -.4328142   .5680317    -0.76   0.446    -1.546136    .6805075
     L_gdppc |   .4014979   .5596353     0.72   0.473    -.6953672    1.498363
        d_bh |   .0602195   .0335031     1.80   0.072    -.0054453    .1258843
     cefta06 |    .047509    .048334     0.98   0.326    -.0472239    .1422419
      vat_bh |  -.0384318   .0456289    -0.84   0.400    -.1278627    .0509991
   d_bhcefta |  -.0502582   .0860155    -0.58   0.559    -.2188454     .118329
        d_eu |   .0272916   .0285139     0.96   0.339    -.0285946    .0831777
        dum2 |  -.0029943   .0360764    -0.08   0.934    -.0737029    .0677142
        dum3 |   .0427588   .0365148     1.17   0.242     -.028809    .1143265
        dum4 |   .0203676   .0340131     0.60   0.549    -.0462969     .087032
        dum5 |  -.0179536   .0342909    -0.52   0.601    -.0851625    .0492553
       _cons |   .0080793   .1276497     0.06   0.950    -.2421095    .2582682
-------------+----------------------------------------------------------------
     sigma_u |          0
     sigma_e |  .19367229
         rho |          0   (fraction of variance due to u_i)
------------------------------------------------------------------------------


. testnl _b[L_export]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

  (1)  _b[L_export]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

               chi2(1) =        5.46
           Prob > chi2 =        0.0194

. testnl _b[L_export]*_b[ gdppc] = -_b[ L_gdppc]

  (1)  _b[L_export]*_b[ gdppc] = -_b[ L_gdppc]

               chi2(1) =        0.00
           Prob > chi2 =        0.9749


. *2)FE*

. xtreg export L_export fbh_gdp L_fbh_gdp gdppc L_gdppc d_bh cefta06 vat_bh d_bhcefta d_eu
dum2-dum6, fe
```

```
Fixed-effects (within) regression               Number of obs      =       550
Group variable: code                            Number of groups   =       110
R-sq:  within  = 0.4313                         Obs per group: min =         5
       between = 0.1863                                        avg =       5.0
       overall = 0.2001                                        max =         5
                                                F(13,427)          =     24.91
corr(u_i, Xb)  = -0.1744                        Prob > F           =    0.0000
------------------------------------------------------------------------------
      export |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    L_export |   .1358675   .0450258     3.02   0.003     .0473677    .2243673
     fbh_gdp |   2.011891   .8402432     2.39   0.017     .3603638    3.663419
   L_fbh_gdp |  -1.188402    .894292    -1.33   0.185    -2.946165    .5693601
       gdppc |   .4948516   .5554457     0.89   0.373    -.5968965      1.5866
     L_gdppc |  -.9248067   .6344218    -1.46   0.146    -2.171785    .3221716
        d_bh |  (dropped)
    cefta06 |   .0453464   .0549184     0.83   0.409    -.0625977    .1532905
      vat_bh |   .0496368   .0492834     1.01   0.314    -.0472314     .146505
   d_bhcefta |  -.1089945   .1056629    -1.03   0.303    -.3166785    .0986896
        d_eu |   .1468521   .0787839     1.86   0.063    -.0080005    .3017046
        dum2 |  -.1945577   .0989888    -1.97   0.050    -.3891236    8.29e-06
        dum3 |  -.1095449   .0800796    -1.37   0.172    -.2669441    .0478543
        dum4 |  -.0577883   .0601892    -0.96   0.338    -.1760922    .0605157
        dum5 |   -.046677   .0392599    -1.19   0.235    -.1238438    .0304898
        dum6 |  (dropped)
       _cons |  -2.911467   3.038087    -0.96   0.338    -8.882933        3.06
-------------+----------------------------------------------------------------
     sigma_u |  .79354015
     sigma_e |  .19367229
         rho |   .9437828   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(109, 427) =     4.00           Prob > F = 0.0000


. testnl _b[L_export]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

  (1)  _b[L_export]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

             F(1, 427) =        1.29
              Prob > F =        0.2566

. testnl _b[L_export]*_b[ gdppc] = -_b[ L_gdppc]

  (1)  _b[L_export]*_b[ gdppc] = -_b[ L_gdppc]

             F(1, 427) =        2.15
              Prob > F =        0.1432
```

. *first stage: AR1 correction*

```
. xtregar export fbh_gdp gdppc cefta06 vat_bh d_bhcefta d_eu dum2-dum6,fe rhotype(dw) lbi

FE (within) regression with AR(1) disturbances  Number of obs      =       550
Group variable: code                            Number of groups   =       110

R-sq:  within  = 0.2063                         Obs per group: min =         5
       between = 0.0063                                        avg =       5.0
       overall = 0.0099                                        max =         5
                                                F(10,430)          =     11.17
corr(u_i, Xb)  = -0.5943                        Prob > F           =    0.0000
------------------------------------------------------------------------------
      export |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   .9964096   .6564104     1.52   0.130    -.2937625    2.286582
       gdppc |   .0462121   .4867238     0.09   0.924    -.9104417    1.002866
     cefta06 |   .0748096   .0644135     1.16   0.246    -.0517949     .201414
      vat_bh |   .0502078   .0615349     0.82   0.415    -.0707388    .1711544
   d_bhcefta |  -.1542344   .1339731    -1.15   0.250     -.417558    .1090893
        d_eu |  -.0098919   .0768534    -0.13   0.898    -.1609469    .1411632
```

```
        dum2 |  -.1426079   .0667003    -2.14   0.033     -.273707   -.0115088
        dum3 |  -.1118897   .0753136    -1.49   0.138    -.2599184     .036139
        dum4 |  -.0779426   .0611158    -1.28   0.203    -.1980654    .0421803
        dum5 |  -.0422936   .0348977    -1.21   0.226    -.1108848    .0262977
        dum6 |  (dropped)
       _cons |  -3.812798   2.222134    -1.72   0.087    -8.180395    .5547981
-------------+----------------------------------------------------------------
      rho_ar |  .34843913
     sigma_u |  1.0789969
     sigma_e |  .19972517
     rho_fov |  .96687207   (fraction of variance because of u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(109,430) =    31.15            Prob > F = 0.0000
modified Bhargava et al. Durbin-Watson = 1.3141949
Baltagi-Wu LBI = 1.8406611

. *AR1 correction with two steps*

. xtregar export fbh_gdp gdppc cefta06 vat_bh d_bhcefta d_eu dum2-dum6,fe rhotype(dw)
twostep lbi

FE (within) regression with AR(1) disturbances  Number of obs      =       550
Group variable: code                            Number of groups   =       110
R-sq:  within  = 0.2096                         Obs per group: min =         5
       between = 0.0063                                        avg =       5.0
       overall = 0.0100                                        max =         5
                                                F(10,430)          =     11.41
corr(u_i, Xb)  = -0.5940                        Prob > F           =    0.0000
------------------------------------------------------------------------------
      export |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   .9962254   .6534945     1.52   0.128    -.2882155    2.280666
       gdppc |   .0444379   .4847354     0.09   0.927    -.9083077    .9971835
     cefta06 |   .0742095   .0642261     1.16   0.249    -.0520267    .2004457
      vat_bh |   .0504549   .0612956     0.82   0.411    -.0700213    .1709312
   d_bhcefta |  -.1537544   .1334504    -1.15   0.250    -.4160507    .1085419
        d_eu |  -.0076131   .0769263    -0.10   0.921    -.1588114    .1435851
        dum2 |   -.144166   .0670966    -2.15   0.032     -.276044    -.012288
        dum3 |  -.1127775   .0754504    -1.49   0.136     -.261075    .0355199
        dum4 |   -.078179   .0610874    -1.28   0.201    -.1982461    .0418881
        dum5 |  -.0424164   .0348823    -1.22   0.225    -.1109774    .0261446
        dum6 |  (dropped)
       _cons |  -3.812375   2.230847    -1.71   0.088    -8.197096    .5723454
-------------+----------------------------------------------------------------
      rho_ar |  .34290253
     sigma_u |  1.0786904
     sigma_e |  .19948347
     rho_fov |   .9669314   (fraction of variance because of u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(109,430) =    31.76            Prob > F = 0.0000
modified Bhargava et al. Durbin-Watson = 1.3141949
Baltagi-Wu LBI = 1.8406611
```

. *FE from AR1 correction with two steps*

```
. predict FEAR1_correct, u
(110 missing values generated)
(110 missing values generated)
```

. *second stage*

```
. reg FEAR1_correct distance d_cc d_bor d_bh d_cro d_smk d_mace

      Source |       SS       df       MS              Number of obs =     550
-------------+------------------------------           F(  7,   542) =  510.94
       Model |  548.236749     7  78.3195356           Prob > F      =  0.0000
    Residual |  83.0807269   542  .153285474           R-squared     =  0.8684
-------------+------------------------------           Adj R-squared =  0.8667
       Total |  631.317476   549  1.14994076           Root MSE      =  .39152
```

```
------------------------------------------------------------------------------
FEAR1_corr~t |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    distance |  -1.744979   .0705538   -24.73   0.000    -1.883572   -1.606387
        d_cc |   .5951319   .0512638    11.61   0.000     .4944319     .695832
       d_bor |   .3216861   .0582904     5.52   0.000     .2071833     .436189
        d_bh |   1.029873   .0533029    19.32   0.000     .9251673    1.134578
       d_cro |   1.349937   .0536876    25.14   0.000     1.244475    1.455398
       d_smk |   1.290797   .0538632    23.96   0.000     1.184991    1.396604
      d_mace |   1.022688   .0530085    19.29   0.000     .9185611    1.126816
       _cons |    4.23157   .2331189    18.15   0.000     3.773643    4.689497
------------------------------------------------------------------------------


. predict FEAR1_resid_stage2, residuals
(110 missing values generated)
```

. *stage 3*

```
. reg export fbh_gdp gdppc distance d_cc d_bor cefta06 vat_bh FEAR1_resid_stage2 d_bh
d_cro d_smk d_mace d_bhcefta d_eu dum2-dum6

      Source |       SS       df       MS              Number of obs =     550
-------------+------------------------------           F( 18,   531) =  697.30
       Model |  418.324471    18  23.2402484           Prob > F      =  0.0000
    Residual |  17.6976814   531  .033328967           R-squared     =  0.9594
-------------+------------------------------           Adj R-squared =  0.9580
       Total |  436.022152   549  .794211571           Root MSE      =  .18256
------------------------------------------------------------------------------
      export |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   1.015216   .0236335    42.96   0.000     .9687892    1.061642
       gdppc |   .0243233   .0353602     0.69   0.492    -.0451397    .0937863
    distance |  -1.725835   .0510544   -33.80   0.000    -1.826128   -1.625541
        d_cc |   .6177292   .0277681    22.25   0.000     .5631805    .6722779
       d_bor |   .3467163   .0286765    12.09   0.000     .2903829    .4030496
     cefta06 |   .0640299   .0378642     1.69   0.091    -.0103521     .138412
      vat_bh |   .0623977   .0339569     1.84   0.067    -.0043086     .129104
FEAR1_resi~2 |   .9779898    .020197    48.42   0.000     .9383141    1.017666
        d_bh |   1.029568   .0286603    35.92   0.000     .9732669     1.08587
       d_cro |   1.375135   .0332585    41.35   0.000     1.309801    1.440469
       d_smk |    1.29463   .0259407    49.91   0.000     1.243671    1.345589
      d_mace |   1.056364   .0247554    42.67   0.000     1.007733    1.104994
   d_bhcefta |  -.1330206   .0641219    -2.07   0.039    -.2589844   -.0070568
        d_eu |   .0061778   .0236171     0.26   0.794    -.0402167    .0525722
        dum2 |  -.2439904   .0263705    -9.25   0.000    -.2957937    -.192187
        dum3 |  -.1427107   .0262405    -5.44   0.000    -.1942587   -.0911627
        dum4 |   -.085888   .0249387    -3.44   0.001    -.1348786   -.0368974
        dum5 |  -.0442228   .0246526    -1.79   0.073    -.0926513    .0042058
        dum6 |  (dropped)
       _cons |   .2347802   .1304045     1.80   0.072    -.0213918    .4909521
------------------------------------------------------------------------------


. estat hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of export

         chi2(1)      =    97.91
         Prob > chi2  =   0.0000

. estat imtest

Cameron & Trivedi's decomposition of IM-test

---------------------------------------------------
              Source |       chi2     df      p
---------------------+-----------------------------
```

