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Credit Growth and Countercyclical Capital Buffers: Empirical Evidence from Central and Eastern European Countries

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Abstract:
Excessive credit growth is often considered to be an indicator of future problems in the financial sector. This paper examines the issue of how to determine whether the observed level of private sector credit is excessive in the context of the "countercyclical capital buffer", a macroprudential tool proposed in the new regulatory framework of Basel III by the Basel Committee on Banking Supervision. An empirical analysis of selected Central and Eastern European countries, including the Czech Republic, provides alternative estimates of excessive private credit and shows that the HP filter calculation proposed by the Basel Committee is not necessarily a suitable indicator of excessive credit growth for converging countries.

Keywords: Basel regulation, credit growth, financial crisis countercyclical buffer.

JEL: G01, G18, G21.

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1. Introduction

The Basel III reforms to the banking sector regulatory framework agreed in 2010 contain an important macroprudential element intended to dampen the potential procyclicality of the previous capital regulation. The Basel Committee on Banking Supervision (BCBS, 2010a) has introduced a "countercyclical capital buffer" aimed at protecting the banking sector from periods of excessive credit growth, which have often been associated with growth in systemic risk. In good times, banks will – in accordance with set rules – create a capital reserve which can then be used to moderate contractions in the supply of credit by banks in times of recession.

One region that recorded a boom in lending to the private sector in the lead-up to the global financial crisis was the Central and East European (CEE) countries.[1] The observed credit expansion was driven by many factors relating to both the demand and supply side of the credit market. Although the credit growth in these transition economies started from very low levels, the rate of growth in many countries has raised concerns about how sustainable such growth is in the medium term and whether it poses significant risks to the stability of the financial sector.

This paper aims to draw on the historical experience of the CEE countries with credit expansion and, using the method proposed by the Basel Committee, to calculate and discuss what the countercyclical capital buffer level these countries might have had if the newly proposed regulation on the creation of capital buffers had existed before the crisis. The motivation for this analysis is to determine how suitable the Basel Committee's proposed method for calculating excessive credit using the Hodrick-Prescott (HP) filter is for the countries of Central and Eastern Europe. In these countries, rapid credit expansion may simply mean convergence to values typical of the advanced nations, and not excessive borrowing. For this type of country, we propose to use a method involving estimation of the equilibrium private credit level computed using economic fundamentals. Given that different countries have different characteristics, the Basel Committee allows national regulators to exercise discretion and specify different methods for setting the countercyclical capital buffer.

The paper is structured as follows. Section 2 discusses the risks associated with excessive credit expansion, looks at the situation in selected EU countries before the global financial crisis broke out, and briefly examines the logic of the countercyclical capital buffer as proposed by the Basel Committee. Section 3 takes a closer look at the disadvantages of applying the HP filter method and proposes an alternative technique for calculating excessive credit – the out-of-sample method. Both these calculation methods are then used on data for ten CEE countries. Section 4 illustrates the different implications of the alternative indicators of excessive credit growth for the countercyclical capital buffer settings of the banking sectors of the countries analysed. The conclusion attempts to generalise the results of the analysis and formulate recommendations for the national authorities responsible for macroprudential policy.

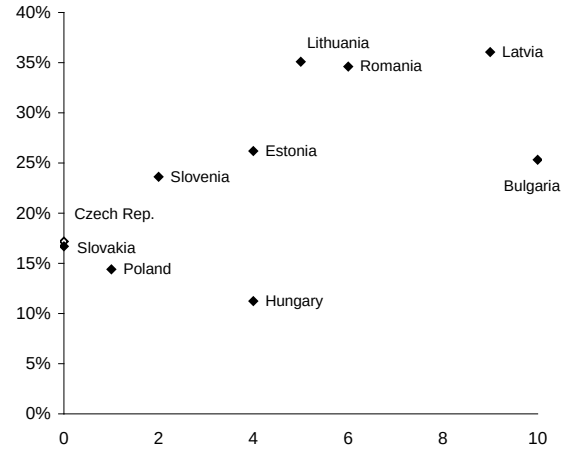
[1] In this study, the group of CEE countries consists of Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia.

2. Excessive Credit Growth

Credit growth in CEE countries has caught the attention of many studies over the past decade. These studies have tried to identify not only the determinants of credit growth, but also its equilibrium level (Enoch and Ötker-Robe, 2007; Égert et al., 2006). The credit boom in some transition economies was strong enough to raise concerns about whether this trend was simply a manifestation of convergence to the average credit levels in advanced nations, or whether it was a case of excessive growth posing a risk to macroeconomic and financial stability (Hilbers et al., 2005). The central banks and supervisory authorities of some countries even assessed the situation as critical and in 2004–2007 introduced a series of tools for limiting credit growth (Dragulin, 2008; Herzberg, 2008). These tools generally included monetary policy tools (increases in official interest rates or reserve requirements justified by policymakers with reference to "rapid credit growth"), regulatory measures (increased risk weights on selected loans, restrictions on loan-to-value and/or debt-to-income ratios, increases in provisioning rates, tighter regulation of large exposures and tougher rules on collateral valuation), soft non-binding measures (the introduction of guidelines and recommendations) and also very "hard" administrative restrictions on credit portfolio growth (as applied, for example, in Bulgaria). The extent of the measures, as measured by the number of different tools used to limit credit growth in individual countries, was correlated to a large degree with the credit growth rate (see Figure 1). While the number of policy measures might not be the best proxy for the degree of policy interventions, given the available data and information it at least serves as a relatively reliable indicator of policymakers' effort. At the same time, it is difficult to assess the effectiveness of the tools used, since most of them were applied just before the global financial crisis erupted. The decline in credit growth observed since then may thus have been due more to the sharp economic contraction and reduced demand for loans. The studies conducted up to now tend to conclude that the aforementioned tools are pretty ineffective and that credit booms can be limited in only a very limited way during good times (Kraft, 2005; Herzberg, 2008).

