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The relationship between the output gap and excess liquidity: Evidence from Czech Republic, Estonia and Kosovo

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Abstract

Aim/purpose – Banks in European Transition Economies are proportionally lending less than their counterparts in the Eurozone in the face of seemingly profitable loan opportunities, whilst apparently continuously holding excess liquidity. The question that arises is whether banks in European Transition Economies are holding excess liquidity that widens the output gap?

Design/methodology/approach – Given its endogenous nature, the relationship between the output gap and excess liquidity is estimated using Seemingly Unrelated Regressions method. The research sample covers three European Transition Economies for the period 2004Q1 – 2013Q4.

Findings – The results indicate that rather than being in a causal relationship, excess liquidity and the output gap are found to be correlated via common observed and unobserved determinants.

Research implications/limitations – The most important policy implication of this research is that since the relationship between output gap and excess liquidity is not causal, reducing excess liquidity will not necessarily lead to a smaller (negative) output gap. There

seems to be no straightforward policy framework informed by a clear trans-mission mechanism from excess liquidity to output gap.

Originality/value/contribution – This study is novel in two respects. Firstly, assuming endogeneity, a new conceptual relationship between output gap and excess liquidity is presented. Secondly, empirical evidence is presented using the system equation method Seemingly Unrelated Regression, not previously used in this context.

Keywords: output gap, excess liquidity, transition economies, system equation models.
JEL Classification: E32, E51, P2, C3.

1. Introduction

The desire to see banks lend more to the private sector is a familiar refrain in the transition context. Given that banks in European Transition Economies (ETEs) are proportionally lending less than their counterparts in the Eurozone in the face of seemingly profitable loan opportunities, then the question arises: is the output gap emanating from excess liquidity, or both are determined by a wider system?

Bank lending to the private sector is relatively low in ETEs, around 40 percent of GDP, average 2000-2014, compared to the lending in the Eurozone, around 93 percent of GDP (World Bank, 2015; European Central Bank [ECB], 2015). This low lending ratio becomes even more important for economic activity, given that banks in most ETEs are the main funding source, with capital markets being non-existent or only in their infancy. However, banks in many of the ETEs appear to be keeping reserves in excess of the Reserve Requirement Ratio required by the central bank as well as above the mandatory liquidity ratio. For example, over the span of 2000-2014, several ETEs have on average accumulated excess liquidity to total assets ratio of 19 percent, in the Czech Republic, Estonia and Kosovo this ratio was 14.2 percent, 5 percent and 25 percent, respectively. This may suggest that banks in ETEs could further extend their lending. Moreover, the net interest margin in ETEs was around 6.5 percent, compared to just 2.2 percent in the Eurozone, average 2000-2014 (World Bank, 2015; ECB, 2015).

Despite available funds and the seemingly profitable opportunities to expand lending, banks in many ETEs have persistently accumulated excess liquidity. Though part of this excess liquidity held may reflect profit-maximising banking behaviour and may simply be precautionary in nature, the involuntarily held part is an underutilised resource (Agenor, Aizenman, & Hoffmaister, 2004; Saxegaard, 2006). Excess liquidity in most cases is non-remunerated and even in the cases where they are remunerated the interest rates earned are very low. Thus, excess liquidity and less lending in the economy could be reflected in the output gap.

Some of the factors implying the presence of a large output gap in ETEs are relatively high unemployment rate (Kosovo 43 percent compared to an average of 9 percent in the Eurozone countries between 2000 and 2014) and around 20 percent unutilised capacity at firm level (European Bank for Reconstruction and Development [EBRD], 2009). Furthermore, the estimated results for the output gap for the selected ETEs, namely Czech Republic, Estonia and Kosovo, are ± 4 percent, 5.8 percent and 5 percent, respectively, as compared to the Eurozone 0.2 percent (average 2000-2013), suggesting that the output gap in ETEs may be relatively larger than those in the Eurozone. Furthermore, in transition economies the 'cycle' also reflects structural effects on potential output that may be reflected in the persistent underutilisation of resources, i.e. a negative output gap (Kastrati, Pugh, & Toçi, 2017).

Following the Global Financial Crisis (GFC) and the fiscal crises in Greece and other Eurozone countries, the concept of the output gap has regained attention as an indicator of the cyclical position of the economy. For example, the concept of the output gap has acquired operational but not legal consideration in the Growth and Stability Pact in European Union, as this measure provides an essential input for calculating indicators of the structural (i.e. cyclically adjusted) fiscal balance (European Commission, 2001; Billmeier, 2004). Several recent studies pay special attention to the cyclical position of the economy as proxied by the output gap (e.g. Organization for Economic Co-operation and Development [OECD], 2010; Roubini, 2015).

The majority of recent discussion has concentrated on finding a causal relationship between finance and growth and most studies conclude that financial markets have an impact on the real economy via financial accelerators, economic multipliers and/or amplification of financial shocks (Biggs & Mayer, 2013; Borio, Disyatat, & Juselius, 2013). However, within the growth and finance nexus little or no research has been conducted on investigating the relationship between the business cycle (output gap) and excess liquidity (an indicator of the credit cycle), from the perspective of underutilised resources and even less so in the transition context. Given the potential endogenous nature of the relationship between the output gap and excess liquidity we test whether this relationship is simultaneously determined via observed and unobserved components. To investigate the relationship between the output gap and excess liquidity, this study presents evidence from three representative countries of ETEs, namely the Czech Republic, Estonia and Kosovo. The reasons for choosing these countries are twofold. Firstly, the three selected countries represent different regions and levels of development. The Czech Republic represents the economically more developed countries that have completed the transition process. Representing the

Baltic countries, Estonia is also a country severely hit by the GFC even though a successful example of a quick recovery. Kosovo, representing the SEE countries, is one of the least developed countries in ETEs and is lagging behind in the transition process. Secondly, the selected countries are also representative of the diversity of economic structure and evolution post-transition.

The objective of exploring the theoretical and empirical relationship between the output gap and excess liquidity is novel, as this relationship has not been previously investigated for ETEs. The empirical investigation is novel in a further respect since an econometric method not previously used in this context, Seemingly Unrelated Regression, is applied assuming potential endogeneity.

The rest of the paper is organised as follows. Section 2 explores the theoretical relationship between excess liquidity as an underutilised resource potentially leading to less credit available and the output gap, and the endogenous relationship between the two. Section 3 explains the research methodology and data. The estimated results and their interpretation is presented in section 4. Section 5 concludes.

2. The theoretical relationship between output gap and excess liquidity

In seeking to explore the relationship between the output gap and excess liquidity, this investigation initially hypothesised a one-way causal relationship. The presence of excess liquidity in the banking sector, given that it holds back further lending, can be considered as an underutilised resource. Thus, the accumulation of excess liquidity in transition economies is expected to have two effects via the same causal mechanism: the level of lending is lower, thus as a consequence, the growth of output is likely to be constrained due to a capital shortage. In addition, given relatively high lending interest rates in TEs, banks may ration borrowers, despite high demand for loans, thus extending a smaller portion of their funds while accumulating excess reserves (Hashi & Toçi, 2010; Stiglitz & Weiss, 1981). If this is the case, the lack of credit dampens growth, then the causality runs from finance to growth. On the other side, banks in many ETEs may argue that excess liquidity is simply an outcome of depressed economies, the lack of feasible projects to invest and low loan demand. If this is the case, then causality between the two runs the other way around.