```
  Heteroskedasticity |     139.25    144    0.5964
            Skewness |      13.57     18    0.7565
            Kurtosis |       3.12      1    0.0774
---------------------+-----------------------------
               Total |     155.94    163    0.6405
---------------------------------------------------

. estat ovtest

Ramsey RESET test using powers of the fitted values of export
       Ho:  model has no omitted variables
                 F(3, 528) =      0.70
                  Prob > F =      0.5549

. estat vif

    Variable |       VIF       1/VIF  
-------------+----------------------
    distance |      4.91    0.203757
       gdppc |      4.84    0.206501
     fbh_gdp |      4.69    0.213079
       d_cro |      2.92    0.342400
     cefta06 |      2.30    0.434890
        d_bh |      2.17    0.461083
        d_eu |      2.15    0.464684
       d_bor |      2.02    0.495358
        d_cc |      1.97    0.508797
      vat_bh |      1.85    0.540732
        dum2 |      1.84    0.544631
        dum3 |      1.82    0.550040
       d_smk |      1.78    0.562830
        dum4 |      1.64    0.608965
      d_mace |      1.62    0.618016
        dum5 |      1.60    0.623181
   d_bhcefta |      1.45    0.690570
FEAR1_resi~2 |      1.02    0.983443
-------------+----------------------
    Mean VIF |      2.37

.
. xtserial export fbh_gdp gdppc distance d_cc d_bor cefta06 vat_bh FEAR1_resid_stage2 d_bh
d_cro d_smk d_mace d_bhcefta d_eu dum2-dum6

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,     109) =      4.966
           Prob > F =      0.0279


. reg export fbh_gdp gdppc distance d_cc d_bor cefta06 vat_bh FEAR1_resid_stage2 d_bh
d_cro d_smk d_mace d_bhcefta d_eu dum2-dum6, robust

Linear regression                                      Number of obs =     550
                                                       F( 18,   531) =  737.54
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.9594
                                                       Root MSE      =  .18256

------------------------------------------------------------------------------
             |               Robust
      export |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   1.015216   .0257991    39.35   0.000      .964535    1.065897
       gdppc |   .0243233   .0351248     0.69   0.489    -.0446773    .0933239
    distance |  -1.725835   .0464875   -37.12   0.000    -1.817157   -1.634513
        d_cc |   .6177292   .0241558    25.57   0.000     .5702766    .6651818
       d_bor |   .3467163   .0218701    15.85   0.000     .3037537    .3896788
     cefta06 |   .0640299   .0303492     2.11   0.035     .0044107    .1236492
      vat_bh |   .0623977   .0291538     2.14   0.033     .0051268    .1196686
FEAR1_resi~2 |   .9779898    .021092    46.37   0.000     .9365559    1.019424
        d_bh |   1.029568   .0312509    32.95   0.000     .9681778    1.090959
       d_cro |   1.375135   .0330843    41.56   0.000     1.310143    1.440127
```

```
       d_smk |    1.29463   .0301412    42.95   0.000     1.235419    1.353841
      d_mace |   1.056364   .0274948    38.42   0.000     1.002352    1.110375
   d_bhcefta |  -.1330206   .0317695    -4.19   0.000    -.1954299   -.0706113
        d_eu |   .0061778   .0231378     0.27   0.790    -.0392751    .0516306
        dum2 |  -.2439904   .0329896    -7.40   0.000    -.3087964   -.1791843
        dum3 |  -.1427107   .0289928    -4.92   0.000    -.1996654    -.085756
        dum4 |   -.085888   .0250193    -3.43   0.001     -.135037    -.036739
        dum5 |  -.0442228   .0248535    -1.78   0.076     -.093046    .0046004
        dum6 |  (dropped)
       _cons |   .2347802   .1350703     1.74   0.083    -.0305575    .5001179
------------------------------------------------------------------------------
```

. *because of evidence of serial correlation, test for CFR in the third stage*

. *1a)OLS*

```
. xtreg  export L_export fbh_gdp L_fbh_gdp gdppc L_gdppc cefta06 vat_bh FEAR1_resid_stage2
d_bh d_cro d_smk d_mace d_bhcefta d_eu dum2-dum6
note: dum2 dropped because of collinearity

Random-effects GLS regression                   Number of obs      =       550
Group variable: code                            Number of groups   =       110
R-sq:  within  = 0.2827                         Obs per group: min =         5
       between = 0.9905                                        avg =       5.0
       overall = 0.9326                                        max =         5
Random effects u_i ~ Gaussian                   Wald chi2(18)      =   7352.75
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000
------------------------------------------------------------------------------
      export |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    L_export |   .8230434   .0202053    40.73   0.000     .7834417    .8626451
     fbh_gdp |   1.462169   .8545634     1.71   0.087    -.2127448    3.137082
   L_fbh_gdp |  -1.434055   .8528242    -1.68   0.093    -3.105559      .23745
       gdppc |   .1103416   .6098556     0.18   0.856    -1.084954    1.305637
     L_gdppc |  -.1401725   .6028848    -0.23   0.816    -1.321805     1.04146
     cefta06 |    .095416   .0468057     2.04   0.041     .0036785    .1871536
      vat_bh |  -.0089099   .0438477    -0.20   0.839    -.0948498    .0770301
FEAR1_resi~2 |   .2147887   .0326986     6.57   0.000     .1507007    .2788767
        d_bh |   .2014867   .0426037     4.73   0.000     .1179851    .2849884
       d_cro |   .2199549    .053178     4.14   0.000     .1157279    .3241819
       d_smk |   .2603614    .046096     5.65   0.000      .170015    .3507079
      d_mace |   .1436242   .0398947     3.60   0.000      .065432    .2218164
   d_bhcefta |  -.0636163   .0823603    -0.77   0.440    -.2250394    .0978069
        d_eu |   .0360077   .0290022     1.24   0.214    -.0208357     .092851
        dum3 |   .0541658   .0318635     1.70   0.089    -.0082855    .1166171
        dum4 |   .0377676   .0334602     1.13   0.259    -.0278133    .1033485
        dum5 |   .0174124   .0357778     0.49   0.626    -.0527109    .0875357
        dum6 |   .0380958   .0352507     1.08   0.280    -.0309943     .107186
       _cons |  -.0526011   .1212276    -0.43   0.664    -.2902029    .1850007
-------------+----------------------------------------------------------------
     sigma_u |          0
     sigma_e |  .19367229
         rho |          0   (fraction of variance due to u_i)
------------------------------------------------------------------------------


. testnl _b[L_export]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

  (1)  _b[L_export]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

               chi2(1) =        2.35
           Prob > chi2 =        0.1254

. testnl _b[L_export]*_b[ gdppc] = -_b[ L_gdppc]

  (1)  _b[L_export]*_b[ gdppc] = -_b[ L_gdppc]

               chi2(1) =        0.20
           Prob > chi2 =        0.6555
```

```
. *2a)FE*
. xtreg  export L_export fbh_gdp L_fbh_gdp gdppc L_gdppc cefta06 vat_bh FEAR1_resid_stage2
d_bh d_bhcefta d_eu dum2-dum6, fe

Fixed-effects (within) regression               Number of obs      =       550
Group variable: code                            Number of groups   =       110
R-sq:  within  = 0.4313                         Obs per group: min =         5
       between = 0.1863                                        avg =       5.0
       overall = 0.2001                                        max =         5
                                                F(13,427)          =     24.91
corr(u_i, Xb)  = -0.1744                        Prob > F           =    0.0000
------------------------------------------------------------------------------
      export |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    L_export |   .1358675   .0450258     3.02   0.003     .0473677    .2243673
     fbh_gdp |   2.011891   .8402432     2.39   0.017     .3603638    3.663419
   L_fbh_gdp |  -1.188402    .894292    -1.33   0.185    -2.946165    .5693601
       gdppc |   .4948516   .5554457     0.89   0.373    -.5968965      1.5866
     L_gdppc |  -.9248067   .6344218    -1.46   0.146    -2.171785    .3221716
     cefta06 |   .0453464   .0549184     0.83   0.409    -.0625977    .1532905
      vat_bh |   .0496368   .0492834     1.01   0.314    -.0472314     .146505
FEAR1_resi~2 |  (dropped)
        d_bh |  (dropped)
   d_bhcefta |  -.1089945   .1056629    -1.03   0.303    -.3166785    .0986896
        d_eu |   .1468521   .0787839     1.86   0.063    -.0080005    .3017046
        dum2 |  -.1945577   .0989888    -1.97   0.050    -.3891236    8.29e-06
        dum3 |  -.1095449   .0800796    -1.37   0.172    -.2669441    .0478543
        dum4 |  -.0577883   .0601892    -0.96   0.338    -.1760922    .0605157
        dum5 |   -.046677   .0392599    -1.19   0.235    -.1238438    .0304898
        dum6 |  (dropped)
       _cons |  -2.911467   3.038087    -0.96   0.338    -8.882933        3.06
-------------+----------------------------------------------------------------
     sigma_u |  .79354015
     sigma_e |  .19367229
         rho |   .9437828   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(109, 427) =     3.70            Prob > F = 0.0000


. testnl _b[L_export]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

  (1)  _b[L_export]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

             F(1, 427) =        1.29
              Prob > F =        0.2566

. testnl _b[L_export]*_b[ gdppc] = -_b[ L_gdppc]

  (1)  _b[L_export]*_b[ gdppc] = -_b[ L_gdppc]

             F(1, 427) =        2.15
              Prob > F =        0.1432


. *Prais-Winston for the consistency with the OLS*

. prais export fbh_gdp gdppc distance d_cc d_bor cefta06 vat_bh FEAR1_resid_stage2 d_bh
d_cro d_smk d_mace d_bhcefta d_eu dum2-dum6, rhotype(regress)
note: dum2 dropped because of collinearity

Number of gaps in sample:  109   (gap count includes panel changes)
(note: computations for rho restarted at each gap)

Iteration 0:  rho = 0.0000
Iteration 1:  rho = 0.0103
Iteration 2:  rho = 0.0104
Iteration 3:  rho = 0.0104

Prais-Winsten AR(1) regression -- iterated estimates
```

```
      Source |       SS       df       MS              Number of obs =     550
-------------+------------------------------           F( 18,   531) =  684.85
       Model |  410.808187    18  22.8226771           Prob > F      =  0.0000
    Residual |  17.6956681   531  .033325175           R-squared     =  0.9587
-------------+------------------------------           Adj R-squared =  0.9573
       Total |  428.503855   549  .780517041           Root MSE      =  .18255

------------------------------------------------------------------------------
      export |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   1.015147   .0238293    42.60   0.000     .9683362    1.061959
       gdppc |   .0247987   .0356407     0.70   0.487    -.0452154    .0948128
    distance |  -1.725903   .0514722   -33.53   0.000    -1.827017   -1.624789
        d_cc |     .61775   .0279873    22.07   0.000     .5627705    .6727294
       d_bor |   .3468583   .0289131    12.00   0.000     .2900603    .4036563
     cefta06 |   .0641027   .0380631     1.68   0.093    -.0106701    .1388755
      vat_bh |   .0624789   .0341592     1.83   0.068    -.0046249    .1295827
FEAR1_resi~2 |   .9779957   .0203644    48.02   0.000      .937991       1.018
        d_bh |   1.029388    .028876    35.65   0.000     .9726626    1.086113
       d_cro |   1.375421   .0335316    41.02   0.000      1.30955    1.441292
       d_smk |   1.294777   .0261565    49.50   0.000     1.243394     1.34616
      d_mace |   1.056391   .0249611    42.32   0.000     1.007357    1.105426
    d_bhcefta |  -.1329692   .0645558    -2.06   0.040    -.2597853   -.0061532
        d_eu |    .006138   .0237927     0.26   0.797    -.0406014    .0528773
        dum3 |   .1012843   .0245031     4.13   0.000     .0531494    .1494192
        dum4 |   .1580865   .0258394     6.12   0.000     .1073265    .2088465
        dum5 |   .1997681   .0261823     7.63   0.000     .1483345    .2512018
        dum6 |   .2440061   .0263922     9.25   0.000     .1921602     .295852
       _cons |  -.0090093   .1286162    -0.07   0.944    -.2616683    .2436497
-------------+----------------------------------------------------------------
         rho |   .0103675
------------------------------------------------------------------------------
Durbin-Watson statistic (original)    1.409013
Durbin-Watson statistic (transformed) 1.420182
```

. *Prais-Winston robust se*