Figure 1: Credit Growth and Number of Tools Applied to Limit Credit Booms

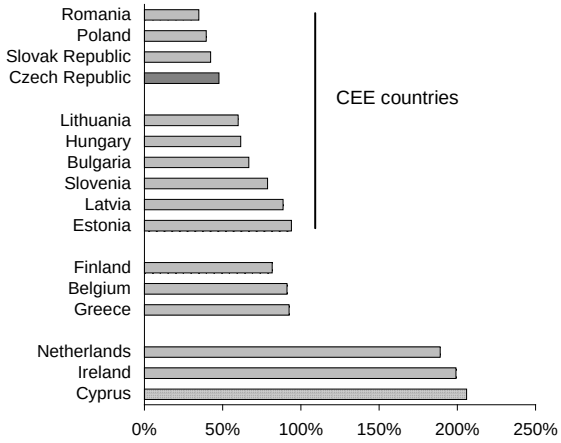
(x-axis: number of measures; y-axis: average year-on-year real credit growth in 2005–2007)



Source: IMF, national authorities´ websites

Figure 2: Private Credit Ratios in Selected EU Countries

(x-axis: credit-to-GDP ratio as of 2007 Q4)



Source: IMF IFS, authors´ calculations

Despite the comparatively strong credit boom observed in 2003–2007, the stock of loans in many CEE countries in the pre-crisis year 2007 was still relatively low, especially in comparison with other EU countries (see Figure 2). Nevertheless, in terms of the private-credit-to-GDP ratio, some countries of the region had reached levels typical of some euro area countries. The question therefore arises whether they were already showing excessive credit levels. One limitation of this comparison is that is based solely on data on domestic bank loans. This indicator understates total private credit, as it neglects loans provided by non-bank financial intermediaries and loans provided directly from abroad.

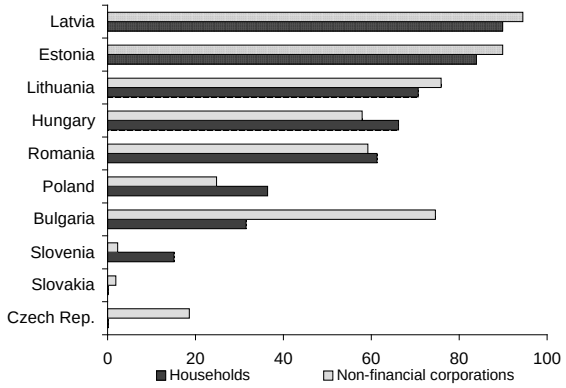
Excessive credit growth can threaten macroeconomic stability in many ways. Given that lending supports consumption, growth in private sector loans can over-stimulate aggregate demand beyond the framework of potential output and cause the economy to overheat, with knock-on effects on inflation, the current account deficit, interest rates and the real exchange rate.

At the same time, lending institutions can, in an economic growth phase, have over-optimistic expectations about borrowers' future ability to repay their debts and therefore very often lend to high-risk borrowers. The upshot is that the bulk of "potentially" bad loans arise during upward phases of the credit cycle. In some CEE countries, private loans were provided in foreign currency because foreign interest rates were lower (see Figure 3). This further increases the risks for the banking sector, because if the domestic currency depreciates, the volume of credit expressed in the domestic currency rises, debt servicing costs go up, and foreign exchange risk turns into credit risk. In many cases, therefore, the aforementioned measures to contain credit growth were targeted primarily at reducing growth in foreign currency loans (Steiner, 2011). Furthermore, if a domestic credit boom is financed from foreign sources, as was the case in several CEE countries (except for the Czech Republic, Slovakia and Poland), the risk of the domestic banking sector having insufficient balance-sheet liquidity (roll-over risk) increases. In economic bad times, domestic banks face a high risk of outflows of short-term foreign funds that cannot be financed by

the sale of liquid assets (Hilbers et al., 2005).[2] Although this study, focusing on excessive credit growth, would benefit from an analysis of different loan types, such detailed disaggregated data is not available in a sufficiently long time series for the countries under examination.

Figure 3: Shares of Foreign Currency Bank Loans

(as of end-2009; as % of total loans to given sector)

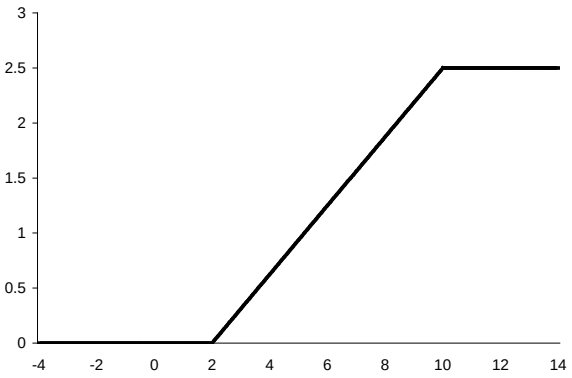


Note: Slovak Republic and Slovenia were already members of the euro area in 2009, so their foreign currency loans comprise currencies other than EUR.

Source: ECB

Figure 4: Countercyclical Capital Buffer

(% of RWA as function of credit-to-GDP gap in p.p.)