In addition to the increased importance of business cycles in policymaking, another theoretical linkage, that has regained attention, is the relationship between financial markets and business cycles (Brunnermeier & Sannikov, 2014;

Furlanetto, Gelain, & Taheri Sanjani, 2014; Morley, 2015). These studies argue that business cycles and financial cycles are closely linked and cannot be understood separately for several reasons. For example, Furlanetto et al. (2014) argue that financial frictions are a significant source of economic instability and may amplify the volatility of the output gap. Furthermore, Biggs & Mayer (2013) argue that business cycles and financial (credit) cycles are so closely correlated with each other, to the point where one could be used as a proxy for the other. Whereas, Borio et al. (2013) argue that information on financial cycles should be incorporated to improve estimates of potential output and the output gap. A recent study investigating the relationship between financial and business cycles in Brazil (Krznar & Matheson, 2017), claim that these two variables are 'tightly correlated' (and that their trend is endogenously determined) and estimate this relationship with causal relationship equations: the credit cycle causing the business cycle and the business cycle also causing the credit cycle with a lag in between. Therefore, the endogenous nature of the relationship between the output gap and excess liquidity has been established solidly in recent literature.

The presence of a (negative) output gap indicates that the economy could produce more with the existing resources, i.e. that there are under-utilised resources. Whilst, excess liquidity means that there are under-utilised savings in the banking system. Hence, they both represent different indicators of under-utilised resources or two different perspectives that describe the general state of the economy, which in a Keynesian model reflects equilibrium in a depressed economy. Thus, in addition to a causal or simultaneously causal relationship, a third possible relationship between output gap and excess liquidity is that they may be endogenously and jointly determined by other factors. Biggs & Mayer (2013) argue that business cycles and financial (credit) cycles are so closely correlated that one could be used as proxy for the other. This suggests that excess liquidity, seen as potential new flow of credit, and the output gap are different ways of looking at the same phenomenon, i.e. they both reflect the general state of the economic activity. If this is the case, then causality – where excess liquidity is causing the outout gap, or the output gap is leading to higher level of excess liquidity accumulation – may be a wrong assumption. If the relationship between the output gap and excess liquidity is one of correlation, then both are outcomes of a wider system, that is they are both being pushed, i.e. caused by other factors. In addition to being co-determined, output gap and excess liquidity may also be separately determined by other observed and unobserved influences, which do not enter in the feedback cycle. In a transition context, some of these unobserved factors impacting both may be: institutional change (Raiser, DiTom-

maso, & Weeks, 2001), managerial and governmental competencies, weak accounting standards (Hay, Shleifer, & Vishny, 1996), culture, socio-economic factors and political systems (Carvalho, Nepal, & Tooraj, 2016).

Based on the theoretical elaboration, the relationship between the output gap and excess liquidity may be more complex than initially envisaged. Since the relationship between the output gap and excess liquidity is potentially endogenous, a different empirical approach is needed to reflect endogeneity. Therefore, as a corollary of this theoretical reconsideration, we examine this relationship with its empirical counterpart, that of Seemingly Unrelated Regressions (SUR). This approach will be presented in the following section.

3. Research methodology and data

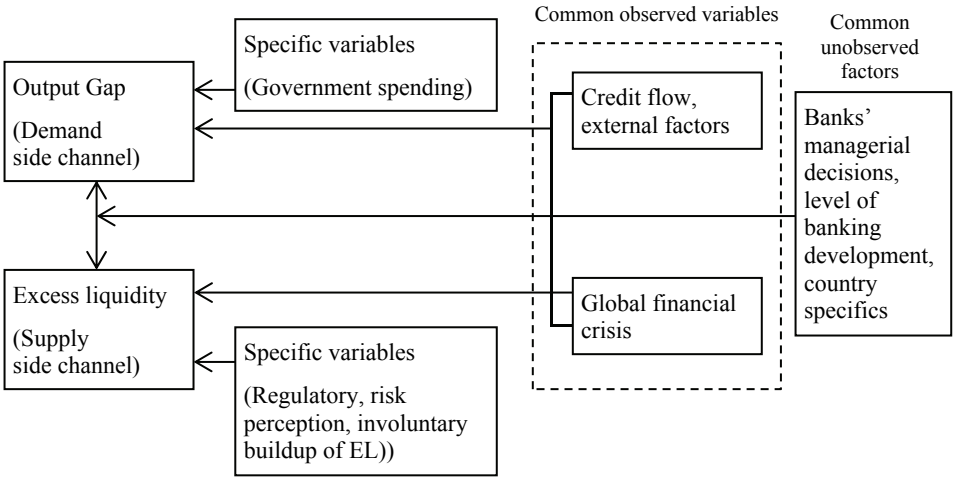
Agenor et al. (2004) used the output gap as an independent variable in their model of precautionary excess liquidity. However, because they were unable to explain the counterintuitive coefficient sign they dropped it from their model. That finding together with the new conceptual relationship between excess liquidity and the output gap outlined above, led to a theoretical reconsideration of the relationship between these two variables and the adoption of a correspondingly different empirical approach.[1] These two variables are brought together by common underlying determinants, both observed and unobserved. The common observed and unobserved determinants may be correlated between the error terms of the output gap and excess liquidity regression equations, in which case more efficient estimators are gained by estimating the equations representing output gap and excess liquidity jointly. Therefore, we follow System Equation Method, namely Zellner's (1962) Seemingly Unrelated Regression (SUR) model, given the specific nature of the data series (correlation) and the possible phenomenon of contemporaneous correlation among the countries. We test the hypothesis whether this relationship is simultaneously determined via observed and unobserved components.

Because the output gap and excess liquidity are potentially endogenous, they may both represent dependent variables within a wider system. Since this study is interested in the effect of both variables jointly, the SUR method provides a systematic framework for estimation of the determinants of the output

[1] Since the initial argument was constructed on the basis that excess liquidity was expected to have an impact on the output gap, initially the model was estimated via the single equation methods to account for causality, amongst others, the Feasible Generalised Least Squares (FGLS) and Panel Corrected Standard Errors (PCSE). The results are available upon request.

gap and excess liquidity. In other words, the system-equation approach via the SUR method enables mutual exogeneity and mutual endogeneity between the variables to be tested (Efendic, Pugh, & Adnett, 2011).

Figure 1. Visual depiction of the SUR in the OG and EL framework



Source: Authors' illustration.