```
. prais export fbh_gdp gdppc distance d_cc d_bor cefta06 vat_bh FEAR1_resid_stage2 d_bh
d_cro d_smk d_mace d_bhcefta d_eu dum2-dum6, rhotype(regress) vce(robust)
note: dum2 dropped because of collinearity

Number of gaps in sample:  109   (gap count includes panel changes)
(note: computations for rho restarted at each gap)

Iteration 0:  rho = 0.0000
Iteration 1:  rho = 0.0103
Iteration 2:  rho = 0.0104
Iteration 3:  rho = 0.0104

Prais-Winsten AR(1) regression -- iterated estimates

Linear regression                                      Number of obs =     550
                                                       F( 19,   531) =10289.56
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.9587
                                                       Root MSE      =  .18255

------------------------------------------------------------------------------
             |             Semi-robust
      export |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   1.015147   .0260219    39.01   0.000     .9640289    1.066266
       gdppc |   .0247987    .035435     0.70   0.484    -.0448113    .0944087
    distance |  -1.725903   .0469024   -36.80   0.000     -1.81804   -1.633766
        d_cc |     .61775    .024388    25.33   0.000     .5698411    .6656588
       d_bor |   .3468583   .0221043    15.69   0.000     .3034358    .3902809
     cefta06 |   .0641027   .0305686     2.10   0.036     .0040526    .1241529
      vat_bh |   .0624789   .0293708     2.13   0.034     .0047816    .1201762
FEAR1_resi~2 |   .9779957   .0213088    45.90   0.000     .9361357    1.019856
        d_bh |   1.029388     .03157    32.61   0.000     .9673705    1.091405
       d_cro |   1.375421   .0334118    41.17   0.000     1.309786    1.441057
       d_smk |   1.294777   .0304099    42.58   0.000     1.235038    1.354515
```

```
      d_mace |   1.056391   .0277752    38.03   0.000     1.001829    1.110954
   d_bhcefta |  -.1329692   .0320148    -4.15   0.000    -.1958605    -.070078
        d_eu |    .006138   .0233237     0.26   0.793      -.03968     .051956
        dum3 |   .1012843     .02721     3.72   0.000     .0478318    .1547367
        dum4 |   .1580865   .0264425     5.98   0.000     .1061417    .2100313
        dum5 |   .1997681   .0278518     7.17   0.000      .145055    .2544813
        dum6 |   .2440061   .0330747     7.38   0.000     .1790327    .3089794
       _cons |  -.0090093   .1309221    -0.07   0.945    -.2661981    .2481795
-------------+----------------------------------------------------------------
         rho |   .0103675
------------------------------------------------------------------------------
Durbin-Watson statistic (original)    1.409013
Durbin-Watson statistic (transformed) 1.420182


. lincom cefta06+d_bhcefta

 ( 1)  cefta06 + d_bhcefta = 0

------------------------------------------------------------------------------
      export |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         (1) |  -.0688665   .0350176    -1.97   0.050    -.1376564   -.0000765
------------------------------------------------------------------------------
```

APPENDIX 6.11: Western Balkans and Euro Area 12 countries imports and exports model estimation

*stage one as suggested in the literature, FE model*

```
. xtreg imports fbh_gdp gdppc distance d_cc d_bor cefta06 vat_bh d_bhcefta d_bh d_cro
d_smk d_mace d_eu d_aust d_belg d_den d_gery d_gre d_slo d_esp d_fra d_ita d_nld d_swe
d_uk  dum2-dum6, fe

Fixed-effects (within) regression               Number of obs      =      1452
Group variable: code                            Number of groups   =       244
R-sq:  within  = 0.4935                         Obs per group: min =         1
       between = 0.5525                                        avg =       6.0
       overall = 0.5578                                        max =         6
                                                F(11,1197)         =    106.03
corr(u_i, Xb)  = -0.0456                        Prob > F           =    0.0000
------------------------------------------------------------------------------
     imports |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   1.247565   .1344697     9.28   0.000     .9837426    1.511388
       gdppc |  -.5931258   .0879078    -6.75   0.000    -.7655963   -.4206553
    distance |  (dropped)
        d_cc |  (dropped)
       d_bor |  (dropped)
     cefta06 |   .1586325    .023492     6.75   0.000     .1125424    .2047226
      vat_bh |   .0155101   .0188071     0.82   0.410    -.0213883    .0524086
   d_bhcefta |  -.0177643   .0479363    -0.37   0.711    -.1118129    .0762842
        d_bh |  (dropped)
       d_cro |  (dropped)
       d_smk |  (dropped)
      d_mace |  (dropped)
        d_eu |  -.0462294   .0218737    -2.11   0.035    -.0891444   -.0033143
      d_aust |  (dropped)
      d_belg |  (dropped)
       d_den |  (dropped)
      d_gery |  (dropped)
       d_gre |  (dropped)
       d_slo |  (dropped)
       d_esp |  (dropped)
       d_fra |  (dropped)
       d_ita |  (dropped)
       d_nld |  (dropped)
       d_swe |  (dropped)
        d_uk |  (dropped)
        dum2 |   .0151964    .009729     1.56   0.119    -.0038915    .0342843
        dum3 |   .0280632   .0111929     2.51   0.012     .0061033     .050023
        dum4 |   .0338433   .0132409     2.56   0.011     .0078654    .0598213
        dum5 |   .0388604   .0164804     2.36   0.019     .0065268    .0711939
        dum6 |   .0414992   .0187226     2.22   0.027     .0047665    .0782319
       _cons |  -4.250895    .756464    -5.62   0.000    -5.735037   -2.766752
-------------+----------------------------------------------------------------
     sigma_u |  .72459041
     sigma_e |  .10020306
         rho |  .98123495   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(243, 1197) =    81.07           Prob > F = 0.0000

. xtreg imports fbh_gdp gdppc distance d_cc d_bor cefta06 vat_bh d_bhcefta d_bh d_eu d_cro
d_smk d_mace d_aust d_belg d_den d_gery d_gre d_slo d_esp d_fra d_ita d_nld d_swe d_uk
dum2-dum6, fe vce(robust)

Fixed-effects (within) regression               Number of obs      =      1452
Group variable: code                            Number of groups   =       244
R-sq:  within  = 0.4935                         Obs per group: min =         1
       between = 0.5525                                        avg =       6.0
```

```
      overall = 0.5578                                          max =          6
                                                F(11,1197)          =      84.90
corr(u_i, Xb)  = -0.0456                        Prob > F            =     0.0000
                                   (Std. Err. adjusted for clustering on code)
------------------------------------------------------------------------------
             |               Robust
     imports |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   1.247565   .2108563     5.92   0.000     .8338761    1.661254
       gdppc |  -.5931258   .1465283    -4.05   0.000    -.8806067   -.3056448
    distance |  (dropped)
        d_cc |  (dropped)
       d_bor |  (dropped)
     cefta06 |   .1586325   .0354443     4.48   0.000     .0890926    .2281724
      vat_bh |   .0155101   .0261334     0.59   0.553    -.0357622    .0667825
   d_bhcefta |  -.0177643   .0813663    -0.22   0.827    -.1774007     .141872
        d_bh |  (dropped)
        d_eu |  -.0462294   .0335035    -1.38   0.168    -.1119614    .0195027
       d_cro |  (dropped)
       d_smk |  (dropped)
      d_mace |  (dropped)
      d_aust |  (dropped)
      d_belg |  (dropped)
       d_den |  (dropped)
      d_gery |  (dropped)
       d_gre |  (dropped)
       d_slo |  (dropped)
       d_esp |  (dropped)
       d_fra |  (dropped)
       d_ita |  (dropped)
       d_nld |  (dropped)
       d_swe |  (dropped)
        d_uk |  (dropped)
        dum2 |   .0151964   .0101541     1.50   0.135    -.0047254    .0351182
        dum3 |   .0280632   .0118089     2.38   0.018     .0048946    .0512317
        dum4 |   .0338433   .0154136     2.20   0.028     .0036026    .0640841
        dum5 |   .0388604   .0206127     1.89   0.060    -.0015807    .0793014
        dum6 |   .0414992   .0207994     2.00   0.046     .0006919    .0823066
       _cons |  -4.250895   1.189992    -3.57   0.000    -6.585596   -1.916193
-------------+----------------------------------------------------------------
     sigma_u |  .72459041
     sigma_e |  .10020306
         rho |  .98123495   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

```
. *stage two, fixed effects obtained from stage one*

. predict Fixed_effects, u


. reg Fixed_effects distance d_cc d_bor d_cro d_smk d_mace d_bh d_aust d_belg d_den d_gery
d_gre d_slo d_esp d_fra d_ita d_nld d_swe d_uk

      Source |       SS       df       MS              Number of obs =    1452
-------------+------------------------------           F( 19,  1432) =  143.35
       Model |  493.045794    19  25.9497786           Prob > F      =  0.0000
    Residual |  259.225857  1432  .181023643           R-squared     =  0.6554
-------------+------------------------------           Adj R-squared =  0.6508
       Total |  752.271651  1451  .518450483           Root MSE      =  .42547
------------------------------------------------------------------------------
Fixed_effe~s |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    distance |  -1.365407   .0498523   -27.39   0.000    -1.463199   -1.267616
        d_cc |   .3844955   .0468294     8.21   0.000     .2926338    .4763572
       d_bor |   .1480246   .0368685     4.01   0.000     .0757026    .2203467
       d_cro |   .2109192   .0528596     3.99   0.000     .1072286    .3146097
       d_smk |    .427379   .0528887     8.08   0.000     .3236313    .5311267
      d_mace |   .1908607   .0524989     3.64   0.000     .0878778    .2938436
        d_bh |   .3623414   .0526371     6.88   0.000     .2590873    .4655954
      d_aust |   .6535886   .0653536    10.00   0.000     .5253896    .7817876
```

```
      d_belg |   .7123402   .0661814    10.76   0.000     .5825172    .8421631
       d_den |   .4887348   .0653739     7.48   0.000     .3604959    .6169737
      d_gery |   .8365054    .066313    12.61   0.000     .7064242    .9665865
       d_gre |   .0387352   .0651077     0.59   0.552    -.0889814    .1664519
       d_slo |   .3642187   .0652476     5.58   0.000     .2362276    .4922097
       d_esp |   1.184493   .0650844    18.20   0.000     1.056823    1.312164
       d_fra |   .6845183   .0659146    10.38   0.000     .5552187    .8138179
       d_ita |   .9244397   .0652763    14.16   0.000     .7963923    1.052487
       d_nld |   .7042402   .0658879    10.69   0.000     .5749931    .8334874
       d_swe |   .8432553    .064875    13.00   0.000     .7159951    .9705155
        d_uk |   .6254937   .0660483     9.47   0.000     .4959319    .7550555
       _cons |   3.672443   .1667643    22.02   0.000     3.345315    3.999571
------------------------------------------------------------------------------
```

```
. *stage three, residuals obtained from stage two*

. predict resid_stage2, residuals

. reg imports fbh_gdp gdppc distance d_cc d_bor cefta06 vat_bh resid_stage2 d_bh d_bhcefta
d_cro d_smk d_mace d_eu d_aust d_belg d_den d_gery d_gre d_slo  d_esp d_fra d_ita d_nld
d_swe d_uk dum2-dum6

      Source |       SS       df       MS              Number of obs =    1452
-------------+------------------------------           F( 31,  1420) = 6528.78
       Model |  1713.01546    31  55.2585632           Prob > F      =  0.0000
    Residual |  12.0186611  1420  .008463846           R-squared     =  0.9930
-------------+------------------------------           Adj R-squared =  0.9929
       Total |  1725.03412  1451   1.1888588           Root MSE      =    .092

------------------------------------------------------------------------------
     imports |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   1.247565   .0077239   161.52   0.000     1.232414    1.262717
       gdppc |  -.5931258   .0140701   -42.16   0.000    -.6207262   -.5655254
    distance |  -1.365407   .0121584  -112.30   0.000    -1.389258   -1.341557
        d_cc |   .3844955   .0122811    31.31   0.000     .3604045    .4085865
       d_bor |   .1480246   .0081488    18.17   0.000     .1320397    .1640095
     cefta06 |   .1586325   .0173305     9.15   0.000     .1246365    .1926286
      vat_bh |   .0155101   .0153578     1.01   0.313    -.0146163    .0456366
resid_stage2 |          1   .0065413   152.87   0.000     .9871683    1.012832
        d_bh |   .3623414   .0136038    26.64   0.000     .3356557     .389027
   d_bhcefta |  -.0177643    .031594    -0.56   0.574    -.0797402    .0442116
       d_cro |   .2109192   .0146021    14.44   0.000     .1822752    .2395631
       d_smk |    .427379    .011713    36.49   0.000     .4044024    .4503556
      d_mace |   .1908607   .0113747    16.78   0.000     .1685477    .2131737
        d_eu |  -.0462294   .0094234    -4.91   0.000    -.0647147   -.0277441
      d_aust |   .6535886   .0217858    30.00   0.000     .6108527    .6963245
      d_belg |   .7123401   .0217874    32.69   0.000     .6696011    .7550792
       d_den |   .4887348   .0229905    21.26   0.000     .4436358    .5338339
      d_gery |   .8365054   .0235451    35.53   0.000     .7903184    .8826923
       d_gre |   .0387352    .019465     1.99   0.047     .0005519    .0769185
       d_slo |   .3642187   .0181942    20.02   0.000     .3285282    .3999091
       d_esp |   1.184493   .0210448    56.28   0.000     1.143211    1.225776
       d_fra |   .6845183   .0233065    29.37   0.000     .6387995    .7302372
       d_ita |   .9244397   .0222492    41.55   0.000     .8807949    .9680845
       d_nld |   .7042402   .0226649    31.07   0.000     .6597799    .7487005
       d_swe |   .8432553   .0223746    37.69   0.000     .7993644    .8871462
        d_uk |   .6254937   .0239763    26.09   0.000      .578461    .6725264
        dum2 |   .0151964   .0084108     1.81   0.071    -.0013026    .0316954
        dum3 |   .0280632   .0084219     3.33   0.001     .0115424    .0445839
        dum4 |   .0338433   .0086492     3.91   0.000     .0168768    .0508099
        dum5 |   .0388604   .0087452     4.44   0.000     .0217055    .0560152
        dum6 |   .0414992   .0087875     4.72   0.000     .0242613    .0587372
       _cons |  -.5784516   .0435586   -13.28   0.000    -.6638977   -.4930055
------------------------------------------------------------------------------


. lvr2plot

. estat hettest
```