Source: CNB

A bursting of the credit bubble and negative macroeconomic developments, leading to external financing constraints and growth in non-performing loans (NPLs), can therefore cause the banking sector serious difficulties. IMF (2004) estimates that more than 75% of credit booms were followed by banking or currency crises. This fear is consistent with existing studies in the field of early warning signals, according to which excessive credit growth can be considered one of the most reliable indicators of future problems in the banking sector (Borio and Lowe, 2002; Borio and Drehmann, 2009; Jimenez and Saurina, 2006; Saurina et al., 2008).

As part of the preparation of the new Basel III regulatory framework for banks, the Basel Committee (BCBS, 2010) has proposed several tools for reducing the procyclical behaviour of the banking sector.[3] One of the key tools is a proposal for banks to create countercyclical capital buffers during credit booms.[4] Such buffers, expressed as a percentage of risk-weighted assets (RWA) and covered by high quality capital (Tier 1, or even core Tier 1), would be set by the regulator within the range of 0% to 2.5%. As a guide for the setting of the buffer, the Basel Committee is proposing to use and regularly publish the difference between the current private

[2] In this regard, the Czech Republic has a very favourable deposit-to-loan ratio. For a comparison with other EU countries, see CNB (2010, section 1.3.1).

[3] The issue of procyclicality of the financial system and its sources and potential consequences was discussed in a thematic paper in last year's CNB Financial Stability Report 2009/2010 (Geršl and Jakubík, 2010).

[4] With regard to the objective of reducing the procyclicality of the financial system, the Basel Committee stated explicitly in its December 2009 consultative document (BCBS, 2009) that the aim of this buffer was to "achieve the broader macroprudential goal of protecting the banking sector from periods of excess credit growth".

credit ratio as a percentage of GDP and its trend value estimated using the HP filter (the "credit-to-GDP gap"). However, regulators may also use other methods to calculate the trend and other variables, such as the prices of various relevant assets and credit conditions. In bad times, this capital buffer would be "released" in order to slow any fall in the credit supply and thereby reduce the procyclicality of the financial system.

The Basel Committee document itself (BCBS, 2010b) proposes to use the aforementioned guide as follows. The capital buffer would start to be created when the credit-to-GDP gap exceeded two percentage points. If the gap reached 10 percentage points or more, the buffer would reach the aforementioned maximum of 2.5% of RWA. For gaps of between 2 and 10 percentage points, the buffer would vary linearly between 0% and 2.5%. For example, for a gap of six percentage points the buffer would be 1.25% of RWA (see Figure 4). For cross-border exposures, the buffer set by the regulator in the foreign jurisdiction would apply. For cross-border banking groups, the capital buffer would be applied on both a solo and a consolidated basis.

It became clear during the discussion phase within the Basel Committee that a simple filtering technique would in many cases not necessarily lead to reliable estimates of excessive credit, so the final version of Basel III (BCBS, 2010b) gives regulators considerable discretion to set the buffer. The primary aim of the buffer, however, is not to restrict credit growth, but to create a capital reserve to give the banking sector greater protection from sudden changes in the credit cycle. At the same time, the Basel Committee documents emphasise the complementarity of this buffer with other macroprudential tools (BCBS, 2010b, p. 5), such as various limits on key indicators of borrowers' ability to repay loans (the loan-to-collateral and loan-to-income ratios).

3. Methods for Estimating the Equilibrium Credit Level

A major problem in constructing an excessive credit growth indicator is determining what level of credit is excessive and might pose a threat to the financial sector. One traditional method is to apply the statistical Hodrick-Prescott (HP) filter, which obtains the trend from a time series. By comparing the actual credit-to-GDP ratio with its long-term trend obtained using the HP filter we can then estimate whether or not the credit level is excessive. This method is used quite routinely in the literature (Borio and Lowe, 2002; Borio and Drehmann, 2009). Hilbers et al. (2005), for example, consider a credit-to-GDP gap of greater than five percentage points to be an indicator of excessive credit in the economy.

Although the HP filter method is used quite often to determine trends in macroeconomic variables, it does have its drawbacks. A time series trend is dependent to a significant extent on the length of the chosen time series and the calculation is very sensitive to the smoothing parameter (lambda). A big problem as regards practical application in macroprudential policy is "end-point bias", which generates a highly unreliable estimate of the trend at the end of the data period.[5] Macroprudential policy, which, by contrast, requires assessment of the trend on the basis of current (i.e. end-of-period) data, would therefore be reliant on indicators subject to a high degree of uncertainty. In the case of some CEE countries with relatively short time series, credit

[5] One way of dealing with end-point bias is to extend the time series into the future by means of prediction. This, however, can introduce further uncertainty into the estimate linked with the quality of the prediction.

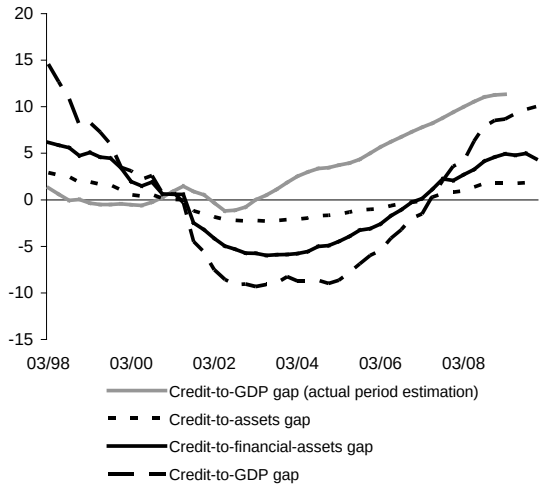
growth is incorporated directly into the trend itself by the HP filter, i.e. excess credit growth is counted as a trend (Cottarelli et al., 2005). Another relevant question is whether the credit ratio should take into account other denominators besides GDP, such as financial assets or total assets of the private sector. Although GDP is correlated to a significant extent with private sector income and therefore serves as an indicator of the ability to repay a given amount of loans, holdings of financial assets (deposits and securities investments) and non-financial assets (e.g. real estate) are also relevant to the evaluation of excessive credit.