As depicted in Figure 1, the output gap and excess liquidity may appear to reflect the general state of economic activity, thus both are considered to represent a separate dependent variable in a set of equations. Moreover, the SUR allows for specific determinants to be included in each separate equation. Given that this dataset comprises a panel of three countries, initially it would be possible to employ a panel SUR with 3xT equations, with two equations for excess liquidity and one equation for the output gap. However, based on Maddala (1997), the SUR estimation method enjoys the virtue of estimating different slope coefficients for each cross-sectional unit. Estimating the model within a panel framework 3xT would impose restrictions on the investigation of the heterogeneity among countries in our sample. With this approach it is possible to have three equations estimating the same panel dataset. So, instead of using a panel SUR with 3xT equations, the estimation procedure will be disaggregated into 9XT equations, where 9 equations are specified, 3 for each of the three countries for all three dependent variables (precautionary excess liquidity: 3xELP, involuntary excess liquidity: 3xELI, the output gap: 3xOG). A 3xT equations system in a panel framework is not suitable for two reasons. First, a 3xT approach imposes slope homogeneity across countries; the only variation would be the fixed effects in the dummy variables or in the error term, whereas

estimating separately (country by country with 9 equations), allows complete slope heterogeneity across countries. This way, with a 9xT structure, instead of restricting the model in a panel framework, a more flexible and technically less demanding structure is enabled. More information would be extracted, and the residuals in the SUR would pick up not only the time-invariant factors, but also the time-variant ones (Maddala, 1997). Second, because of the relatively long T-periods, dynamic modelling in a panel framework due to serial correlation is complicated either with a FE or RE approach. Therefore, the SUR model estimated is static. In other words, the same model is modelled but within a more flexible structure, which enables maximising the heterogeneity between parameters, this way maximising the advantages of the SUR approach.

Regarding all the single equations as potentially part of a multiple-equation system, the 9 by T equations to be estimated simultaneously as a system of equations via the SUR method are presented as in Table 1.

Table 1. SUR 9xT system equations

Czech Republic
$EL^{pC}_t = \alpha^C + \alpha^C_1 RR_t + \alpha^C_2 i^D_t + \alpha^C_3 Eq_t + \alpha^C_4 gdpg1_t + \alpha^C_5 VolC_t + \alpha^C_6 VolD_t + \alpha^C_7 VolG_t + \alpha^C_8 npl_t + \alpha^C_9 d2005 + \alpha^C_{10} d2006 + \alpha^C_{11} d2007 + \alpha^C_{12} d2008 + \alpha^C_{13} d2009 + \alpha^C_{14} d2010 + \alpha^C_{15} d2011 + \alpha^C_{16} d2012 + \alpha^C_{17} d2013 + \alpha^C_{18} dGFC + \varepsilon^C_t$ (1)
$EL^{IC}_t = \beta^C + \beta^C_1 DEP_t + \beta^C_2 i^L_t + \beta^C_3 CREDF_t + \beta^C_4 LEG_t + \beta^C_5 FDI_t + \beta^C_6 CREDLEVEL + \beta^C_7 d2005 + \beta^C_8 d2006 + \beta^C_9 d2007 + \beta^C_{10} d2008 + \beta^C_{11} d2009 + \beta^C_{12} d2010 + \beta^C_{13} d2011 + \beta^C_{14} d2012 + \beta^C_{15} d2013 + \beta^C_{16} dGFC + e^C_t$ (2)
$OG^C_t = \delta^C + \delta^C_1 CREDF_{t-2} + \delta^C_2 OGEU_t + \delta^C_3 GOVEXP_t + \delta^C_4 d2005 + \delta^C_5 d2006 + \delta^C_6 d2007 + \delta^C_7 d2008 + \delta_8 d2009 + \delta^C_9 d2010 + \delta^C_{10} d2011 + \delta^C_{11} d2012 + \delta^{CC}_{12} d2013 + \delta^C_{13} dGFC + \nu^C_t$ (3)
Estonia
$EL^{pE}_t = \alpha^E + \alpha^E_1 RR_t + \alpha^E_2 i^D_t + \alpha^E_3 Eq_t + \alpha^E_4 gdpg1_t + \alpha^E_5 VolC_t + \alpha^E_6 VolD_t + \alpha^E_7 VolG_t + \alpha^E_8 npl_t + \alpha^E_9 d2005 + \alpha^E_{10} d2006 + \alpha^E_{11} d2007 + \alpha^E_{12} d2008 + \alpha^E_{13} d2009 + \alpha^E_{14} d2010 + \alpha^E_{15} d2011 + \alpha^E_{16} d2012 + \alpha^E_{17} d2013 + {}_{18} dGFC + \varepsilon^E_t$ (4)
$EL^{IE}_t = \beta^E + \beta^E_1 DEP_t + \beta^E_2 i^L_t + \beta^E_3 CREDF_t + \beta^E_4 LEG_t + \beta^E_5 FDI_t + \beta^E_6 CREDLEVEL + \beta^E_7 d2005 + \beta^E_8 d2006 + \beta^E_9 d2007 + \beta^E_{10} d2008 + \beta^E_{11} d2009 + \beta^E_{12} d2010 + \beta^E_{13} d2011 + \beta^E_{14} d2012 + \beta^E_{15} d2013 + \beta^E_{16} dGFC + e^E_t$ (5)
$OG^E_t = \delta^E + \delta^E_1 CREDF_t + \delta^E_2 OGEU_t + \delta^E_3 GOVEXP_t + \delta^E_4 d2005 + \delta^E_5 d1998 + \delta^E_6 d1999 + \delta^E_7 d2000 + \delta^E_8 d2001 + \delta^E_9 d2002 + \delta^E_{10} d2003 + \delta^E_{11} d2004 + \delta^E_{12} d2005 + \delta^E_{13} d2006 + \delta^E_{14} d2007 + \delta^E_{15} d2008 + \delta^E_{16} d2009 + \delta^E_{17} d2010 + \delta^E_{18} d2011 + \delta^E_{19} d2012 + \delta^E_{20} d2013 + \delta^E_{21} d2014 + \delta^E_{22} dGFC + \nu^E_t$ (6)
Kosovo
$EL^{pK}_t = \alpha^K + \alpha^K_1 RR_t + \alpha^K_2 i^D_t + \alpha^K_3 Eq_t + \alpha^K_4 gdpg1_t + \alpha^K_5 VolC_t + \alpha^K_6 VolD_t + \alpha^K_7 VolG_t + \alpha^K_8 npl_t + \alpha^K_9 d2005 + \alpha^K_{10} d2006 + \alpha^K_{11} d2007 + \alpha^K_{12} d2008 + \alpha^K_{13} d2009 + \alpha^K_{14} d2010 + \alpha^K_{15} d2011 + \alpha^K_{16} d2012 + \alpha^K_{17} d2013 + {}_{18} dGFC + \varepsilon^K_t$ (7)
$EL^{IK}_t = \beta^K + \beta^K_1 DEP_t + \beta^K_2 i^L_t + \beta^K_3 CREDF_t + \beta^K_4 LEG_t + \beta^K_5 FDI_t + \beta^K_6 CREDLEVEL + \beta^K_7 d2005 + \beta^K_8 d2006 + \beta^K_9 d2007 + \beta^K_{10} d2008 + \beta^K_{11} d2009 + \beta^K_{12} d2010 + \beta^K_{13} d2011 + \beta^K_{14} d2012 + \beta^K_{15} d2013 + \beta^K_{16} dGFC + e^K_t$ (8)
$OG^K_t = \delta^K + \delta^K_1 CREDF_t + \delta^K_2 OGEU_t + \delta^K_3 GOVEXP + \delta^K_4 d2005 + \delta^K_6 d2006 + \delta^K_7 d2007 + \delta^K_8 d2008 + \delta^K_9 d2009 + \delta^K_{10} d2010 + \delta^K_{11} d2011 + \delta^K_{12} d2012 + \delta^K_{13} d2013 + \delta^K_{14} dGFC + \nu^K_t$ (9)