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of imports

         chi2(1)      =   668.62
         Prob > chi2  =   0.0000

. estat imtest

Cameron & Trivedi's decomposition of IM-test

---------------------------------------------------
              Source |       chi2     df      p
---------------------+-----------------------------
  Heteroskedasticity |     384.96    297    0.0004
            Skewness |      21.10     31    0.9093
            Kurtosis |       1.95      1    0.1628
---------------------+-----------------------------
               Total |     408.00    329    0.0019
---------------------------------------------------

. estat ovtest

Ramsey RESET test using powers of the fitted values of imports
       Ho:  model has no omitted variables
                F(3, 1417) =      4.63
                  Prob > F =      0.0032

. estat vif

    Variable |       VIF       1/VIF
-------------+----------------------
       gdppc |      7.68    0.130148
     fbh_gdp |      4.30    0.232359
        d_uk |      4.28    0.233703
      d_gery |      4.13    0.242340
       d_fra |      4.04    0.247328
       d_den |      3.93    0.254173
       d_nld |      3.82    0.261528
       d_swe |      3.73    0.268358
       d_ita |      3.68    0.271393
      d_belg |      3.53    0.283018
      d_aust |      3.53    0.283060
       d_esp |      3.30    0.303344
       d_cro |      3.02    0.330794
       d_gre |      2.82    0.354582
        d_bh |      2.62    0.381126
       d_slo |      2.46    0.405845
    distance |      2.38    0.419584
        d_eu |      2.31    0.432413
      vat_bh |      2.06    0.486178
        d_cc |      2.05    0.487695
     cefta06 |      2.04    0.489918
       d_smk |      1.95    0.514106
        dum6 |      1.84    0.543499
      d_mace |      1.83    0.545138
        dum5 |      1.82    0.548781
        dum4 |      1.78    0.561029
       d_bor |      1.69    0.590108
        dum3 |      1.69    0.591713
        dum2 |      1.69    0.593274
   d_bhcefta |      1.40    0.712494
resid_stage2 |      1.31    0.763063
-------------+----------------------
    Mean VIF |      2.86


. reg imports  fbh_gdp gdppc distance d_cc d_bor cefta06 vat_bh resid_stage2 d_bh
d_bhcefta d_cro d_smk d_mace d_eu d_aust d_belg d_den d_gery d_gre d_slo d_esp d_fra d_ita
d_nld d_swe d_uk dum2-dum6, vce(robust)
```

```
Linear regression                                      Number of obs =    1452
                                                       F( 31,  1420) =10902.96
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.9930
                                                       Root MSE      =    .092

------------------------------------------------------------------------------
             |               Robust
     imports |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   1.247565   .0089433   139.50   0.000     1.230022    1.265109
       gdppc |  -.5931258     .01848   -32.10   0.000    -.6293768   -.5568748
    distance |  -1.365407   .0095838  -142.47   0.000    -1.384207   -1.346607
        d_cc |   .3844955   .0176535    21.78   0.000     .3498657    .4191252
       d_bor |   .1480246   .0077735    19.04   0.000     .1327758    .1632734
     cefta06 |   .1586325   .0270196     5.87   0.000     .1056298    .2116352
      vat_bh |   .0155101   .0213674     0.73   0.468    -.0264048    .0574251
resid_stage2 |          1   .0080888   123.63   0.000     .9841327    1.015867
        d_bh |   .3623414   .0187841    19.29   0.000     .3254939    .3991889
   d_bhcefta |  -.0177643   .0516344    -0.34   0.731    -.1190523    .0835236
       d_cro |   .2109192    .015918    13.25   0.000     .1796938    .2421445
       d_smk |    .427379   .0185131    23.09   0.000     .3910631    .4636949
      d_mace |   .1908607   .0151918    12.56   0.000       .16106    .2206614
        d_eu |  -.0462294   .0141338    -3.27   0.001    -.0739547    -.018504
      d_aust |   .6535886   .0224123    29.16   0.000     .6096239    .6975533
      d_belg |   .7123401   .0220758    32.27   0.000     .6690354    .7556449
       d_den |   .4887348   .0236907    20.63   0.000     .4422623    .5352074
      d_gery |   .8365054   .0230502    36.29   0.000     .7912893    .8817215
       d_gre |   .0387352   .0185584     2.09   0.037     .0023305      .07514
       d_slo |   .3642187   .0202692    17.97   0.000     .3244578    .4039796
       d_esp |   1.184493   .0206676    57.31   0.000     1.143951    1.225036
       d_fra |   .6845183   .0234311    29.21   0.000     .6385551    .7304816
       d_ita |   .9244397   .0216997    42.60   0.000     .8818728    .9670067
       d_nld |   .7042402   .0227913    30.90   0.000     .6595319    .7489485
       d_swe |   .8432553   .0220422    38.26   0.000     .8000165    .8864941
        d_uk |   .6254937   .0240867    25.97   0.000     .5782443     .672743
        dum2 |   .0151964   .0084951     1.79   0.074    -.0014679    .0318607
        dum3 |   .0280632   .0077827     3.61   0.000     .0127963      .04333
        dum4 |   .0338433   .0083938     4.03   0.000     .0173778    .0503089
        dum5 |   .0388604   .0083194     4.67   0.000     .0225407      .05518
        dum6 |   .0414992   .0103826     4.00   0.000     .0211323    .0618662
       _cons |  -.5784516   .0579297    -9.99   0.000    -.6920886   -.4648146
------------------------------------------------------------------------------


. lincom cefta06+d_bhcefta

 ( 1)  cefta06 + d_bhcefta = 0

------------------------------------------------------------------------------
     imports |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         (1) |   .1408682   .0508852     2.77   0.006     .0410499    .2406865
------------------------------------------------------------------------------

.
. xtserial imports fbh_gdp gdppc distance d_cc d_bor cefta06 vat_bh resid_stage2 d_bh
d_bhcefta d_cro d_smk d_mace d_eu d_aust d_belg d_den d_gery d_gre d_slo  d_esp d_fra
d_ita d_nld d_swe d_uk dum2-dum6

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,     241) =     34.300
           Prob > F =      0.0000
```

. *Model improvements*

. *Testing and accounting for serial correlation*

```
. xtreg imports  fbh_gdp gdppc distance d_cc d_bor cefta06 vat_bh d_bh d_bhcefta d_cro
d_smk d_mace d_eu dum2-dum6, fe
```

```
Fixed-effects (within) regression               Number of obs      =      1452
Group variable: code                            Number of groups   =       244
R-sq:  within  = 0.4935                         Obs per group: min =         1
       between = 0.5525                                        avg =       6.0
       overall = 0.5578                                        max =         6
                                                F(11,1197)         =    106.03
corr(u_i, Xb)  = -0.0456                        Prob > F           =    0.0000
------------------------------------------------------------------------------
     imports |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   1.247565   .1344697     9.28   0.000     .9837426    1.511388
       gdppc |  -.5931258   .0879078    -6.75   0.000    -.7655963   -.4206553
    distance |  (dropped)
        d_cc |  (dropped)
       d_bor |  (dropped)
     cefta06 |   .1586325    .023492     6.75   0.000     .1125424    .2047226
      vat_bh |   .0155101   .0188071     0.82   0.410    -.0213883    .0524086
        d_bh |  (dropped)
   d_bhcefta |  -.0177643   .0479363    -0.37   0.711    -.1118129    .0762842
       d_cro |  (dropped)
       d_smk |  (dropped)
      d_mace |  (dropped)
        d_eu |  -.0462294   .0218737    -2.11   0.035    -.0891444   -.0033143
        dum2 |   .0151964    .009729     1.56   0.119    -.0038915    .0342843
        dum3 |   .0280632   .0111929     2.51   0.012     .0061033     .050023
        dum4 |   .0338433   .0132409     2.56   0.011     .0078654    .0598213
        dum5 |   .0388604   .0164804     2.36   0.019     .0065268    .0711939
        dum6 |   .0414992   .0187226     2.22   0.027     .0047665    .0782319
       _cons |  -4.250895    .756464    -5.62   0.000    -5.735037   -2.766752
-------------+----------------------------------------------------------------
     sigma_u |  .72459041
     sigma_e |  .10020306
         rho |  .98123495   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(243, 1197) =   125.71           Prob > F = 0.0000
```

```
. xtserial imports fbh_gdp gdppc distance d_cc d_bor cefta06 vat_bh d_bh d_bhcefta d_cro
d_smk d_mace d_eu dum2-dum6

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,     241) =     34.300
           Prob > F =      0.0000
```

. *testing the lagged model for CFR*

```
. generate float L_imports = l.imports
(244 missing values generated)

. generate float L_fbh_gdp = l.fbh_gdp
(244 missing values generated)

. generate float L_gdppc = l.gdppc
(244 missing values generated)
```

. *1)OLS*

```
. xtreg  imports L_imports fbh_gdp L_fbh_gdp gdppc L_gdppc cefta06 vat_bh d_bh d_bhcefta
d_cro d_smk d_mace d_eu dum2-dum6
note: dum2 dropped because of collinearity

Random-effects GLS regression                   Number of obs      =      1208
Group variable: code                            Number of groups   =       242
R-sq:  within  = 0.3336                         Obs per group: min =         4
       between = 0.9989                                        avg =       5.0
       overall = 0.9900                                        max =         5
Random effects u_i ~ Gaussian                   Wald chi2(17)      = 118385.31
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000
```