Figure 5 presents credit gaps with alternative denominators (GDP and financial assets and total assets of the private sector) calculated using the HP filter on data for bank loans in the Czech Republic with a high lambda parameter equal to 400,000. Such a high value of lambda was proposed in Basel III with the argument that the credit cycle is usually longer than the business cycle. The filter is applied to quarterly data for the period 1998–2010, which, however, is regarded as relatively short from the international perspective (Basel III recommends at least a 20-year period). The estimates indicate that the current level of bank loans is below the long-term trend. However, the trend estimate is subject to a range of problems related to the short time series and above all to extraordinary factors linked with a fall in credit volume in 1998–2002 caused by a banking crisis in the 1990s and the clean-up of bank balance sheets ahead of the privatisation of large banks.

As regards simulating possible macroprudential policy in the past, it makes more sense to apply the HP filter recursively, i.e. in each past period using only the data that were available in that period (at the end of 2005, for example, the trend value and therefore also the gap between the observed credit level and the trend is calculated on 1998–2005 data). This simulates the situation that the macroprudential policy-maker would hypothetically have found itself in had it been required to decide whether excessive credit growth was emerging. The calculated credit gaps expressed as a percentage of GDP indicate that the Czech Republic would have found itself in a situation of excessive credit as early as 2004 (see Figure 5). However, the aforementioned drawbacks of the HP filter play an even greater role in the calculated gap, as the problem period of 1998–2002 influences the trend.

Figure 5: Credit Gaps in the Czech Republic with Alternative Denominators

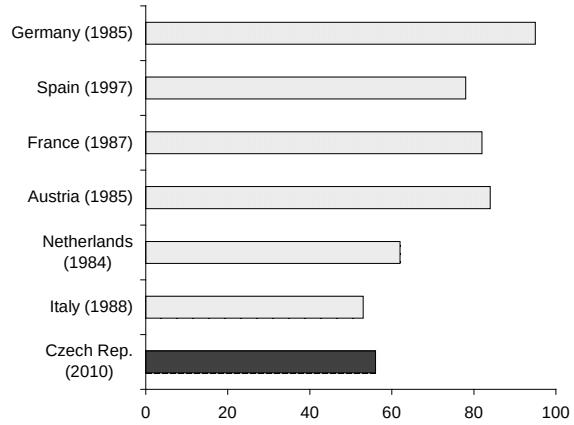
(in %)



Source: CNB, authors´ calculations

Figure 6: Credit-to-GDP Ratios for a Similar Level of Economic Development

(in %; GDP per capita, in PPP, constant 2005 international $; approximately $22,500 for the Czech Rep as of 2010)



Source: IMF IFS, WB WDI, authors´ calculations

The main criticism of the HP filter technique, however, is that it does not take into account economic fundamentals that affect the equilibrium stock of loans. An alternative method is to estimate the equilibrium private credit level in relation to key economic variables (such as the level of development of the economy measured in terms of real GDP per capita).This method says that if GDP per capita – as a proxy for the standard of living of an economy – is the main and only economic fundamental, all countries with the same level of development should have a similar equilibrium credit level. Poorer countries should have a lower equilibrium credit level than wealthier countries. A positive linkage between the credit-to-GDP ratio and the economic development of a country is referred to as financial deepening (see Terrones and Mendoza, 2004). A comparison of bank loans as a percentage of GDP for the Czech Republic in 2010 and selected euro area countries in years when they were at a similar level of economic development indicates, in contrast to the HP filter findings, that the credit ratio in the Czech Republic is below the level consistent with its economic level (see Figure 6).

Other economic fundamentals besides the above-mentioned GDP per capita should also be considered as factors influencing the equilibrium credit level in a particular country, and a suitable econometric model should therefore be employed. However, given that the CEE countries started from very low private credit levels, the estimation of such a model on data for these countries would capture the rapid growth caused by convergence towards the average level of the advanced nations. As Égert et al. (2006, p. 14) point out, such estimated elasticities of the relationships between fundamentals and credit would be overstated. At the same time, the estimates would reflect not the equilibrium level, but only the present relationship between economic fundamentals and private credit.

For this reason, the existing literature suggests using out-of-sample (OOS) panel estimation, i.e. estimating the model on a different sample of countries ("in-sample countries") and applying the elasticities obtained to the data for the countries for which the equilibrium credit level is being estimated ("out-of-sample countries"). This approach assumes a priori that the stock of credit of the in-sample countries, which serve for estimating elasticities, is at equilibrium on average, which is quite a significant assumption. Therefore, one needs to choose a suitable group of "in-sample" countries that best meets the need to estimate the correct equilibrium relationships between economic fundamentals and private credit. The existing studies on this topic therefore normally use the developed countries of the EU or OECD as appropriate countries for comparison (Kiss et al., 2006; Égert et al., 2006). For this study, the advanced EU countries were used as in-sample countries. While a possible approach would be to narrow down the number of sample countries to the ones similar in structure to the CEE countries, the econometric methodology used and the availability of data in the time dimension do not allow us to significantly reduce the number of in-sample countries. However, owing to the current debate regarding the excessive debt of the PIIGS[6] countries, these countries were omitted from the calculation of the equilibrium credit level.[7]

However, to estimate the equilibrium elasticities for the given countries, the proper set of fundamental variables influencing the credit-to-GDP ratio must be found. As the analysis of possible credit determinants is beyond the scope of this paper, we refer to previous studies for a comprehensive discussion regarding possible credit determinants; see, for example, Égert et al. (2006) and the references therein. Based on these studies, we use data on aggregate household consumption, government debt, short-term interest rates, unemployment, inflation measured by the GDP deflator and the CPI index, and GDP per capita.