Correlation coefficients (ρ) are calculated for each pair of error terms across the nine equations in the system. In Table 1, equations (1) to (9), EL^I_t and EL^p_t stand for the ratio of involuntary and precautionary excess liquidity to total as-

sets, respectively, in each country at time *t*. As suggested by theory (Agenor et al., 2004; Saxegaard, 2006), excess liquidity will be estimated by two separate equations, namely precautionary excess liquidity and involuntary excess liquidity. Precautionary excess liquidity is the part of excess liquidity voluntarily held by banks due to a perceived increase in the risk of default. In this case, this part of excess liquidity represents banks' optimising behaviour. On the other hand, involuntary excess liquidity represents the part accumulated because banks are unable to lend, due to factors outside of banks' control, e.g. lack of demand for loans, lack of alternative vehicles to invest, deficient markets and institutions, etc., and which do not provide a convenience return which offsets the opportunity cost of holding them. The rationale for including two sets of excess liquidity equations is explained in Saxegaard (2006), where excess liquidity is presented as a phenomenon reflecting both the supply side (risk perception) and the demand side (involuntary build-up) factors.

In short, precautionary excess liquidity (superscripted with 'p', i.e. EL^{p}_{t}) encompasses regulatory, banking and risk-perceived variables, whereas the involuntary excess liquidity (superscripted with 'I', i.e. EL^{I}_{t}) encompasses mainly factors that lead to involuntary build-up of excess reserves, like the public's decisions to deposit, investors' deposits or the strength of the legal rights variables. In involuntary excess liquidity equations an interaction variable between credit and a GFC dummy was added, *Credlevel*, to account for a possible behaviour of this variable post GFC. The δ is the constant term, δ_1 to δ_{24} are the parameter estimates of the independent variables, and ε_t, e_t, v_t are the error terms.

The inclusion of the output gap equation in the system of equations is novel: previous studies that have investigated the determinants of excess liquidity did not consider a possible endogenous relationship between the two (for example Saxegaard, 2006). On the other side, theoretical guidance in setting up an output gap equation is both limited and vague. However, from basic theory the output gap has been commonly used as a proxy for the demand side of the economy (Gordon, 1997). Thus, as a variable reflecting the state of the aggregate demand in the economy should include all the factors comprising a full aggregate demand identity. Kennedy (2009) argue that a system equation approach may also include identities (e.g., $Y \equiv C + I + G + NX$). With a purpose of setting up a fully specified aggregate demand equation as a requirement in the SUR models and following Moinescu (2012), output gap equations (3), (6) and (9) are specified (Table 1).

The OG_t stands for the ratio of output gap to GDP in each period of the respective country.[2] $CREDF_{t-2}$ denotes the credit to GDP ratio, which is based on the credit accelerator theory (Bernanke, 2007) and feeds consumption and investment. Establishing endogeneity between *OG* and *CREDF*, the second lag of the credit flow will be used on the grounds that lagged values of endogenous variables are treated as predetermined, and are not simultaneously determined in the current time period (Studenmund, 2006). By the logic of 'weak exogeneity', all other explanatory variables have a one period lag, i.e. in order to have 'weak exogenous' explanatory variables (Wooldridge, 2010).

Given that two of the countries in the sample are EU countries and Kosovo has very strong trade relationships with the EU, the output gap of the European Union divided by GDP, $OGEU_t$, is taken to proxy the external sector (foreign demand) and is considered as exogenous. Given the lack of a publicly available measure for the quarterly output gap of the Eurozone, this unobserved component was estimated via the Hodrick–Prescott filter. Moinescu (2012) uses the long-term interest rate (bond yield) as a proxy for the fiscal stance. However, given that the issuance of the government securities in Kosovo started only in 2012, it is not possible to utilise this measure and government expenditure, $GOVEXP_t$, is used instead. To control for possible correlated cross-country shocks, year dummies *d2005-d12014* will be included (*d2004* set as a benchmark). To account for possible structural breaks in the series due to the incidence of the financial crisis, a *GFC* dummy was also included. The δ is the constant term, whereas the δ_1 to δ_n are the parameter estimates of the independent variables and v_t is the error term.

Finally, the ρ term in the SUR framework measures the extent of correlation between the equations. The non-zero covariance of the respective error terms reflects the idea that unobserved variables are shared between these errors. When a correlated error is included, then the coefficient on the estimates of EL and OG will most likely be reduced and improved. This is because, a part of the relationship between indicators of excess liquidity and output gap comes from the influence of common (although unobserved) variables. Table 2 sets out the model variables with symbols, description, if they are interpolated, seasonally adjusted and their source.

[2] The estimation procedure for the output gap for the three respective countries is explained in Kastrati, Pugh, & Toçi (2017).

Table 2. Descriptive statistics of variables used in the empirical investigation

Variable	Variable symbol	Description	Interpolated	Seasonally adjusted	Source
1	*2*	*3*	*4*	*5*	*6*
Excess Liquidity	*EL*	The ratio of excess liquidity (comprising above statutory reserves at the central bank + above mandatory liquidity ratio) over total assets, in percent	No	Yes	Respective central banks
Required Reserve Ratio	*RRR*	The reserve required ratio from the central bank to total deposits. In percent	No	No	Respective central banks
Deposit Interest Rate	i^D	Average interest rate on deposits in percent	For Kosovo (2004Q1)	No	Respective central banks
Real Growth	*rgdp*	The real GDP growth rate compared to the previous quarter. In percent.	No	Yes	EUROSTAT, CBK
Volatility of Private Sector Credit	*VolC*	The five-quarter moving average of the standard deviation of the private sector credit, then divided by the five year moving average of the variable	No	No	Own calculations*
Volatility of the Deposits	*VolD*	The five-quarter moving average of the standard deviation of the total deposits, then divided by the five year moving average of the variable	No	No	Own calculations*
Volatility of GDP	*VolGDP*	The five-quarter moving average of the standard deviation of the real growth rate, then divided by the five year moving average of the variable	No	No	Own calculations*
Non-Performing Loans	*NPL*	The ratio of non-performing loans (delayed in repayment more than 180 days) over total loans, in percent	For Kosovo 2004Q1-2005Q4	No	Respective central banks
Equity	*Eq*	Total banking equity over total assets, in percent	No	No	Respective central banks
Deposits	*Dep*	Total deposits minus government deposits over GDP. in percent	No	Yes	Respective central banks
Government Deposits	*Govdep*	Government deposits (central + local) over GDP, in percent	No	Yes	Respective central banks
Credit	*Cred*	Total private sector credit over GDP, in percent	No	Yes	Respective central banks
Loan interest rate	i^L	Average interest rate on loans, in percent	For Kosovo (2004Q1)	No	Respective central banks
Rule of Law Estimate	*RLE*	Capturing perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence	Yes (2002 and 2013)	No	World Bank
Foreign Direct Investment	*FDI*	Foreign direct investment inflows over GDP, in percent	Kosovo: first 3 quarters of 2004-2008	Yes	Respective central banks

Table 2 cont.