```
------------------------------------------------------------------------------
     imports |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   L_imports |   .9794462   .0047362   206.80   0.000     .9701634    .9887291
     fbh_gdp |   .0032997   .2627109     0.01   0.990    -.5116042    .5182036
   L_fbh_gdp |  -.0068839   .2598724    -0.03   0.979    -.5162246    .5024567
       gdppc |  -.8955634   .1957506    -4.58   0.000    -1.279227   -.5118993
     L_gdppc |   .8422653   .1906563     4.42   0.000     .4685858    1.215945
     cefta06 |  -.0305034   .0202458    -1.51   0.132    -.0701845    .0091776
      vat_bh |  -.0444268   .0196476    -2.26   0.024    -.0829353   -.0059183
        d_bh |   .0497205   .0179952     2.76   0.006     .0144505    .0849905
   d_bhcefta |  -.0287535   .0373204    -0.77   0.441    -.1019002    .0443931
       d_cro |  -.0130407   .0118638    -1.10   0.272    -.0362933    .0102119
       d_smk |   .0211807   .0137025     1.55   0.122    -.0056757     .048037
      d_mace |   .0167057   .0136268     1.23   0.220    -.0100023    .0434137
        d_eu |  -.0563026   .0111313    -5.06   0.000    -.0781195   -.0344857
        dum3 |   .0018191   .0098908     0.18   0.854    -.0175665    .0212047
        dum4 |   .0194836   .0101737     1.92   0.055    -.0004564    .0394237
        dum5 |   .0084357   .0103783     0.81   0.416    -.0119054    .0287768
        dum6 |  -.0101257   .0103703    -0.98   0.329     -.030451    .0101997
       _cons |   .1726543   .0469587     3.68   0.000     .0806169    .2646917
-------------+----------------------------------------------------------------
     sigma_u |          0
     sigma_e |  .09301138
         rho |          0   (fraction of variance due to u_i)
------------------------------------------------------------------------------


. testnl _b[L_imports]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

  (1)  _b[L_imports]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

               chi2(1) =        0.20
           Prob > chi2 =        0.6570

. testnl _b[L_imports]*_b[ gdppc] = -_b[ L_gdppc]

  (1)  _b[L_imports]*_b[ gdppc] = -_b[ L_gdppc]

               chi2(1) =       15.58
           Prob > chi2 =        0.0001


. *2)FE*

. xtreg imports L_imports fbh_gdp L_fbh_gdp gdppc L_gdppc cefta06 vat_bh d_bh d_bhcefta
d_cro d_smk d_mace d_eu dum2-dum6, fe

Fixed-effects (within) regression               Number of obs      =      1208
Group variable: code                            Number of groups   =       242
R-sq:  within  = 0.4790                         Obs per group: min =         4
       between = 0.7340                                        avg =       5.0
       overall = 0.7318                                        max =         5
                                                F(13,953)          =     67.40
corr(u_i, Xb)  = -0.1875                        Prob > F           =    0.0000
------------------------------------------------------------------------------
     imports |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   L_imports |   .2623723   .0343364     7.64   0.000     .1949885    .3297561
     fbh_gdp |   1.175925   .2963239     3.97   0.000     .5944019    1.757448
   L_fbh_gdp |   .0058588   .3133464     0.02   0.985    -.6090698    .6207873
       gdppc |  -.8470439   .1885415    -4.49   0.000    -1.217048   -.4770395
     L_gdppc |   .1953055   .2280212     0.86   0.392     -.252176    .6427871
     cefta06 |   .0825602   .0255558     3.23   0.001     .0324081    .1327123
      vat_bh |  -.0163956    .019664    -0.83   0.405    -.0549853    .0221942
        d_bh |  (dropped)
   d_bhcefta |  -.0366501   .0498078    -0.74   0.462    -.1343956    .0610955
       d_cro |  (dropped)
       d_smk |  (dropped)
      d_mace |  (dropped)
```

```
        d_eu |  -.1924654   .0355164    -5.42   0.000    -.2621648   -.1227659
        dum2 |  (dropped)
        dum3 |   .0019884   .0097916     0.20   0.839    -.0172273    .0212041
        dum4 |   .0065774   .0122995     0.53   0.593    -.0175598    .0307147
        dum5 |   .0033299   .0161599     0.21   0.837    -.0283832    .0350429
        dum6 |  -.0065313   .0209176    -0.31   0.755    -.0475811    .0345186
       _cons |  -4.425665   1.056992    -4.19   0.000    -6.499966   -2.351364
-------------+----------------------------------------------------------------
     sigma_u |  .56430215
     sigma_e |  .09301138
         rho |  .97355111   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(241, 953) =     2.76           Prob > F = 0.0000


. testnl _b[L_imports]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

  (1)  _b[L_imports]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

             F(1, 953) =        1.50
              Prob > F =        0.2213

. testnl _b[L_imports]*_b[ gdppc] = -_b[ L_gdppc]

  (1)  _b[L_imports]*_b[ gdppc] = -_b[ L_gdppc]

             F(1, 953) =        0.02
              Prob > F =        0.8859
```

. *first stage: AR1 correction*

```
. xtregar imports fbh_gdp gdppc cefta06 vat_bh d_bhcefta d_eu dum2-dum6,fe rhotype(dw) lbi

FE (within) regression with AR(1) disturbances  Number of obs      =      1208
Group variable: code                            Number of groups   =       242
R-sq:  within  = 0.2663                         Obs per group: min =         4
       between = 0.5878                                        avg =       5.0
       overall = 0.5859                                        max =         5
                                                F(10,956)          =     34.69
corr(u_i, Xb)  = -0.1480                        Prob > F           =    0.0000
------------------------------------------------------------------------------
     imports |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   1.290122   .2036646     6.33   0.000      .890441    1.689804
       gdppc |  -.9693706   .1297613    -7.47   0.000     -1.22402   -.7147206
     cefta06 |   .0928121   .0290097     3.20   0.001     .0358821    .1497422
      vat_bh |  -.0376386   .0243245    -1.55   0.122    -.0853743     .010097
   d_bhcefta |  -.0099125   .0622714    -0.16   0.874    -.1321169    .1122918
        d_eu |  -.1908301     .03185    -5.99   0.000    -.2533342    -.128326
        dum2 |  -.0071246   .0132328    -0.54   0.590    -.0330934    .0188441
        dum3 |  -.0089524   .0145727    -0.61   0.539    -.0375505    .0196458
        dum4 |   -.000678   .0122576    -0.06   0.956    -.0247329     .023377
        dum5 |   .0035541   .0080708     0.44   0.660    -.0122844    .0193926
        dum6 |  (dropped)
       _cons |  -4.221057   .7324953    -5.76   0.000    -5.658541   -2.783572
-------------+----------------------------------------------------------------
      rho_ar |   .3763721
     sigma_u |   .6989626
     sigma_e |  .09336042
     rho_fov |  .98247178   (fraction of variance because of u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(241,956) =    97.13            Prob > F = 0.0000
modified Bhargava et al. Durbin-Watson = 1.2694455
Baltagi-Wu LBI = 1.7654684
```

. *AR1 correction with two steps*

```
. xtregar imports fbh_gdp gdppc cefta06 vat_bh d_bhcefta d_eu dum2-dum6,fe rhotype(dw)
twostep lbi
```

```
FE (within) regression with AR(1) disturbances  Number of obs      =      1208
Group variable: code                            Number of groups   =       242
R-sq:  within  = 0.2723                         Obs per group: min =         4
       between = 0.5865                                        avg =       5.0
       overall = 0.5846                                        max =         5
                                                F(10,956)          =     35.78
corr(u_i, Xb)  = -0.1577                        Prob > F           =    0.0000
------------------------------------------------------------------------------
     imports |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   1.305534   .2022053     6.46   0.000     .9087161    1.702351
       gdppc |  -.9608834   .1285313    -7.48   0.000    -1.213119   -.7086474
     cefta06 |   .0937444   .0288839     3.25   0.001     .0370613    .1504275
      vat_bh |  -.0362294     .02418    -1.50   0.134    -.0836814    .0112227
   d_bhcefta |  -.0112163   .0618888    -0.18   0.856    -.1326699    .1102373
        d_eu |  -.1918213   .0320329    -5.99   0.000    -.2546842   -.1289583
        dum2 |  -.0068713   .0133825    -0.51   0.608    -.0331338    .0193912
        dum3 |  -.0085232   .0146313    -0.58   0.560    -.0372363      .02019
        dum4 |  -.0004738   .0122691    -0.04   0.969    -.0245512    .0236036
        dum5 |   .0035998   .0080938     0.44   0.657    -.0122838    .0194833
        dum6 |  (dropped)
       _cons |  -4.313093   .7399878    -5.83   0.000    -5.765281   -2.860905
-------------+----------------------------------------------------------------
      rho_ar |  .36527723
     sigma_u |  .70109448
     sigma_e |  .09325799
     rho_fov |  .98261391   (fraction of variance because of u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(241,956) =   100.82            Prob > F = 0.0000
modified Bhargava et al. Durbin-Watson = 1.2694455
Baltagi-Wu LBI = 1.7654684
```

. *FE from AR1 correction with two steps*

```
. predict FEAR1_correct, u
(244 missing values generated)
(244 missing values generated)
```

. *second stage*

```
. reg FEAR1_correct distance d_cc d_bor d_cro d_smk d_mace d_bh d_aust d_belg d_den d_gery
d_gre d_slo d_esp d_fra d_ita d_nld d_swe d_uk

      Source |       SS       df       MS              Number of obs =    1208
-------------+------------------------------           F( 19,  1188) =   80.55
       Model |  330.377875    19  17.3883092           Prob > F      =  0.0000
    Residual |  256.439423  1188    .2158581           R-squared     =  0.5630
-------------+------------------------------           Adj R-squared =  0.5560
       Total |  586.817297  1207  .486178374           Root MSE      =  .46461
------------------------------------------------------------------------------
FEAR1_corr~t |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    distance |  -1.350942   .0596473   -22.65   0.000    -1.467968   -1.233916
        d_cc |   .2187878   .0560193     3.91   0.000     .1088799    .3286956
       d_bor |   .1070345   .0441057     2.43   0.015     .0205007    .1935682
       d_cro |  -.0244378   .0632314    -0.39   0.699    -.1484954    .0996199
       d_smk |   .3726841   .0632661     5.89   0.000     .2485584    .4968098
      d_mace |   .1816166   .0627997     2.89   0.004     .0584061    .3048272
        d_bh |   .3883775   .0629651     6.17   0.000     .2648423    .5119126
      d_aust |   .3122805   .0781768     3.99   0.000     .1589006    .4656603
      d_belg |   .3826535   .0791674     4.83   0.000     .2273301     .537977
       d_den |   .1065289   .0782012     1.36   0.173    -.0468988    .2599567
      d_gery |   .5037935   .0793245     6.35   0.000     .3481619    .6594252
       d_gre |  -.2449682   .0778825    -3.15   0.002    -.3977708   -.0921655
       d_slo |   .1579437   .0780499     2.02   0.043     .0048128    .3110747
       d_esp |   .8630828   .0778546    11.09   0.000     .7103349    1.015831
       d_fra |   .3387926   .0788479     4.30   0.000     .1840959    .4934892
       d_ita |    .603301   .0780841     7.73   0.000     .4501028    .7564992
```

```
      d_nld |   .3474387   .0788162     4.41   0.000     .1928042    .5020731
      d_swe |    .498625   .0780726     6.39   0.000     .3454495    .6518004
       d_uk |   .2671402   .0795009     3.36   0.001     .1111624     .423118
      _cons |   3.852716   .1995277    19.31   0.000      3.46125    4.244182
------------------------------------------------------------------------------


. predict FEAR1_resid_stage2, residuals
(244 missing values generated)
```

### ***Western Balkans and Euro Area 12 countries exports  model estimation***

```
*stage one as suggested in the literature, FE model*

. xtreg export fbh_gdp gdppc distance d_cc d_bor cefta06 vat_bh d_bh d_cro d_smk d_mace
d_bhcefta d_eu d_aust d_belg d_den d_gery d_gre d_slo d_esp d_fra d_ita d_nld d_swe d_uk
dum2-dum6, fe