The data were mostly obtained from the International Monetary Fund's IFS (International Financial Statistics) database, which provides the required macroeconomic data with a sufficient history (which is vital for estimating long-run relationships). For this reason, we used data for a 30-year period (1980–2010). The available statistics on bank loans to the private sector were used as the credit indicator. As stated earlier, these statistics slightly underestimate the total credit of the private sector, as they do not include non-bank financial intermediaries (e.g. leasing) and cross-border loans.[8] However, as the financial system in CEE countries is primarily bank-based, using bank credit only should not introduce considerable bias into our estimates.

We applied a set of panel unit root tests for the above-mentioned variables, and some of them were found to be nonstationary in levels, i.e. I(1) processes. A more detailed summary of the results is provided in the Appendix. Further, cointegration was tested for selected groups of variables using the Johansen Fisher Panel Cointegration Test. The results confirmed one cointegration relationship between the credit-to-GDP ratio, the household consumption-to-GDP ratio and GDP per capita for the set of in-sample countries. As discussed above, the presence of the GDP per capita variable in the long-run relationship is desirable as it captures the different

[6] Portugal, Italy, Ireland, Greece and Spain.

[7] However, nations that are structurally quite different from the CEE countries, such as the United Kingdom, remain in the sample of control countries. This may skew the results of the analysis towards higher equilibrium credit values for a given set of economic fundamentals. Nevertheless, the method used (see later in the text) would control for the cyclical component of excessive debt in the sample of countries used.

[8] A detailed description of the available data is provided in the Appendix.

degree of wealth of the economy, which therefore also influences the equilibrium private credit level (Terrones and Mendoza, 2004).

A variety of econometric methods can be used for OOS estimation. Nevertheless, given the properties of the variables used, traditional panel methods run into the problem of nonstationary time series, mutual regression of which can lead to spurious results. The traditional solution to the problem of nonstationarity of variables involves differentiating them. This step allows us to obtain the short-run relationship between the variables by regression, but the longer-run relationship is lost in the differentiation. The long-run relationship between nonstationary variables can be better estimated if the variables are cointegrated. This fact is used by the ECM (error correction model) method, which estimates not only the long-run relationship between the cointegrated variables, but also the potential short-run deviations from this long-run relationship.

Based on the characteristics of the time series used and the character of our study, focusing on the long-term equilibrium credit level, we employ the PMG (pooled mean group) estimation method, introduced for panel estimates by Pesaran et al. (1999). The PMG estimator is an error correction form of the autoregressive distributive lag (ARDL) model, where the dependent variable in its first differences is explained by the lagged independent and dependent variables in both levels and first differences. This method can be used to estimate the long-run relationship between the credit-to-GDP ratio and other variables, which is identical for all countries, whereas the short-run adjustment to this long-run relationship can differ across countries. The PMG model therefore allows heterogeneity of the estimates for individual countries in the short run. However, the long-run relationship of the cointegrated variables is common to all the countries in the sample The equation is expressed as follows:

$$\Delta y_{i,t} = \rho_i (y_{i,t-1} - \sum_{h=1}^{v} \alpha_{i,h} x_{i,h,t}) + \sum_{j=1}^{p-1} \beta_{i,j} \Delta y_{i,t-j} + \sum_{h=1}^{v} \sum_{j=0}^{q-1} \gamma_{i,h,j} \Delta x_{i,h,t-j} + c_i + \varepsilon_{i,t} , \qquad \begin{matrix} i = 1,..., N, \\ t = 1,..., T, \end{matrix}$$

where y is dependent variable, x represents set of v independent variables, p and q represent maximum lags used, and α, β, c, and γ are estimated coefficients. Coefficient α represents the long-term relationship, which is specific for each cross-section in the MG estimator or the same for every country in the case of PMG estimator. Parameter ρ is the country specific error correction term, i.e. the speed of adjustment towards the equilibrium. For more details see Pesaran et al. (1999).

The long-term relationship of the given equation is taken as a cointegrated relationship, which was found for the credit-to-GDP ratio, the household consumption-to-GDP ratio and GDP per capita. We also employed a different set of other variables and their lags that might affect the short-run adjustment of the credit-to-GDP ratio to its long-run relationship. For example, the government debt-to-GDP ratio might capture any crowding out of bank lending to the private sector.[9] Also, the real interest rate, or changes therein, should, as the cost of financing, be in a negative relationship with the explained variable. However, these variables were not significant even at the 15% level.

[9] For this reason, we would expect a negative relationship between the government debt ratio and loans to the private sector. The fact that a less indebted government sector would be able to provide more significant support if the banking sector ran into serious problems is relevant for assessing whether the current private sector credit level is excessive with regard to financial stability.