1	*2*	*3*	*4*	*5*	*6*
Output Gap	*OG*	Output Gap over GDP, in percent	No	Yes	Own calculations
Credit Flow	*CredF*	Credit flow over GDP, in percent	No	Yes	Respective central banks
Eurozone Output Gap	*OGEU*	a) OECD: Output Gap over Potential Output; b) HP filter: Output Gap over GDP, in percent	a) Yes b) No	Yes	a) OECD; b) own calculations
Government Expenditure	*Govexp*	Total government expenditure over GDP, in percent	No	Yes	EUROSTAT (Czech and Estonia), Ministry of Finance (Kosovo)

* Note: The calculation of the volatility measures were conducted following the procedure as in Agenor et al. (2004) and Saxegaard (2006).

After discussing the preferred estimation approach, a discussion of the results follows.

4. Research findings and discussion

The Breusch–Pagan test assesses the contemporaneous covariance independence between the error terms and provides evidence in support of contemporaneous cross-sectional correlation among the error terms, meaning that there is an efficiency gain from employing the SUR method. Additionally, the correlation matrix of the Breusch–Pagan test provides evidence in support of the idea that there are common and linked systematic unobservable associated with both, excess liquidity and the output gap. The results (Table 3) indicate that the SUR model can explain some of the determinants of excess liquidity and the output gap, especially for Kosovo and Estonia. The results for the overall country--specific equations indicate that the model has strong explanatory power, even though the statistical significance of the separate variables are weak or insignificant. The joint-significance results indicate that 10 out of the 13 regressors in the model are jointly significant at conventional levels of significance. This may be a sign of multicollinearity in the data.

Table 3. Descriptive statistics of variables used in the empirical investigation

Dependent: Precautionary EL/Assets				Dependent: Involuntary EL/Assets				Dependent: Output Gap/GDP			
Country/Equat. Variables	CZ (1) del_1	EE_ (4) del_2	KS (7) del_3	Variables	CZ (2) 2del_1	EE_ (5) 5del_2	KS (8) 8del_3	Variables	CZ (3) og_1	EE_ (6) og_2	KS (9) og_3
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
L.rrr	−0.289	−0.516*	−0.012	L.dep	−0.094**	−0.073	0.195	L.Cred	0.005	−0.005	−0.299**
	(1.061)	(0.278)	(0.079)		(0.048)	(0.049)	(0.135)		(0.006)	(0.011)	(0.127)
L.idep	−0.311	−0.790	−1.659***	L.Govdep	−0.014	−0.035	−0.012	L.Ogeu	0.324***	0.755***	−0.393
	(0.933)	(1.141)	(0.625)		(0.017)	(0.037)	(0.045)		(0.066)	(0.122)	(0.290)
L.volc	−0.068	1.843	0.366	L.Cred	−0.016	0.047	0.108	L.Govex	0.023	0.008	−0.009
	(0.475)	(6.145)	(0.291)		(0.010)	(0.031)	(0.073)		(0.043)	(0.015)	(0.021)
L.voldep	−0.054	0.141	−1.444**	L.iloan	−0.300	−0.207	−0.336	d2005	1.031***	0.553	−0.303
	(1.430)	(0.753)	(0.651)		(0.720)	(0.201)	(0.307)		(0.201)	(0.433)	(1.026)
L.volgdpg	0.003	−9.051	0.904**	L.Fdi	0.348***	−0.188***	0.010	d2006	2.325***	1.236***	0.413
	(0.040)	(20.68)	(0.361)		(0.124)	(0.036)	(0.015)		(0.208)	(0.443)	(1.032)
L.Npl	0.072	−2.892*	0.385*	L.Rle	14.508**	14.227	55.956**	d2007	2.778***	0.445	3.193***
	(0.234)	(1.351)	(0.229)		(6.335)	(16.077)	(24.702)		(0.254)	(0.526)	(1.212)
L.Eq	−0.036	−0.176	−0.817***	L.Credlevel	−	−0.055	−0.778***	d2008	2.682***	−2.776***	5.847***
	(0.179)	(0.295)	(0.279)		−	(0.029)	(0.240)		(0.276)	(0.571)	(1.312)
d2005	0.198	0.188	−0.779	d2005	−0.309	2.347	2.847**	d2009	1.920***	−6.978***	3.720***
	(0.491)	(1.659)	(0.981)		(0.448)	(1.368)	(1.412)		(0.204)	(0.444)	(1.038)
d2006	−0.405	−2.401	−0.341	d2006	−0.937**	−2.302**	1.398	d2010	2.342***	−5.998***	3.650**
	(0.602)	(1.882)	(0.944)		(0.432)	(1.124)	(1.116)		(0.305)	(0.625)	(1.480)
d2007	−0.526	0.546	−1.795*	d2007	−1.417***	−0.526	−0.927	d2011	1.632***	−5.634***	5.558***
	(0.625)	(2.410)	(0.934)		(0.458)	(1.245)	(0.976)		(0.250)	(0.524)	(1.225)
d2008	1.864***	4.482*	−0.576	d2008	1.240***	0.412	−1.073	d2012	0.461*	−5.331***	5.060***
	(0.687)	(2.663)	(0.941)		(0.441)	(1.181)	(1.077)		(0.268)	(0.555)	(1.345)
d2009	0.895	4.170	1.534	d2009	0.620	−0.688	1.453	d2013	−0.429	−3.993***	1.641
	(0.556)	(2.710)	(0.969)		(0.437)	(0.968)	(1.362)		(0.303)	(0.633)	(1.518)
d2010	0.267	2.552	−0.002	d2010	0.259	2.036**	2.268	Const	−1.278	3.638***	−4.861***
	(0.558)	(1.926)	(0.970)		(0.412)	(1.010)	(1.667)		(1.858)	(0.353)	(0.825)
d2011	0.876	−1.075	−1.011	d2011	0.949**	4.349***	1.035				
	(0.537)	(3.081)	(0.974)		(0.462)	(0.913)	(1.751)				
d2012	0.514	−7.749*	0.585	d2012	0.493	−	0.978				
	(0.541)	(3.871)	(0.947)		(0.421)	−	(1.565)				
d2013	1.112*	−8.330*	1.478	d2013	1.086***	−1.683*	1.281				

Table 3 cont.

1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
	(0.624)	(3.682)	(0.967)		(0.410)	(0.950)	(1.518)				
Const	−	6.766*	−	dpulse	0.800**	5.681	−				
	−	(3.755)	−		(0.406)	(1.951)	−				
				dlevel	−	1.980	3.680**				
					−	(2.048)	(1.575)				
				Const	−1.121**	2.729	−2.761**				
					(0.438)	(1.006)	(1.170)				
Observations	38	38	38		38	38	38		38	38	38
R-squared	0.642	0.492	0.551		0.721	0.740	0.489		0.98	0.987	0.821
RMSE	0.534	1.867	1.105		0.471	1.335	1.179		0.234	0.508	1.157
				F−stat for the joint significance of country specific equations							
	78.4***	36.6***	58.9***		110.65***	128.93***	42.81***		1891.33***	2911.95***	180.2***
Breusch-Pagan test for the contemporaneous covariance independence between the error terms chi2 = 116.451; p-value = 0.000											

Note: *** significant at 1% l.s.; ** significant at 5% l.s.; * significant at 10% l.s.

Source: Authors' calculations.