Fixed-effects (within) regression               Number of obs      =      1452
Group variable: code                            Number of groups   =       244
R-sq:  within  = 0.4478                         Obs per group: min =         1
       between = 0.4556                                        avg =       6.0
       overall = 0.4555                                        max =         6
                                                F(11,1197)         =     88.24
corr(u_i, Xb)  = -0.5858                        Prob > F           =    0.0000
------------------------------------------------------------------------------
      export |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |    2.42973   .2076527    11.70   0.000     2.022327    2.837134
       gdppc |   -.690976   .1357502    -5.09   0.000    -.9573108   -.4246411
    distance |  (dropped)
        d_cc |  (dropped)
       d_bor |  (dropped)
     cefta06 |    .008792   .0362771     0.24   0.809    -.0623818    .0799659
      vat_bh |   .1768499   .0290425     6.09   0.000       .11987    .2338297
        d_bh |  (dropped)
       d_cro |  (dropped)
       d_smk |  (dropped)
      d_mace |  (dropped)
   d_bhcefta |  -.1734924   .0740249    -2.34   0.019    -.3187254   -.0282594
        d_eu |   .1028151   .0337781     3.04   0.002     .0365443     .169086
      d_aust |  (dropped)
      d_belg |  (dropped)
       d_den |  (dropped)
      d_gery |  (dropped)
       d_gre |  (dropped)
       d_slo |  (dropped)
       d_esp |  (dropped)
       d_fra |  (dropped)
       d_ita |  (dropped)
       d_nld |  (dropped)
       d_swe |  (dropped)
        d_uk |  (dropped)
        dum2 |  -.0126597   .0150239    -0.84   0.400    -.0421359    .0168164
        dum3 |   .0002123   .0172844     0.01   0.990    -.0336988    .0341234
        dum4 |  -.0084131    .020447    -0.41   0.681    -.0485292    .0317029
        dum5 |  -.0401479   .0254495    -1.58   0.115    -.0900786    .0097827
        dum6 |  -.0597415    .028912    -2.07   0.039    -.1164654   -.0030175
       _cons |  -11.40057   1.168157    -9.76   0.000    -13.69243   -9.108703
-------------+----------------------------------------------------------------
     sigma_u |  1.2250503
     sigma_e |  .15473697
         rho |  .98429615   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(243, 1197) =    32.58           Prob > F = 0.0000
```

```
. xtreg export fbh_gdp gdppc distance d_cc d_bor cefta06 vat_bh d_bh d_cro d_smk d_mace
d_bhcefta d_eu d_aust d_belg d_den d_gery d_gre d_slo d_esp d_fra d_ita d_nld d_swe d_uk
dum2-dum6, fe vce(robust)

Fixed-effects (within) regression               Number of obs      =      1452
Group variable: code                            Number of groups   =       244
R-sq:  within  = 0.4478                         Obs per group: min =         1
       between = 0.4556                                        avg =       6.0
       overall = 0.4555                                        max =         6
                                                F(11,1197)         =     79.60
corr(u_i, Xb)  = -0.5858                        Prob > F           =    0.0000
                                   (Std. Err. adjusted for clustering on code)
------------------------------------------------------------------------------
             |               Robust
      export |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |    2.42973    .336708     7.22   0.000     1.769127    3.090334
       gdppc |   -.690976   .2077029    -3.33   0.001    -1.098478   -.2834738
    distance |  (dropped)
        d_cc |  (dropped)
       d_bor |  (dropped)
     cefta06 |    .008792   .0512226     0.17   0.864    -.0917039     .109288
      vat_bh |   .1768499   .0473002     3.74   0.000     .0840493    .2696505
        d_bh |  (dropped)
       d_cro |  (dropped)
       d_smk |  (dropped)
      d_mace |  (dropped)
   d_bhcefta |  -.1734924   .0653285    -2.66   0.008    -.3016635   -.0453213
        d_eu |   .1028151   .0503331     2.04   0.041     .0040642     .201566
      d_aust |  (dropped)
      d_belg |  (dropped)
       d_den |  (dropped)
      d_gery |  (dropped)
       d_gre |  (dropped)
       d_slo |  (dropped)
       d_esp |  (dropped)
       d_fra |  (dropped)
       d_ita |  (dropped)
       d_nld |  (dropped)
       d_swe |  (dropped)
        d_uk |  (dropped)
        dum2 |  -.0126597   .0161143    -0.79   0.432    -.0442751    .0189557
        dum3 |   .0002123   .0179518     0.01   0.991    -.0350082    .0354328
        dum4 |  -.0084131   .0221961    -0.38   0.705    -.0519607    .0351345
        dum5 |  -.0401479   .0302981    -1.33   0.185    -.0995913    .0192954
        dum6 |  -.0597415   .0318832    -1.87   0.061    -.1222947    .0028118
       _cons |  -11.40057   1.914982    -5.95   0.000    -15.15766   -7.643472
-------------+----------------------------------------------------------------
     sigma_u |  1.2250503
     sigma_e |  .15473697
         rho |  .98429615   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

. *stage two, fixed effects obtained from stage one*

```
. predict Fixed_effects, u


. reg Fixed_effects distance d_cc d_bor d_bh d_cro d_smk d_mace d_aust d_belg d_den d_gery
d_esp d_fra d_ita d_nld d_swe d_uk

      Source |       SS       df       MS              Number of obs =    1452
-------------+------------------------------           F( 17,  1434) =  244.40
       Model |   1615.8368    17  95.0492234           Prob > F      =  0.0000
    Residual |  557.696737  1434  .388909858           R-squared     =  0.7434
-------------+------------------------------           Adj R-squared =  0.7404
       Total |  2173.53353  1451  1.49795557           Root MSE      =  .62363
------------------------------------------------------------------------------
Fixed_effe~s |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
```

```
    distance |  -2.238063   .0722623   -30.97   0.000    -2.379814   -2.096312
        d_cc |   1.572901   .0674605    23.32   0.000     1.440569    1.705233
       d_bor |   .2034627   .0540181     3.77   0.000     .0974997    .3094256
        d_bh |   .6101097   .0670251     9.10   0.000     .4786318    .7415875
       d_cro |   .4725134   .0673146     7.02   0.000     .3404678     .604559
       d_smk |    .783342   .0672567    11.65   0.000     .6514099    .9152741
      d_mace |   .7759275   .0667189    11.63   0.000     .6450504    .9068046
      d_aust |   .7957052   .0868054     9.17   0.000      .625426    .9659844
      d_belg |   .9550798   .0880492    10.85   0.000     .7823607    1.127799
       d_den |   .7039609   .0868997     8.10   0.000     .5334968    .8744249
      d_gery |   .4884803   .0881644     5.54   0.000     .3155352    .6614254
       d_esp |   1.194318   .0864401    13.82   0.000     1.024755     1.36388
       d_fra |    .291407   .0875811     3.33   0.001     .1196063    .4632077
       d_ita |   .7684887    .086634     8.87   0.000     .5985458    .9384316
       d_nld |   .9542726   .0876473    10.89   0.000      .782342    1.126203
       d_swe |   1.235196   .0861094    14.34   0.000     1.066282     1.40411
        d_uk |   .1386433    .088034     1.57   0.116    -.0340458    .3113324
       _cons |   6.140743   .2385621    25.74   0.000     5.672775    6.608712
------------------------------------------------------------------------------
```