The following equation gives the final estimates of the coefficients of the long-run relationship between the cointegrated variables and the values of the coefficients and the constant term in the short run, which are presented below as the mean of all the estimates for the countries concerned.[10]

$$\Delta (credit/gdp)_t = \underset{(**)}{-0.035}(credit/gdp_{t-1} - (\underset{(***)}{0.7}cons/gdp_t + \underset{(***)}{0.13}gdp/pop_t)) + \quad \}\text{long-run relationship}$$

$$+ \underset{(**)}{0.87}\Delta(cons/gdp)_t - \underset{(*)}{0.07}inf_t + \underset{(***)}{0.014} \quad \}\text{short-run deviations}$$

Note: *, ** and *** denote significance of the estimated coefficients at the 10, 5 and 1% levels respectively.

Credit/gdp represents the ratio of private sector credit to GDP, *cons/gdp* denotes the ratio of household consumption to GDP, *gdp/pop* is GDP per capita in dollar terms and *inf* is the change in the price level, expressed as the year-on-year change in the GDP deflator.

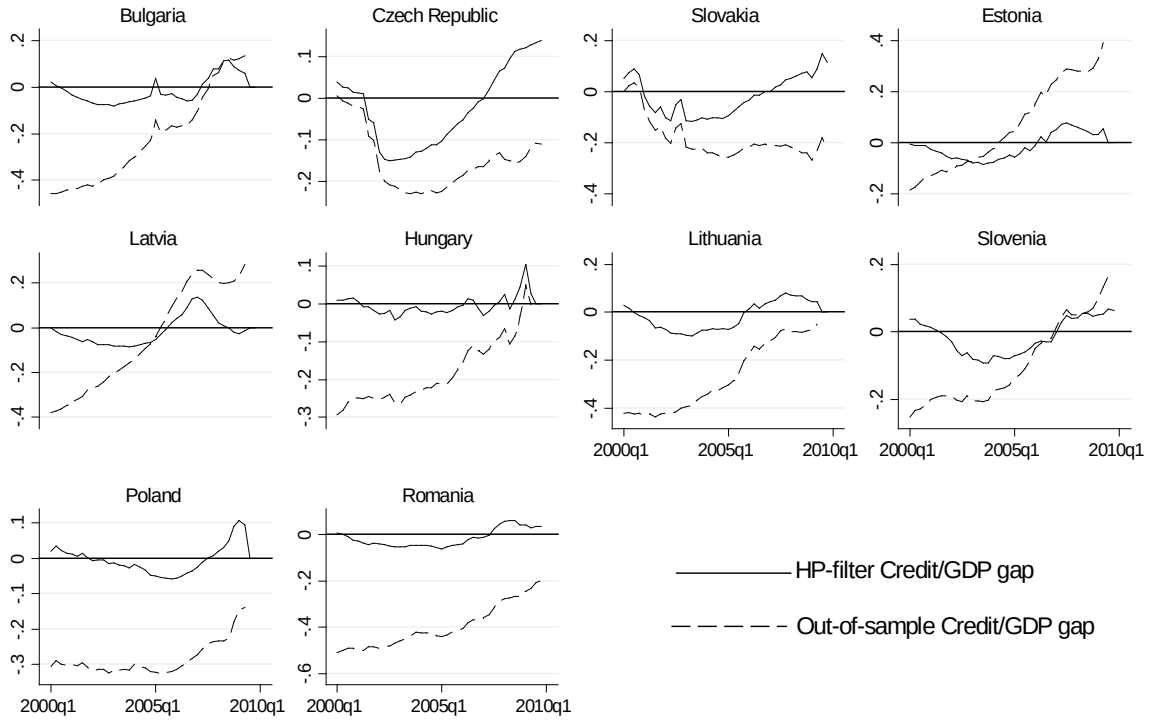
On the basis of the model, short-run deviations from the long-run trend are given as a function of the change in the consumption-to-GDP ratio and as a function of inflation. Based on the estimated coefficients, we can conclude that in the long-run relationship the credit-to-GDP ratio increases with increasing wealth of the economy and with an increasing consumption-to-GDP ratio. This factor then positively affects the explained variable in the short-run relationship as well, while inflation acts in the opposite direction. These conclusions are in accordance with intuition as regards the effects of the variables used on the credit-to-GDP ratio.

The estimated parameters of the model were applied to the data for the CEE countries to obtain values of the "equilibrium" credit ratio. As we are interested in the long-run fundamental-based level of the credit-to-GDP ratio, we used only the coefficients of the estimated long-run relationship between the cointegrated variables. This approach controls in parallel for the credit cycle of in-sample countries, as only equilibrium sensitivities between credit and economic fundamentals are extracted. The results indicate that the OOS calculations may in some cases imply significantly different conclusions regarding excessive credit compared to the HP filter values computed on the end-2009 data (see Figure 7). According to the HP filter, the credit-to-GDP gap indicates excessive credit in the recent period not only for the Czech Republic, but also, for example, for Slovakia, Lithuania, Romania and Poland, whereas the econometric estimate does not confirm this excessive credit level (values in the positive part of the chart indicates excessive private credit-to-GDP ratios). By contrast, Bulgaria, Estonia, Latvia and Slovenia now have excessive credit-to-GDP ratios according to the OOS method. It is clear, therefore, that the two calculation methods used give contradictory results in some cases.

[10] Based on the Hausman test, we cannot reject the null hypothesis of PMG being an efficient estimator, so PMG is preferred over its mean-group (MG) counterpart. The MG estimator is the simple non-weighted mean of the regression estimates for each country. The Hausman statistic $\chi^2(2)$ is equal to 0.9 (p-value = 0.637). Furthermore, only those variables which were significant at least at the 10% confidence level were kept in the estimated equation. Also, a more empirical approach was used as in Sekine (2001), so inflation is present in the short-run part of the equation but not in the long-run part. Moreover, the low value of the correlation coefficient between *cons/gdp* and *gdp/pop* indicates no possible multicollinearity problem.