With regard to the determinants of precautionary excess liquidity, more variables appear to be significant in Estonia and Kosovo than in the Czech Republic (where none of the explanatory variables turned out to have a statistically significant impact). As expected, the reserve requirement ratio (*rrr*) appears with a negative coefficient for all three countries, which is in line with the theory suggesting that rising the reserve ratio (which are typically non-remunerated in these countries), also raises the overall cost of holding reserves and thus, may induce banks to reduce their precautionary holdings of excess liquidity. However, this variable is significant only in the case of Estonia, which may be plausible because this ratio was unchanged throughout the period for the Czech Republic and Kosovo. There were two policy induced changes in the *rrr* in Estonia. The first one associated with an increasing concern with maintaining the stability of the financial system is likely to have caused increases in the *rrr* for prudential reasons at the beginning of 2007; the second one more of a gradual shift towards converging with the ECB reserve ratio of two percent.

The deposit interest rate (*idep*), approximating the funding costs of the banks, also appears to have reduced uniformly the precautionary excess liquidity, however it is statistically significant for Kosovo only. A one percentage point (pp) increase in the deposit interest rate would reduce the change in precautionary excess liquidity by 1.6 pp. This is not in line with orthodox theory suggesting that, ceteris paribus, when funding costs increase, banks are expected to hold larger amounts of excess reserves to prevent liquidity shortages. As noted above, banks in ETEs typically relied heavily on their domestic deposits as their main funding source. While deposit interest rates were relatively lower in the Czech Republic and Estonia, in Kosovo they sometimes reached 5 percent and thus may be considered to be relatively costly. Thus, orthodox theory may not necessarily explain the behaviour of excess liquidity with regard to the funding costs in ETEs. If the cost of acquiring liabilities increases, then the quantity acquired should fall because banks would rather use up their own excess funds to finance loans or other investments. The insignificant and low coefficients on changes of deposit interest rates for the Czech Republic and Estonia may reflect, amongst other factors, the convergence process of interest rates in the Eurozone. This may imply that deposit interest rates reflect low funding costs. The volatility of credit (*Volcred*) appears to have no significant impact on the precautionary excess liquidity. The volatility of deposits (*VolDep*) is significant only for Kosovo. The negative coefficient is not in line with theory suggesting that as volatility of deposits increases banks act to insure themselves against shortfalls in liquidity by increasing the precautionary excess liquidity. However, Saxegaard (2006) also reports a negative coefficient on this variable. A 1 pp change in the volatili-

ty of deposits, ceteris paribus, would reduce the change in precautionary excess liquidity by 1.4 pp, implying that banks in Kosovo try to protect themselves from sudden surges in the demand for cash when deposits are more volatile and less predictable. The volatility of the growth rate (*Volgdp*) is only significant in the case of Kosovo and the coefficient has the expected sign. A one unit increase in the volatility of growth rate, ceteris paribus, would increase the insecurity regarding the economic performance thus increase the change in precautionary excess liquidity by 0.9 pp.

The changes in non-performing loans ratio (*NPLs*), approximating a risk measure for banks, is statistically significant in the Estonia and Kosovo cases, nevertheless, the respective coefficients have opposite signs. As expected, a one pp increase in the change of NPL rate would, ceteris paribus, induce banks to increase the change in precautionary excess liquidity ratio in Kosovo by 0.4 pp. In Estonia, the change in the NPL ratio would, other things being equal, reduce the increase in precautionary excess liquidity by 2.9 pp. This finding is not in line with expectations, since higher NPLs reduce the expected income of banks thus inducing them to lend less and hold more excess reserves. One explanation may be weak liquidity management skills (Murthi, Srinivasan, & Kalyanaram, 1996) and a failure to properly monitor and screen loan applications. Secondly, regardless of the rising NPLs which may also reflect past decisions on the issuance of the loans that appear in current financial reports of the banks, deposit flows have been lower post-crisis, so banks have had to use their own excess funds to expand lending. The changes in the ratio of equity to assets (*Eq*) appear to induce banks to hold less precautionary excess liquidity, although significant only for Kosovo. This finding is in line with expectations since equity already serves as a precautionary buffer, albeit for longer term obligations. Meanwhile, additional equity requirements are policy-induced restrictions on the banks, i.e. restricted funds that banks cannot use for doing business, so they also represent additional costs. Therefore, when required to increase their equity to assets ratio, banks may want to hold less precautionary excess reserves. Finally, the year dummies controlling for the common shocks across countries are significant in the two countries severely hit by the financial crisis in 2008, the Czech Republic and especially Estonia. In 2008, the positive year dummy coefficients indicate that banks in the Czech Republic and Estonia accumulated more precautionary excess liquidity as compared to the benchmark year of 2004. Also, 2012 and 2013 appear significant having in mind that they represent periods of stagnation following a recuperating period.

The determinants of involuntary excess liquidity seem to have a higher impact on the behaviour of excess liquidity for the Czech Republic than in the other

two countries (CZ (2) in Table 3). The change of deposits to GDP ratio (*Dep*) appears to negatively impact the excess liquidity to assets ratio in all three countries, even though this impact is statistically significant only in the case of the Czech Republic. A one pp change in deposits to GDP ratio reduces the change in involuntary excess liquidity ratio by 0.09 pp. This finding is not in line with theory suggesting that an increase in deposits is thought to reflect in an increase of involuntary excess liquidity. The government deposits to GDP ratios (*Govdep*) are statistically insignificant in all three countries. This may be due to the government deposits being much lower than overall deposits and thus having an insignificant impact. The effect of a change in the credit to GDP ratio (*Cred*) also has a statistically insignificant effect on the accumulation for the changes of involuntary excess liquidity to assets ratio in all three countries. Even though *Cred* is the only common variable linking excess liquidity with the output gap, its impact does not appear to be dominant in explaining the accumulation or reduction of the involuntary excess liquidity. As will be discussed below, this may partially be due to other external factors influencing the whole system. The estimated results also indicate an insignificant impact with regard to the loan interest rate (*iloan*).[3] The FDI to GDP ratio (*FDI*) is highly significant for the Czech Republic and Estonia, but insignificant for Kosovo. This result is to be expected, because the FDI inflows represent a more important funding source in the former two countries. A one pp increase in the FDI inflows to GDP ratio would increase the changes in involuntary excess liquidity by 0.35 pp in the Czech Republic, while decreasing it in Estonia by 0.19 pp, ceteris paribus. In the case of Estonia this result may be picking up the after-crisis behaviour when the FDI inflows reduced drastically.[4]

Considering the likely importance of a rule of law index (*RLI*) in the transition context, the preferred SUR specification includes such an index in all the equations. Nevertheless, consistent with the theory, the *RLI* index turns insignificant in the precautionary excess liquidity and the output gap equations. Furthermore, most of the model remains similar to the main specified SUR model, regarding the coefficients sign, size and significance. The generated results re-

[3] The inclusion of a squared lending interest rate variable in the model to account for a possible non-linear relationship between excess liquidity and lending rates was considered. However, it turned out to be insignificant. Saxegaard (2006) argued that the loan rate may be sticky because of imperfect information about potential new borrowers. Sticky loan rate may also be case in ETEs because lending interest rates kept broadly to the same level for over a decade.