. *stage three, residuals obtained from stage two*

```
. predict resid_stage2, residuals

. reg export fbh_gdp gdppc distance d_cc d_bor cefta06 vat_bh resid_stage2 d_bh d_cro
d_smk d_mace d_bhcefta d_eu d_aust d_belg d_den d_gery d_gre d_slo  d_esp d_fra d_ita
d_nld d_swe d_uk  dum2-dum6


      Source |       SS       df       MS              Number of obs =    1452
-------------+------------------------------           F( 31,  1420) = 4228.82
       Model |   2645.9065    31  85.3518224           Prob > F      =  0.0000
    Residual |  28.6604059  1420  .020183384           R-squared     =  0.9893
-------------+------------------------------           Adj R-squared =  0.9891
       Total |   2674.5669  1451  1.84325769           Root MSE      =  .14207
------------------------------------------------------------------------------
      export |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |    2.42973   .0184247   131.87   0.000     2.393588    2.465873
       gdppc |   -.690976   .0207339   -33.33   0.000    -.7316483   -.6503037
    distance |  -2.238063   .0219515  -101.95   0.000    -2.281124   -2.195002
        d_cc |   1.572901   .0202986    77.49   0.000     1.533082    1.612719
       d_bor |   .2034627   .0126766    16.05   0.000     .1785957    .2283296
     cefta06 |    .008792   .0264467     0.33   0.740    -.0430868    .0606709
      vat_bh |   .1768499   .0237178     7.46   0.000     .1303243    .2233755
resid_stage2 |          1   .0103192    96.91   0.000     .9797576    1.020242
        d_bh |   .6101097   .0213812    28.53   0.000     .5681676    .6520517
       d_cro |   .4725134   .0236095    20.01   0.000        .4262    .5188267
       d_smk |    .783342   .0188769    41.50   0.000     .7463124    .8203716
      d_mace |   .7759275   .0178947    43.36   0.000     .7408247    .8110303
   d_bhcefta |  -.1734924   .0487537    -3.56   0.000    -.2691295   -.0778553
        d_eu |   .1028151   .0145752     7.05   0.000     .0742238    .1314064
      d_aust |   .7957052   .0355484    22.38   0.000     .7259722    .8654382
      d_belg |   .9550798   .0362318    26.36   0.000     .8840062    1.026153
       d_den |   .7039609   .0372056    18.92   0.000      .630977    .7769447
      d_gery |   .4884803    .041246    11.84   0.000     .4075707    .5693899
       d_gre |  -1.60e-08    .030813    -0.00   1.000     -.060444    .0604439
       d_slo |   1.76e-08   .0323753     0.00   1.000    -.0635086    .0635087
       d_esp |   1.194318   .0345605    34.56   0.000     1.126523    1.262113
       d_fra |    .291407   .0404046     7.21   0.000     .2121479    .3706662
       d_ita |   .7684887   .0377788    20.34   0.000     .6943804     .842597
       d_nld |   .9542726   .0378938    25.18   0.000     .8799388    1.028606
       d_swe |   1.235196   .0358373    34.47   0.000     1.164896    1.305496
        d_uk |   .1386433   .0416711     3.33   0.001     .0568998    .2203868
        dum2 |  -.0126597   .0129908    -0.97   0.330     -.038143    .0128235
        dum3 |   .0002123   .0130195     0.02   0.987    -.0253271    .0257518
        dum4 |  -.0084131   .0133769    -0.63   0.529    -.0346538    .0178275
        dum5 |  -.0401479   .0135548    -2.96   0.003    -.0667376   -.0135583
        dum6 |  -.0597415   .0136429    -4.38   0.000    -.0865039    -.032979
       _cons |  -5.259823   .0751329   -70.01   0.000    -5.407207    -5.11244
```

```
. lvr2plot

. estat hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of export

         chi2(1)      =   995.16
         Prob > chi2  =   0.0000

. estat imtest

Cameron & Trivedi's decomposition of IM-test

---------------------------------------------------
              Source |       chi2     df      p
---------------------+-----------------------------
  Heteroskedasticity |     361.44    297    0.0062
            Skewness |      26.52     31    0.6962
            Kurtosis |       3.83      1    0.0503
---------------------+-----------------------------
               Total |     391.79    329    0.0098
---------------------------------------------------

. estat ovtest

Ramsey RESET test using powers of the fitted values of export
       Ho:  model has no omitted variables
                 F(3, 1417) =      2.73
                   Prob > F =      0.0424

. estat vif

    Variable |       VIF       1/VIF
-------------+----------------------
     fbh_gdp |     10.27    0.097377
       gdppc |      7.00    0.142922
        d_uk |      5.42    0.184495
      d_gery |      5.31    0.188317
       d_fra |      5.10    0.196242
       d_nld |      4.48    0.223109
       d_ita |      4.45    0.224469
       d_den |      4.32    0.231439
      d_belg |      4.10    0.244047
       d_swe |      4.01    0.249450
      d_aust |      3.94    0.253521
       d_esp |      3.73    0.268221
       d_cro |      3.31    0.301743
       d_slo |      3.27    0.305650
    distance |      3.26    0.306951
       d_gre |      2.96    0.337431
resid_stage2 |      2.94    0.339866
        d_bh |      2.72    0.367917
        d_cc |      2.35    0.425712
        d_eu |      2.32    0.431033
       d_smk |      2.12    0.472010
      vat_bh |      2.06    0.486107
     cefta06 |      1.99    0.501679
      d_mace |      1.90    0.525250
        dum6 |      1.86    0.537708
        dum5 |      1.84    0.544717
        dum4 |      1.79    0.559303
       d_bor |      1.72    0.581476
        dum3 |      1.69    0.590437
        dum2 |      1.69    0.593045
   d_bhcefta |      1.40    0.713511
-------------+----------------------
    Mean VIF |      3.40
```

```
. reg export fbh_gdp gdppc distance d_cc d_bor cefta06 vat_bh resid_stage2 d_bh d_cro
d_smk d_mace d_bhcefta d_eu d_aust d_belg d_den d_gery d_gre d_slo d_esp d_fra d_ita d_nld
d_swe d_uk dum2-dum6, vce(robust)

Linear regression                                      Number of obs =    1452
                                                       F( 31,  1420) = 7373.82
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.9893
                                                       Root MSE      =  .14207

------------------------------------------------------------------------------
             |               Robust
      export |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |    2.42973    .017116   141.96   0.000     2.396155    2.463306
       gdppc |   -.690976     .02513   -27.50   0.000    -.7402719   -.6416801
    distance |  -2.238063   .0193658  -115.57   0.000    -2.276052   -2.200074
        d_cc |   1.572901   .0236625    66.47   0.000     1.526484    1.619318
       d_bor |   .2034627   .0097573    20.85   0.000     .1843224    .2226029
     cefta06 |    .008792   .0307428     0.29   0.775    -.0515141    .0690982
      vat_bh |   .1768499   .0347435     5.09   0.000     .1086958    .2450039
resid_stage2 |          1   .0107829    92.74   0.000     .9788478    1.021152
        d_bh |   .6101097   .0369239    16.52   0.000     .5376784    .6825409
       d_cro |   .4725134   .0284516    16.61   0.000     .4167018     .528325
       d_smk |    .783342    .028522    27.46   0.000     .7273922    .8392918
      d_mace |   .7759275   .0284418    27.28   0.000     .7201351    .8317198
   d_bhcefta |  -.1734924   .0359732    -4.82   0.000    -.2440587   -.1029262
        d_eu |   .1028151   .0197388     5.21   0.000     .0640949    .1415354
      d_aust |   .7957052   .0345949    23.00   0.000     .7278425    .8635679
      d_belg |   .9550798   .0346005    27.60   0.000     .8872062    1.022953
       d_den |   .7039609   .0369562    19.05   0.000     .6314662    .7764555
      d_gery |   .4884803   .0364998    13.38   0.000      .416881    .5600796
       d_gre |  -1.60e-08   .0323638    -0.00   1.000     -.063486    .0634859
       d_slo |   1.76e-08   .0296555     0.00   1.000    -.0581733    .0581733
       d_esp |   1.194318   .0319007    37.44   0.000      1.13174    1.256895
       d_fra |    .291407   .0364339     8.00   0.000     .2199369    .3628771
       d_ita |   .7684887   .0339068    22.66   0.000      .701976    .8350014
       d_nld |   .9542726   .0360217    26.49   0.000     .8836113    1.024934
       d_swe |   1.235196   .0349814    35.31   0.000     1.166575    1.303817
        d_uk |   .1386433   .0379573     3.65   0.000     .0641849    .2131017
        dum2 |  -.0126597   .0145174    -0.87   0.383    -.0411377    .0158182
        dum3 |   .0002123   .0140623     0.02   0.988    -.0273728    .0277974
        dum4 |  -.0084131   .0130192    -0.65   0.518     -.033952    .0171257
        dum5 |  -.0401479   .0132833    -3.02   0.003     -.066205   -.0140909
        dum6 |  -.0597415   .0162326    -3.68   0.000    -.0915839    -.027899
       _cons |  -5.259823   .0977622   -53.80   0.000    -5.451597   -5.068049
------------------------------------------------------------------------------


. lincom cefta06+d_bhcefta

 ( 1)  cefta06 + d_bhcefta = 0

------------------------------------------------------------------------------
      export |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         (1) |  -.1647004   .0325334    -5.06   0.000     -.228519   -.1008818
------------------------------------------------------------------------------


. xtserial export fbh_gdp gdppc distance d_cc d_bor cefta06 vat_bh resid_stage2 d_bh d_cro
d_smk d_mace d_bhcefta d_eu d_aust d_belg d_den d_gery d_gre d_slo  d_esp d_fra d_ita
d_nld d_swe d_uk dum2-dum6

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,     241) =     12.569
           Prob > F =      0.0005


. *Model improvements*
. *Testing and accounting for serial correlation*
```

```
. xtreg export fbh_gdp gdppc distance d_cc d_bor cefta06 vat_bh d_bh d_cro d_smk d_mace
d_bhcefta d_eu d_aust d_belg d_den d_gery d_gre d_slo d_esp d_fra d_ita d_nld d_swe d_uk
dum2-dum6, fe

Fixed-effects (within) regression               Number of obs      =      1452
Group variable: code                            Number of groups   =       244
R-sq:  within  = 0.4478                         Obs per group: min =         1
       between = 0.4556                                        avg =       6.0
       overall = 0.4555                                        max =         6
                                                F(11,1197)         =     88.24
corr(u_i, Xb)  = -0.5858                        Prob > F           =    0.0000
------------------------------------------------------------------------------
      export |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |    2.42973   .2076527    11.70   0.000     2.022327    2.837134
       gdppc |   -.690976   .1357502    -5.09   0.000    -.9573108   -.4246411
    distance |  (dropped)
        d_cc |  (dropped)
       d_bor |  (dropped)
     cefta06 |    .008792   .0362771     0.24   0.809    -.0623818    .0799659
      vat_bh |   .1768499   .0290425     6.09   0.000       .11987    .2338297
        d_bh |  (dropped)
       d_cro |  (dropped)
       d_smk |  (dropped)
      d_mace |  (dropped)
   d_bhcefta |  -.1734924   .0740249    -2.34   0.019    -.3187254   -.0282594
        d_eu |   .1028151   .0337781     3.04   0.002     .0365443     .169086
      d_aust |  (dropped)
      d_belg |  (dropped)
       d_den |  (dropped)
      d_gery |  (dropped)
       d_gre |  (dropped)
       d_slo |  (dropped)
       d_esp |  (dropped)
       d_fra |  (dropped)
       d_ita |  (dropped)
       d_nld |  (dropped)
       d_swe |  (dropped)
        d_uk |  (dropped)
        dum2 |  -.0126597   .0150239    -0.84   0.400    -.0421359    .0168164
        dum3 |   .0002123   .0172844     0.01   0.990    -.0336988    .0341234
        dum4 |  -.0084131    .020447    -0.41   0.681    -.0485292    .0317029
        dum5 |  -.0401479   .0254495    -1.58   0.115    -.0900786    .0097827
        dum6 |  -.0597415    .028912    -2.07   0.039    -.1164654   -.0030175
       _cons |  -11.40057   1.168157    -9.76   0.000    -13.69243   -9.108703
-------------+----------------------------------------------------------------
     sigma_u |  1.2250503
     sigma_e |  .15473697
         rho |  .98429615   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(243, 1197) =    32.58           Prob > F = 0.0000


. xtserial export fbh_gdp gdppc distance d_cc d_bor cefta06 vat_bh d_bh d_cro d_smk d_mace
d_bhcefta d_eu d_aust d_belg d_den d_gery d_gre d_slo d_esp d_fra d_ita d_nld d_swe d_uk
dum2-dum6

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,     241) =     12.569
           Prob > F =      0.0005
```

. *testing the lagged model for CFR*

```
. generate float L_export = l.export
(244 missing values generated)

. generate float L_fbh_gdp = l.fbh_gdp
(244 missing values generated)
```

```
. generate float L_gdppc = l.gdppc
(244 missing values generated)
```

. *1)OLS*

```
. xtreg  export L_export fbh_gdp L_fbh_gdp gdppc L_gdppc cefta06 vat_bh d_bh d_bhcefta
d_eu dum2-dum6
note: dum6 dropped because of collinearity

Random-effects GLS regression                   Number of obs      =      1208
Group variable: code                            Number of groups   =       242
R-sq:  within  = 0.2654                         Obs per group: min =         4
       between = 0.9980                                        avg =       5.0
       overall = 0.9838                                        max =         5
Random effects u_i ~ Gaussian                   Wald chi2(14)      =  72409.97
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000
------------------------------------------------------------------------------
      export |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    L_export |   .9690343   .0064552   150.12   0.000     .9563823    .9816863
     fbh_gdp |    1.44199   .4045164     3.56   0.000     .6491525    2.234828
   L_fbh_gdp |  -1.430319   .4000846    -3.58   0.000     -2.21447   -.6461673
       gdppc |    .266353   .2877868     0.93   0.355    -.2976988    .8304047
     L_gdppc |   -.272766    .279298    -0.98   0.329    -.8201801    .2746481
     cefta06 |   .0399293   .0322282     1.24   0.215    -.0232369    .1030954
      vat_bh |  -.0654446   .0310433    -2.11   0.035    -.1262884   -.0046008
        d_bh |   .0754847   .0264412     2.85   0.004     .0236608    .1273086
   d_bhcefta |  -.0541668   .0588304    -0.92   0.357    -.1694723    .0611387
        d_eu |   .0109729    .017143     0.64   0.522    -.0226268    .0445725
        dum2 |   .0051362   .0163782     0.31   0.754    -.0269645    .0372369
        dum3 |   .0216734   .0163871     1.32   0.186    -.0104446    .0537914
        dum4 |   .0303222   .0160754     1.89   0.059     -.001185    .0618294
        dum5 |   .0019941   .0164795     0.12   0.904    -.0303051    .0342932
       _cons |   .0128483   .0714196     0.18   0.857    -.1271315    .1528281
-------------+----------------------------------------------------------------
     sigma_u |          0
     sigma_e |  .13526258
         rho |          0   (fraction of variance due to u_i)
------------------------------------------------------------------------------


. testnl _b[L_export]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

  (1)  _b[L_export]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

               chi2(1) =        7.62
           Prob > chi2 =        0.0058

. testnl _b[L_export]*_b[ gdppc] = -_b[ L_gdppc]

  (1)  _b[L_export]*_b[ gdppc] = -_b[ L_gdppc]

               chi2(1) =        0.76
           Prob > chi2 =        0.3832
```

. *2)FE*

```
. xtreg export L_export fbh_gdp L_fbh_gdp gdppc L_gdppc cefta06 vat_bh d_bh d_bhcefta d_eu
dum2-dum6, fe

Fixed-effects (within) regression               Number of obs      =      1208
Group variable: code                            Number of groups   =       242
R-sq:  within  = 0.4295                         Obs per group: min =         4
       between = 0.7037                                        avg =       5.0
       overall = 0.7007                                        max =         5
                                                F(13,953)          =     55.18
corr(u_i, Xb)  = -0.1137                        Prob > F           =    0.0000
------------------------------------------------------------------------------
      export |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
```

```
    L_export |   .1634645   .0305538     5.35   0.000     .1035039    .2234251
     fbh_gdp |   2.071692   .4280294     4.84   0.000     1.231703    2.911682
   L_fbh_gdp |  -.7020797   .4576466    -1.53   0.125    -1.600191    .1960318
       gdppc |   .2106892   .2739573     0.77   0.442    -.3269401    .7483184
     L_gdppc |  -1.154799   .3317738    -3.48   0.001     -1.80589   -.5037069
    cefta06 |   .0684086   .0363952     1.88   0.060    -.0030153    .1398326
      vat_bh |   .0882993   .0293861     3.00   0.003     .0306303    .1459683
        d_bh |  (dropped)
   d_bhcefta |  -.1306815   .0725923    -1.80   0.072    -.2731406    .0117777
        d_eu |   .1715765   .0519023     3.31   0.001     .0697206    .2734325
        dum2 |  (dropped)
        dum3 |   .0260692   .0142237     1.83   0.067    -.0018442    .0539826
        dum4 |   .0394111   .0178953     2.20   0.028     .0042923    .0745299
        dum5 |   .0224273   .0234722     0.96   0.340    -.0236357    .0684904
        dum6 |   .0211706    .030316     0.70   0.485    -.0383234    .0806645
       _cons |  -5.686497   1.572944    -3.62   0.000    -8.773331   -2.599662
-------------+----------------------------------------------------------------
     sigma_u |  .72947904
     sigma_e |  .13526258
         rho |  .96676093   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(241, 953) =     4.01           Prob > F = 0.0000


. testnl _b[L_export]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

  (1)  _b[L_export]*_b[ fbh_gdp] = -_b[ L_fbh_gdp]

             F(1, 953) =        0.82
              Prob > F =        0.3655

. testnl _b[L_export]*_b[ gdppc] = -_b[ L_gdppc]

  (1)  _b[L_export]*_b[ gdppc] = -_b[ L_gdppc]

             F(1, 953) =       14.40
              Prob > F =        0.0002
```