Figure 7: Comparison of Credit-to-GDP Ratios for Various Calculation Methods

(in p.p.)



Source: IMF IFS, authors' calculations

As mentioned at the beginning of the study, further refinement of the estimates with respect to different loan types and their currency denomination would be desirable. However, current data limitations leave this additional analysis as a future research question.

4. Implications for the Size of the Capital Buffer

One of the questions associated with the new Basel III rules is whether the requirement to create a countercyclical capital buffer would contribute to the creation of capital reserves in those CEE countries which experienced significant problems in their banking sectors during the global financial crisis. In the following simulation, the size of the capital buffer is calculated for individual CEE countries using the two aforementioned methods, i.e. the HP filter method and the econometric OOS method. As the crisis did not manifest itself fully in the CEE countries until late 2008 and (in particular) 2009, i.e. after the collapse of Lehman Brothers in September 2008, we set mid-2008 as the starting point for the buffer calculation.

Table 1: Simulation of Countercyclical Buffer Calculation

(data as of 2008 Q2)

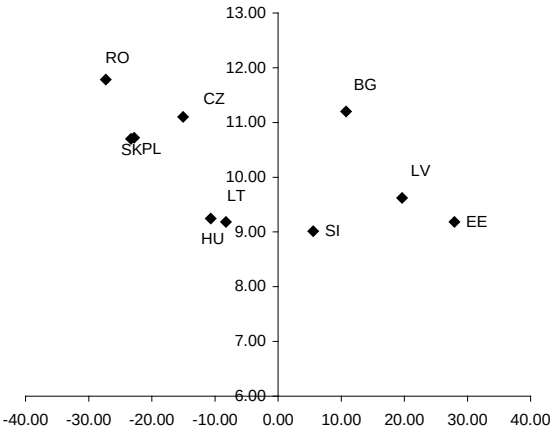
	Credit-to-GDP gap (%)		Countercyclical capital buffer (% of RWA)	
	HP filter	Out-of-sample	HP filter	Out-of-sample
Bulgaria	11.4	10.8	2.5	2.5
Czech Rep.	9.5	-15.0	2.4	0.0
Estonia	5.3	27.9	1.0	2.5
Lithuania	6.9	-8.3	1.5	0.0
Latvia	1.0	19.6	0.0	2.5
Hungary	-1.4	-10.7	0.0	0.0
Poland	3.0	-23.3	0.3	0.0
Romania	6.1	-27.3	1.3	0.0
Slovakia	6.1	-22.8	1.3	0.0
Slovenia	5.4	5.5	1.1	1.1

Source: authors´ calculations

The results of this simple simulation indicate that only four countries needed a countercyclical capital buffer according to the OOS method (Bulgaria, Estonia and Latvia needed the maximum possible 2.5% of RWA, while Slovenia needed 1.1% of RWA).

Figure 8: Credit-to-GDP gap via out-of-sample and Tier 1 ratio in 2008

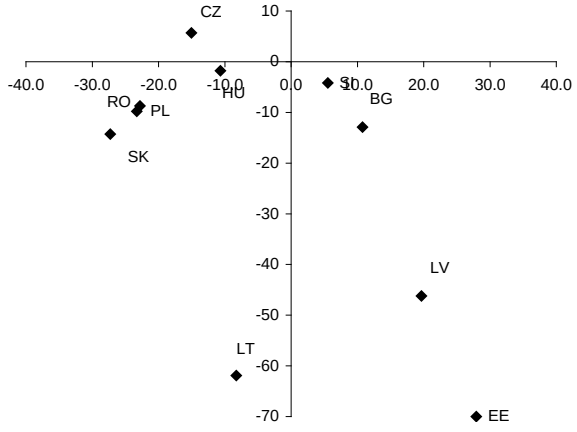
(gap in p.p.; Tier 1 capital ratio in 2008)



Source: IMF, authors´ calculations

Figure 9: Credit-to-GDP gap via out-of-sample and change in RoE

(gap in p.p.; change in RoE of banking sector in p.p.)



Source: IMF, authors´ calculations

It is relevant to ask whether the banking sectors of these countries had a sufficient capital reserve already in 2008 and were building a "would-be" capital buffer composed of high-quality loss-bearing capital (such as common shares and retained earnings, i.e. in essence a major part of Tier 1 capital) in anticipation of possible problems in the banking sector due to the credit boom. Figure 8 indicates that the countries identified by the OOS method as having excessive credit ratios (i.e. Estonia, Latvia and Slovenia) had relatively low Tier 1 capitalisation. The only exception was Bulgaria, which had set its minimum regulatory limit for total capital adequacy at a higher level (12%) than the traditional 8%, a fact which is also reflected in a higher observed Tier 1 ratio.

Several indicators can be used to compare the impacts of the crisis on the banking sectors of individual countries. In this paper, we look at the change in banking sector profits between 2008 and 2009 (in p.p. of return on equity, RoE), as profitability reflects both credit and market losses as well as the impact of possible higher funding costs on pre-provision income. A simple graphical analysis reveals that two countries identified by the OOS method as having excessive credit ratios (Estonia and Latvia) recorded large losses in their banking sectors in 2009, causing the RoE to decline dramatically (see Figure 9). Two of the countries identified, namely Latvia and Slovenia, saw their governments stepping in and providing public support in 2009. It is worth mentioning that the HP method would not have identified the problems building up in the Latvian and Estonian economies, which were hit hard by the crisis and, especially in the case of Latvia, suffered very high real costs.