[4] To pick up the post-crisis behaviour of the FDI to GDP in involuntary excess liquidity, this variable was also interacted with the intercept shift dummy. However, this interaction term turned out to be statistically insignificant as a separate variable, as well as when tested for joint significance.

garding the RLI indicate quite a similar impact on Czech and Estonian involuntary excess liquidity, quantitatively and qualitatively. On the other side, this index seems to have a profound impact on the Kosovo banking system. The relatively large coefficient magnitude in all three countries can be explained by the relatively small range of the *RLI* index (from −2.5 to +2.5). Thus, the interpreted results for the *RLI* indicator will only be in qualitative terms. A better perception of the extent that private agents have confidence in and abide with the legal, institutional and political framework is expected to contribute to reducing the asymmetric information and moral hazard problem between banks and borrowers and, as such, induce the banks to issue more loans and hold less excess reserves. However, the situation in transition economies may be more complex. This is because with better institutional and legal frameworks, higher transparency may be required from borrowers during the application process, such as improved financial reporting and tax paying evidence. Hellström (2009) found that the quality of financial accounts in transition economies was lower than in the developed countries (with special reference to the Czech Republic), which directly impacts on the investors' decisions. Based on practitioner's knowledge, enterprises in Kosovo, tend to hold two types of accounting reports: one with deflated numbers for the tax authorities, and another one with inflated profits for the banks when applying for a loan. Therefore, better institutional and judicial institutions in transition economies would require the fuller disclosure of information and given the unrealistic situation prevailing (much lower profits and thus lower repayment capabilities), would actually induce banks to increase the involuntary excess liquidity holdings. Thus, the positive sign of the RLI may be explained in this sample.

The results presented in Table 3 indicate that the determinants of the output gap to GDP ratio act in a similar fashion in the Czech Republic and Estonia but differently in Kosovo. The changes in credit to GDP ratio appear to negatively impact the output gap in Estonia and Kosovo, however, the impact is significant only in the latter. This finding is in line with the arguments of Biggs & Mayer (2013) who suggest that the business cycle and the change in credit, i.e. 'credit impulse', are positively correlated. As expected, a higher credit impulse is expected to raise consumption and investment, therefore reflected in faster growth and a lower output gap. The credit impulse variable is significant only in the Kosovo case. On the other side, as expected, the results suggest that the output gap of Eurozone is highly and positively correlated with the output gap to GDP of the Czech Republic and Estonia. A one pp increase in the (below potential) output gap of the Eurozone, on average, would increase the (below potential) output gap in the Czech Republic and Estonia by 0.3 and 0.7 pp, respectively. This result is as expected, given that both the Czech Republic and Estonia are

part of the EU. Furthermore, from 2011 Estonia was also part of the Euro area. Therefore, these two countries, besides having close external sector relations with Eurozone countries, are also closely linked due to similar or converging towards the same policy frameworks regarding monetary, financial and fiscal sectors. This finding is in line with the findings of Moinescu (2012) who also finds that the Eurozone output gap has the largest impact (and positively correlated) on these countries' output gaps.

Overall, the SUR model does not provide a fundamental variable that would affect both, excess liquidity and the output gap significantly and in the same direction. The only variable in common, the credit to GDP variable (Cred), is insignificant in most cases and with opposite signs in the excess liquidity and output gap equations. Given the high explanatory power of these equations but the relatively low significance of the individual variables in the model, the model seems to be more correlated via the unobserved determinants rather than via the observables. The year dummies picking up otherwise unobserved factors impacting both excess liquidity and the output gap suggest the following pattern: for the Czech Republic, the unobserved factors prior to 2008 appear to negatively impact the excess liquidity and positively the output gap, whereas from 2008 onwards (except for 2013) these unobserved factors act as a system, consistently pushing the two variables to increase. In Estonia the pattern is less clear, however in 2008 the unobserved factors act in opposite directions, whereas in 2012 and 2013 these factors seem to reduce both, excess liquidity and the output gap. In the case of Kosovo, the underlying unobserved factors in most cases seem to reduce excess liquidity while inducing an increase in the output gap.

In addition to the common and specific observable factors, it was found that the unobserved factors driving the output gap and excess liquidity jointly as a system were even more pronounced than the observed part of the model. A careful analysis of the correlations in the Breusch–Pagan test, as well as information picked up by the year dummies (which do not encompass information on any specific policy variable), all indicated that the output gap and excess liquidity were jointly affected by the unobserved part of the model, be it in the same or opposite direction. The year dummies serve as evidence indicating that both types of excess liquidity (precautionary and involuntary) and the output gap have common determinants, picking up common global events. This is to be expected, given that all three countries in the sample are small open economies and they are also prone to common external developments, which once more support the idea that they are linked via the common observed and unobserved factors. Therefore, in this system the linkage comes from either unobserved non-systematic events in the error term, or unobserved systematic influences captured by the period effects.

5. Conclusions

Compared to previous studies investigating the output gap and the determinants of excess liquidity, this investigation was novel in two respects. Firstly, a new conceptual relationship between the output gap and excess liquidity was introduced and secondly, empirical evidence is presented using the system equation method Seemingly Unrelated Regression, not previously used in this context.

Initially, the aim of this study was to investigate whether underutilised excess liquidity is holding back bank lending and possibly impacting the output gap. However, it was theoretically argued that excess liquidity and the output gap are not necessarily in a causal relationship, but rather in a correlation relationship. Furthermore, the current study confirms the Krznar & Matheson (2017) findings that the output gap and excess liquidity are positively correlated. Nevertheless, the causation approach of Krznar & Matheson appears to be theoretically and empirically incorrect, since it does not take into account the endogenous nature of the two (these authors estimate a bivariate VAR model for comparison reasons only). Thus, the initial research question was rephrased to 'what is the relationship between excess liquidity and the output gap'? A critical assessment of theories that investigate the behaviour of the business cycle with respect to financial factors provided the background to the conduct of empirical analysis. For the latter purpose, macro-level data for three countries were used, including regulatory, financial, institutional and fiscal variables. This study found that treating the output gap and excess liquidity from a single causal point of view was conceptually misconceived. This is because, a correlation relationship indicates that both variables are an outcome of a wider system and do not necessarily cause each other. After due consideration, a System Equations approach, the SUR method, which accounts for endogeneity between output gap and excess liquidity was considered to be the most appropriate method. This approach allowed the equations of output gap and excess liquidity to be correlated via common observed and unobserved determinants.

One of the key findings of this analysis is that precautionary motive appear to have a more significant impact on excess liquidity in Kosovo and Estonia, while the involuntary motive for excess liquidity prevails in the Czech Republic. The external sector, as proxied by the Eurozone business cycle, appear to persistently push the business cycles in the Czech Republic and Estonia in the same direction, while domestic financial developments have the greatest impact on the business cycle in Kosovo. Another key finding is that there is no clear transmission mechanism from excess liquidity to the output gap, thus there is no simple causal relationship between the two. The precautionary and involuntary excess

liquidity and the output gap are more strongly linked via the unobserved common factors rather than by the common observables, indicating that they are located in a complex system.