. *first stage: AR1 correction*

```
. xtregar export fbh_gdp gdppc cefta06 vat_bh d_bh d_bhcefta d_eu dum2-dum6,fe rhotype(dw)
lbi
note: d_bh dropped because of collinearity

FE (within) regression with AR(1) disturbances  Number of obs      =      1208
Group variable: code                            Number of groups   =       242
R-sq:  within  = 0.1915                         Obs per group: min =         4
       between = 0.4502                                        avg =       5.0
       overall = 0.4488                                        max =         5
                                                F(10,956)          =     22.64
corr(u_i, Xb)  = -0.2590                        Prob > F           =    0.0000

------------------------------------------------------------------------------
      export |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   1.768337   .3008177     5.88   0.000     1.177997    2.358676
       gdppc |  -.4992497   .1908774    -2.62   0.009    -.8738368   -.1246625
     cefta06 |   .0873126    .043055     2.03   0.043     .0028194    .1718058
      vat_bh |    .059513   .0359997     1.65   0.099    -.0111346    .1301606
   d_bhcefta |  -.1650581   .0921276    -1.79   0.074    -.3458537    .0157375
        d_eu |  -.0097099   .0481028    -0.20   0.840    -.1041092    .0846894
        dum2 |  -.0170629   .0201772    -0.85   0.398    -.0566595    .0225338
        dum3 |   .0016841    .021941     0.08   0.939    -.0413739    .0447421
        dum4 |   .0142224   .0183573     0.77   0.439    -.0218029    .0502476
        dum5 |   .0073316   .0121286     0.60   0.546    -.0164702    .0311334
        dum6 |  (dropped)
       _cons |   -7.53136   1.114818    -6.76   0.000    -9.719133   -5.343586
-------------+----------------------------------------------------------------
      rho_ar |  .35710901
     sigma_u |  1.0226563
```

```
     sigma_e |  .13935438
     rho_fov |   .9817698   (fraction of variance because of u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(241,956) =    61.72            Prob > F = 0.0000
modified Bhargava et al. Durbin-Watson = 1.303536
Baltagi-Wu LBI = 1.8276213

. *AR1 correction with two steps*

. xtregar export fbh_gdp gdppc cefta06 vat_bh d_bh d_bhcefta d_eu dum2-dum6,fe rhotype(dw)
twostep lbi
note: d_bh dropped because of collinearity

FE (within) regression with AR(1) disturbances  Number of obs      =      1208
Group variable: code                            Number of groups   =       242
R-sq:  within  = 0.1968                         Obs per group: min =         4
       between = 0.4513                                        avg =       5.0
       overall = 0.4500                                        max =         5
                                                F(10,956)          =     23.43
corr(u_i, Xb)  = -0.2620                        Prob > F           =    0.0000
------------------------------------------------------------------------------
      export |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     fbh_gdp |   1.773022   .2988936     5.93   0.000     1.186458    2.359585
       gdppc |  -.5052186   .1892863    -2.67   0.008    -.8766832    -.133754
     cefta06 |   .0865257   .0428667     2.02   0.044     .0024021    .1706494
      vat_bh |   .0613658   .0357943     1.71   0.087    -.0088787    .1316103
   d_bhcefta |  -.1652216   .0915871    -1.80   0.072    -.3449567    .0145134
        d_eu |  -.0062912   .0482763    -0.13   0.896    -.1010309    .0884486
        dum2 |  -.0170006   .0203381    -0.84   0.403    -.0569131    .0229118
        dum3 |   .0020517   .0219846     0.09   0.926     -.041092    .0451954
        dum4 |   .0145382   .0183493     0.79   0.428    -.0214714    .0505478
        dum5 |   .0074277    .012145     0.61   0.541    -.0164062    .0312616
        dum6 |  (dropped)
       _cons |   -7.56031   1.122747    -6.73   0.000    -9.763642   -5.356977
-------------+----------------------------------------------------------------
      rho_ar |  .34823201
     sigma_u |  1.0224935
     sigma_e |  .13912387
     rho_fov |  .98182328   (fraction of variance because of u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(241,956) =    63.60            Prob > F = 0.0000
modified Bhargava et al. Durbin-Watson = 1.303536
Baltagi-Wu LBI = 1.8276213


. *FE from AR1 correction with two steps*

. predict FEAR1_correct, u
(244 missing values generated)
(244 missing values generated)


. *second stage*

. reg FEAR1_correct distance d_cc d_bor d_bh d_cro d_smk d_mace d_aust d_belg d_den d_gery
d_gre d_slo d_esp d_fra d_ita d_nld d_swe d_uk

      Source |       SS       df       MS              Number of obs =    1208
-------------+------------------------------           F( 19,  1188) =  266.19
       Model |  1017.03528    19  53.5281726           Prob > F      =  0.0000
    Residual |  238.893369  1188  .201088695           R-squared     =  0.8098
-------------+------------------------------           Adj R-squared =  0.8067
       Total |  1255.92865  1207  1.04053741           Root MSE      =  .44843
------------------------------------------------------------------------------
FEAR1_corr~t |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    distance |  -1.717605   .0575706   -29.83   0.000    -1.830556   -1.604653
        d_cc |   1.180464   .0540689    21.83   0.000     1.074383    1.286546
       d_bor |   .2410862   .0425701     5.66   0.000     .1575653    .3246071
        d_bh |   1.011544   .0607728    16.64   0.000     .8923103    1.130778
```

```
     d_cro |   .9624749   .0610299    15.77   0.000     .8427366    1.082213
     d_smk |   1.183783   .0610633    19.39   0.000     1.063979    1.303587
    d_mace |   1.038366   .0606132    17.13   0.000      .919445    1.157287
    d_aust |   1.573681   .0754549    20.86   0.000     1.425642    1.721721
    d_belg |   1.823069    .076411    23.86   0.000     1.673153    1.972984
     d_den |   1.488747   .0754784    19.72   0.000     1.340661    1.636833
    d_gery |   1.636814   .0765626    21.38   0.000     1.486601    1.787027
     d_gre |   .5403175   .0751709     7.19   0.000      .392835    .6878001
     d_slo |   1.251081   .0753324    16.61   0.000     1.103282     1.39888
     d_esp |   1.962158    .075144    26.11   0.000     1.814729    2.109588
     d_fra |   1.361597   .0761026    17.89   0.000     1.212286    1.510907
     d_ita |   1.736332   .0753655    23.04   0.000     1.588468    1.884196
     d_nld |   1.879517   .0760721    24.71   0.000     1.730266    2.028767
     d_swe |   1.967372   .0753543    26.11   0.000     1.819529    2.115214
      d_uk |   1.253978   .0767329    16.34   0.000     1.103431    1.404525
     _cons |   3.925217   .1925807    20.38   0.000     3.547381    4.303053
------------------------------------------------------------------------------

. predict FEAR1_resid_stage2, residuals
(244 missing values generated)
```

***Residuals from step two estimation, exports and imports***

| FROM | TO | EXPORTS FEAR1_resid_stage2 | IMPORTS FEAR1_resid_stage2 |
|---|---|---|---|
| Bosnia | UK | | |
| Bosnia | UK | -1.068522 | -0.7681265 |
| Bosnia | UK | -1.068522 | -0.7681265 |
| Bosnia | UK | -1.068522 | -0.7681265 |
| Bosnia | UK | -1.068522 | -0.7681265 |
| Bosnia | UK | -1.068522 | -0.7681265 |
| Bosnia | Austria | | |
| Bosnia | Austria | 0.7139459 | 0.614239 |
| Bosnia | Austria | 0.7139459 | 0.614239 |
| Bosnia | Austria | 0.7139459 | 0.614239 |
| Bosnia | Austria | 0.7139459 | 0.614239 |
| Bosnia | Austria | 0.7139459 | 0.614239 |
| Bosnia | Belgium | | |
| Bosnia | Belgium | 0.1540795 | 0.1063292 |
| Bosnia | Belgium | 0.1540795 | 0.1063292 |
| Bosnia | Belgium | 0.1540795 | 0.1063292 |
| Bosnia | Belgium | 0.1540795 | 0.1063292 |
| Bosnia | Belgium | 0.1540795 | 0.1063292 |
| Bosnia | Denmark | | |
| Bosnia | Denmark | -0.2107182 | 0.1176523 |
| Bosnia | Denmark | -0.2107182 | 0.1176523 |
| Bosnia | Denmark | -0.2107182 | 0.1176523 |
| Bosnia | Denmark | -0.2107182 | 0.1176523 |
| Bosnia | Denmark | -0.2107182 | 0.1176523 |
| Bosnia | France | | |
| Bosnia | France | -0.7257633 | -0.3172632 |
| Bosnia | France | -0.7257633 | -0.3172632 |
| Bosnia | France | -0.7257633 | -0.3172632 |
| Bosnia | France | -0.7257633 | -0.3172632 |

| | | | |
|---|---|---|---|
| Bosnia | France | -0.7257633 | -0.3172632 |
| Bosnia | Germany | | |
| Bosnia | Germany | -0.2629887 | 0.1567204 |
| Bosnia | Germany | -0.2629887 | 0.1567204 |
| Bosnia | Germany | -0.2629887 | 0.1567204 |
| Bosnia | Germany | -0.2629887 | 0.1567204 |
| Bosnia | Germany | -0.2629887 | 0.1567204 |
| Bosnia | Greece | | |
| Bosnia | Greece | -0.4056971 | -0.1707506 |
| Bosnia | Greece | -0.4056971 | -0.1707506 |
| Bosnia | Greece | -0.4056971 | -0.1707506 |
| Bosnia | Greece | -0.4056971 | -0.1707506 |
| Bosnia | Greece | -0.4056971 | -0.1707506 |
| Bosnia | Italy | | |
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| Italy | Germany | | |

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| Sweeden | Spain | | |
| Sweeden | Spain | 0.2050575 | -0.0952888 |
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| Sweeden | Spain | 0.2050575 | -0.0952888 |
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| Sweeden | France | | |
| Sweeden | France | -0.2211838 | -0.0553644 |
| Sweeden | France | -0.2211838 | -0.0553644 |
| Sweeden | France | -0.2211838 | -0.0553644 |
| Sweeden | France | -0.2211838 | -0.0553644 |
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| Sweeden | Italy | | |
| Sweeden | Italy | -0.107145 | -0.0337673 |
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| Sweeden | Netherlands | | |
| Sweeden | Netherlands | 0.2828248 | 0.4861812 |
| Sweeden | Netherlands | 0.2828248 | 0.4861812 |
| Sweeden | Netherlands | 0.2828248 | 0.4861812 |
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| Sweeden | Netherlands | 0.2828248 | 0.4861812 |
| Sweeden | Austria | | |
| Sweeden | Austria | 0.0494679 | -0.0414579 |
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| Sweeden | Slovenia | | |
| Sweeden | Slovenia | | |
| Sweeden | Slovenia | -0.5199053 | -0.7263414 |
| Sweeden | Slovenia | -0.5199053 | -0.7263414 |
| Sweeden | Slovenia | -0.5199053 | -0.7263414 |

| | | | |
|---|---|---|---|
| Sweeden | Slovenia | -0.5199053 | -0.7263414 |
| Sweeden | UK | | |
| Sweeden | UK | -0.0948235 | 0.0705279 |
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| Sweeden | UK | -0.0948235 | 0.0705279 |
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| Sweeden | UK | -0.0948235 | 0.0705279 |
| UK | Denmark | | |
| UK | Denmark | 0.0475566 | 0.1590289 |
| UK | Denmark | 0.0475566 | 0.1590289 |
| UK | Denmark | 0.0475566 | 0.1590289 |
| UK | Denmark | 0.0475566 | 0.1590289 |
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| UK | Germany | | |
| UK | Germany | 0.4080418 | 0.5826812 |
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| UK | Greece | | |
| UK | Greece | 0.3273757 | -0.3957427 |
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| UK | Spain | | |
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| UK | France | -0.3960235 | -0.1897502 |
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| UK | Italy | | |
| UK | Italy | 0.4204568 | 0.4588873 |
| UK | Italy | 0.4204568 | 0.4588873 |
| UK | Italy | 0.4204568 | 0.4588873 |
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| UK | Austria | | |
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| UK | Slovenia | | |

| | | | |
|---|---|---|---|
| UK | Slovenia | | |
| UK | Slovenia | -0.9877619 | -1.128878 |
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| UK | Belgium | | |
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| UK | Sweeden | | |
| UK | Sweeden | 0.5760369 | 0.4753751 |
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| UK | Sweeden | 0.5760369 | 0.4753751 |
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