5. Conclusions and Policy Lessons

This paper discusses methods for calculating excessive private sector credit in the Central and Eastern European countries and their suitability as regards the input needed to calculate the countercyclical capital buffer introduced by the Basel Committee on Banking Supervision (BCBS, 2010). The BCBS has recommended the use of an excessive credit indicator based on the Hodrick-Prescott (HP) filter technique as a guide for setting this buffer.

The paper shows that the HP filter-based calculation of the excessive credit indicator is not necessarily appropriate in certain cases. For the CEE countries in particular, rapid credit expansion may simply mean convergence to values typical of the advanced nations, and not excessive borrowing. As an alternative, the paper suggests considering excessive credit calculation methods that better reflect the evolution of a country's economic fundamentals. One such method is an out-of-sample technique based on estimates for advanced EU countries which are subsequently used to calculate the equilibrium credit levels of the CEE countries.

Although statistical filtering techniques such as the HP filter do have a role to play in the analysis as a first step in the interpretation of the available data, a broader set of indicators and methods should be employed to determine a country's position in the credit cycle. Our chosen method, based on economic fundamentals, would have better identified the problem of excessive credit in those CEE countries whose banking sectors recorded serious problems during the crisis. Although this calculation technique also has its limitations and could be further developed, it can at least be considered by the macroprudential authority responsible for setting capital buffers as a complementary indicator of excessive credit, especially for small converging economies.

There is a clear policy lesson arising from our analysis for macroprudential policy, in which countercyclical buffers will serve as one of the main instruments: national authorities cannot rely on a single indicator only and have to apply judgement, ideally supported by a variety of analyses that help them to identify the position of the economy in the credit cycle with respect to economic fundamentals. Given the current preparatory phase for the implementation of Basel III, including the countercyclical capital buffer, it is crucial to start building a robust, credible and transparent buffer regime that policymakers will apply through the credit cycle once Basel III is fully implemented.

This issue is especially important within the EU, as Basel III will be implemented in the EU countries as part of the Capital Requirements Directive ("CRD IV") and the Capital Requirements Regulation, which will be binding on all EU countries and will be centred on the idea of a "single rulebook" (or "maximum harmonisation"). The European Commission published rather advanced drafts of both documents in July 2011 and wants to finalise them by the end of 2011 or in early 2012. Throughout the proposal, the call for a single rulebook is clearly visible and national discretions are limited across a number of regulatory issues. In the area of capital buffers, while the July 2011 proposal gives national policymakers discretion in setting the buffer rate, it limits the discretion regarding the methods and variables used to calculate the buffer, as it requires the set of variables to be agreed on within the European Systemic Risk Board.[11] Nevertheless, the idea of "maximum harmonisation" is still under review in relevant European fora given that it could effectively prevent national policymakers from strengthening the prudential requirements and thus hamper their ability to conduct national macroprudential policy effectively.

[11] The proposal allows for a part of the buffer to be set independently of ESRB guidance, but this part could be reviewed only annually (as opposed to the quarterly review of the countercyclical buffer), the variables used could be of a structural nature and no international reciprocity would apply. Clearly, such a "structural" buffer at hand for national policymakers would not be a too effective instrument for macroprudential policy.

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Appendix

A. Detailed Description of the Data Time Series Used

Table A1

Time Series' Codes	Description
IMF IFS: AF.ZF...	National Currency per US Dollar average period
IMF IFS: 22D..Z IMF IFS: 32D..ZF...	Claims on private sector
IMF IFS: 32AN.ZW...	Claims on general government (net)
IMF IFS: 222A..ZF...	Claims on general government (net)
IMF IFS: 60P..ZF...	Interest rate
IMF IFS: 64...ZF...	Index CPI
IMF IFS: 67R..ZF...	Unemployment rate
IMF IFS: 99Z..ZF...	Population
IMF IFS: 96F..ZW...	Household consumption expenditures (incl. NPISH) *
IMF IFS: 99BIPZF...	Deflator HDP (base year = 2005)
IMF IFS: 99B..ZF...	Gross Domestic Product in the National Currency
WB WDI: NY.GDP.PCAP.PP.KD	GDP per capita, PPP (constant 2005 international $) **

Note: *NPISH = Non-Profit Institutions Serving Households

** Linearly interpolated from yearly to quarterly frequency

Source: IMF IFS Database, WB WDI Database

Time series of interest rates for some countries were completed using the ECB and Eurostat databases and data provided by national central banks.

B. Panel Unit Root Tests

The standard set of panel unit root tests was applied, i.e. Levin, Lin and Chu (2002), Breitung (2000), Im, Pesaran and Shin (2003) and Fisher-type tests using ADF and PP tests – see Maddala and Wu (1999) and Choi (2001). Since the set of tests generates extensive output, the results are presented parsimoniously as a summary table for particular variables. However, detailed results are available upon request.

Table A2

Variable	Result	Note
consumption / gdp	I(1)	Not confirmed by LLCH
credit / gdp	I(1)	
gdp per capita	I(1)	
gdp per capita in PPP	I(1)	
government debt / gdp	I(0)	
inflation (cpi)	I(0)	Not confirmed by LLCH
inflation (deflator)	I(0)	
lending rate	I(0)	Not confirmed by LLCH
real lending rate	I(0)	
unemployment rate	I(0)	

Note: LLCH = Levin, Lin and Chu test for common unit roots across countries.

Source: authors´ computation

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