The most important policy implication of this research is that since the relationship between output gap and excess liquidity is not causal, reducing excess liquidity will not necessarily lead to a smaller (negative) output gap. This is because, the output gap and excess liquidity are bound together in a correlation relationship, which means that both are an outcome of the general state of the economic activity, i.e. both represent under-utilised resources in a depressed economy. If the relationship between output gap and excess liquidity is one of correlation, then instead of pushing banks to reduce excess liquidity and increase lending so the output gap may decrease, other 'third party' factors need to change so that these two variables of interest will improve. However, no potential policy variable was identified in this analysis. There seems to be no straightforward policy framework informed by a clear transmission mechanism from one to the other. Therefore, a policy whereby the regulatory authority induces banks to reduce excess liquidity in order to increase lending and thus decrease the output gap may not have the desired effects or may even produce quite unintended consequences, such as causing inefficient lending e.g. a new wave of bad loans or causing a higher (negative) output gap. Instead, a more complex policy framework is needed where other factors outside of the system need to be identified that are capable of pushing both variables in the desired direction. For this reason, additional empirical analysis is needed to fully understand the underlying relationship between output gap and excess liquidity. Future investigations should focus on the structural changes needed to improve business cycles. In addition to regulatory, financial and fiscal variables in the model, in the future research should consider variables that reflect the innovation potential of analysed economies.

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References

Agenor, P., Aizenman, J., & Hoffmaister, A. W. (2004). The credit crunch in East Asia: What can bank excess liquid assets tell us? *Journal of International Money and Finance*, *23*(1), 27-49. https://doi.org/10.1016/j.jimonfin.2003.08.008

Bernanke, B. S. (2007). *The Financial Accelerator and the Credit Channel* (Speech 296, Board of Governors of the Federal Reserve System, U.S.). Retrieved from https://www.federalreserve.gov/newsevents/speech/bernanke20070615a.htm

Biggs, M., & Mayer, T. (2013). *Bring credit back into the monetary policy framework!* (Political Economy of Financial Markets Programme). Frankfurt: Policy Brief.

Billmeier, A. (2004). Ghostbusting: Which output gap measure really matters? (IMF Working Paper, No. 146). Retrieved from https://www.sant.ox.ac.uk/sites/default/files/pefmcreditpolicybrief.pdf

Borio, C., Disyatat, P., & Juselius, M. (2013). Rethinking potential output: Embedding information about the financial cycle (BIS Working Paper, No. 404). Retrieved from http://www.bis.org/publ/work404.htm

Brunnermeier, M. K., & Sannikov, Y. (2014). A macroeconomic model with a financial sector. *American Economic Review*, *104*(2), 379-421. https://doi:10.1257/aer.104.2.379

Carvalho, A., Nepal, R., & Tooraj, J. (2016). Economic reforms and human development: evidence from transition economies. *Applied Economics*, *14*(48), 1330-1347. https://doi.org/10.1080/00036846.2015.1100251

European Commission (2001). Economic Policy Committee: Opinion by the Economic Policy Committee on the Commission Communication. Structural Indicators, ECFIN/01/752-rev1. Retrieved from http://ec.europa.eu/economy_finance/publications/pages/publication6568_en.pdf

Efendic, A., Pugh, G., & Adnett, N. (2011). Confidence in formal institutions and reliance on informal institutions in Bosnia and Herzegovina: An empirical investigation using survey data. *Economics of Transition*, *3*(19), 521-540. https://doi:10.1111/j.1468-0351.2010.00408.x

European Bank for Reconstruction and Development. (2009). Business Environment and Enterprise Performance Survey (BEEPS), Panel Questionnaire 2009. Retrieved from http://ebrd-beeps.com/panel-data/

European Central Bank. (2015). *Statistical bulletins 2000-2014*. Retrieved from http://sdw.ecb.europa.eu/reports.do?node=1000004045

EUROSTAT (2015). *Quarterly National Accounts*. Retrieved from http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=namq_10_gdp&lang=en

Furlanetto, F., Gelain, P., & Taheri Sanjani, M. (2014). *Output gap in presence of financial frictions and monetary policy trade-offs* (Working Paper, No. 128). Washington, DC: IMF.

Gordon, R. J. (1997). The time-varying NAIRU and its implications for economic policy. *The Journal of Economic Perspectives*, *11*, 11-32. https://doi:10.1257/jep.11.1.11

Hay, J. R., Shleifer, A., & Vishny, R. W. (1996). Toward a theory of legal reform. *European Economic Review*, *40*, 559-567. https://doi.org/10.1016/0014-2921(95)00069-0

Hashi, I., & Toçi, V. (2010). Financing constraints, credit rationing and financing obstacles: Evidence from firm-level data in South-Eastern Europe. *Economic and Business Review*, *1*(12), 29-60.

Hellström, K. (2009). *Financial accounting quality in a European transition economy: The case of the Czech Republic* (Doctoral dissertation, Centre for Financial Analysis and Managerial Economics in Accounting). Retrieved from https://ex.hhs.se/dissertations/220630-FULLTEXT01.pdf

Kastrati, A., Pugh, G., & Toçi, V. (2017). Output gap in transition economies using unobserved components method: The case of Czech Republic, Estonia and Kosovo. *Economic Thought and Practice*, *1*(23), 477-500.

Kennedy, P. (2009). *A guide to econometrics*. Oxford: Wiley Blackwell.

Krznar, I., & Matheson, T. D. (2017). *Financial and business cycles in Brazil* (Working Paper, No. 17). Washington, DC: IMF.

Maddala, G. S. (1997). *Introduction to econometrics.* Hoboken, NJ: Wiley Press.

Moinescu, B. (2012). Credit flow, output gap and inflation: Nominal convergence challenges for the EU new member states. *Journal of Applied Quantitative Methods*, *4*(7), 1-10.

Morley, J. (2015). Macro-financial linkages. *Economic Surveys*, *30*(4), 698-711. https://doi:10.1111/joes.12108

Murthi, B. P. S., Srinivasan, K., & Kalyanaram, G. (1996). Controlling for observed and unobserved managerial skills in determining first-mover market share advantages. *Journal of Marketing Research*, *3*(33), 329-336.

Organization for Economic Co-operation and Development. (2010). *Counter-cyclical economic policy: Economics Department Policy Notes.* Retrieved from https://www.oecd.org/tax/public-finance/45105376.pdf

Raiser, M., DiTommaso, M. L., & Weeks, M. (2001). *The measurements and determinants of institutional change: Evidence from transition economies* (Working Paper, No. 60). London: EBRD.

Roubini, N. (2015). *Unconventional truth. Project Syndicate*. Retrieved from http://www.project-syndicate.org/commentary/unconventional-monetary-policies-and-fiscal-stimulus-by-nouriel-roubini-2015-02

Stiglitz, J. E., & Weiss, A. (1981). Credit rationing in markets with imperfect information. *American Economic Review*, *3*(71), 393-410.

Saxegaard, M. (2006). *Excess liquidity and effectiveness of monetary policy: Evidence from Sub-Saharan Africa* (Working Paper, No. 06(115)). Washington, D.C.: IMF.

Studenmund, A. H. (2006). *Using econometrics: A practical guide*. Boston: Addison Wesley.

World Bank. (2015). *Financial sector indicators*. Retrieved from http://data.worldbank.org/topic/financial-sector

Wooldridge, J. M. (2010). *Econometric analysis of cross section and panel data.* Cambridge: MIT Press.

Zellner, A. (1962). An efficient method of estimating seemingly unrelated regressions and tests for aggregation bias. *Journal of the American Statistical Association*, *298*(57), 348-368. https://doi/abs/10.1080/01621459.1962.10480664