Detecting credit cycle and setting countercyclical capital buffer in the Czech Republic

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Following the signs of emerging credit boom the Czech National Bank decided as a third European country to set non-zero rate of the countercyclical capital buffer in December 2015. This contribution describes the approach to setting this genuine macroprudential policy tool as applied by the Czech National Bank. The approach that can be labelled discretion guided by multiple-factor analysis builds upon the signals from both individual and composite indicators of financial cycle and systemic risk.

1 Introduction

The Czech National Banks (CNB) as the delegated macroprudential authority in the Czech Republic decides upon the countercyclical capital buffer (CCyB) since 2014. Despite its shorty history the Czech economy experienced two credit booms and one bust thus far. The first credit boom in early 1990s led to deep banking crisis and subsequent sector restructuring with sharp deleveraging. The second credit boom of 2005-2008 had almost negligible consequences within the Czech boundaries. There are signs the third credit surge may have started recently which raises the importance of the CCyB setting. The objective of this paper is to shed some light on how the CNB approaches setting of the CCyB rate and what critical aspects are taken into account during the assessment. We provide the insight into the process trough looking at two complementary approaches. The first concentrates on the signals from the credit-to-GDP gauge while the second is based on answering several layers of fundamental questions regarding the developments of credit in the economy.

2 Setting the CCyB rate by strictly following the official guidelines

[1] The views presented are those of the authors and not necessarily those of the Czech National Bank. Jan Frait acknowledges support from the Grant Agency of the Czech Republic (project no. 16-2150S).

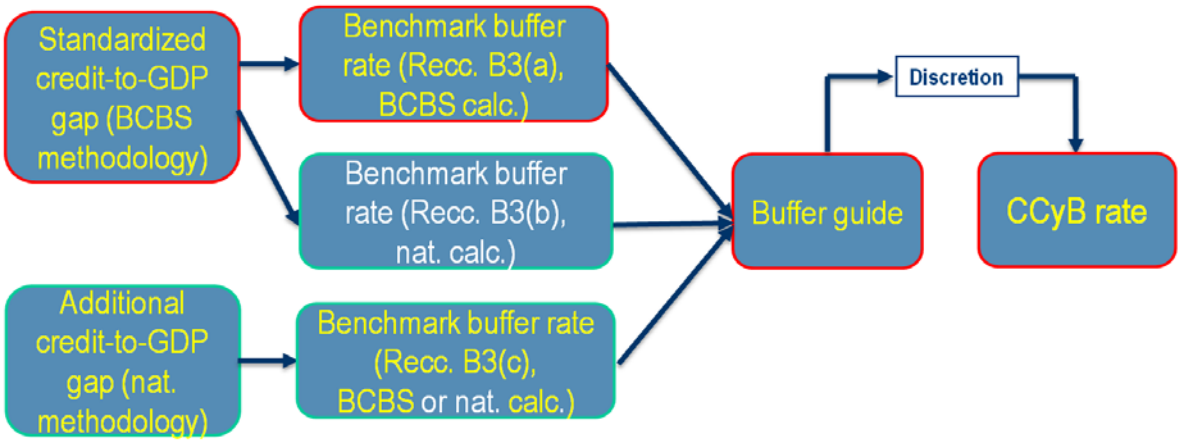
The official approach to setting the CCyB rate is based on the methodology proposed by the Basel Committee for Banking Supervision (BCBS, 2010). In a nutshell, a non-zero CCyB in a given country should be set on the basis of the magnitude of the deviation of the currently observed credit-to-GDP ratio from its long-term trend (i.e. credit-to-GDP gap), which is obtained by applying the Hodrick-Prescott (HP) filter.[2] Once the credit-to-GDP gap is estimated, the BCBS recommends using this estimation as an input for the calculation of the benchmark buffer rate.[3]

Aforementioned BCBS' approach was then further tailored to the European regulatory environment by means of the ESRB (2014) recommendation. The recommendation, among other things, extends the original methodology by introducing mandatory and optional elements of the CCyB operational framework for the European member states. The framework consists of four steps (Figure 1). The mandatory elements (marked red in Figure 1) include the estimation of the standardised credit-to-GDP gap and "standardised" benchmark buffer rate (both calculated on the basis of the BCBS' guidance). The recommendation also leaves room for optional "standardised buffer (which is not calculated on the basis of the BCBS's guidance). As far as the optional elements are concerned (marked green in Figure 1), the recommendation allows to include additional credit-to-GDP gap and "additional" benchmark rate. The delegated authority is then required to select one of the two benchmark rates as a buffer guide and by applying guided discretion the authority should set the final CCyB rate.

Figure 1 The ESRB recommendation approach to setting the CCyB

[2] The credit aggregate should contain all loans provided to the private non-financial sector (i.e. non-financial corporations, households, non-profit institutions serving households) plus the debt securities issued. Formally, the deviation can be written: $\left(R_t^{gap}\right) = R_t - \min_{\{\tau_t\}_{t=-1}^{T}} \{\sum_{t=1}^{T}(R_t - \tau_t)^2 + \lambda \sum_{t=2}^{T-1}[(\tau_{t+1} - \tau_t) - (\tau_t - \tau_{t-1})]^2\}$ for quarters $t = 1, \dots, T$. R_t^{gap} is the credit-to-GDP gap, R_t is the credit-to-GDP ratio, τ_t is a trend component of the credit-to-GDP ratio and λ is a smoothing parameter which penalizes variability in the trend component series. ESRB (2014) recommends setting λ to 400,000.

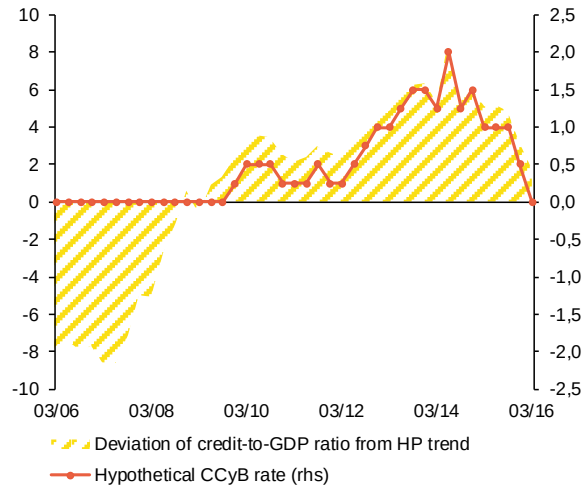
[3] The size of r_t^b, the benchmark buffer rate (as a percentage of risk-weighted assets), is zero when the credit-to-GDP gap is below or equal to lower threshold which is set to 2 percentage points. It then increases linearly and can be characterized by formula: $\left(r_t^b\right) = 0{,}3125 \times \left(R_t^{gap}\right) - 0{,}625$; until the benchmark buffer rate reaches its maximum level of 2,5 % when the credit-to-GDP gap reaches or exceeds the upper threshold which is set to 10 percentage points. While the benchmark buffer rates increase linearly in line with GDP and can thus take any value between zero and 2,5 %, the related regulation specifies that the buffer rate set by the designated authority shall be calibrated in steps of 0,25 percentage points or multiples thereof.



Source: authors interpretation

ESRB itself provides the estimates of the credit-to-GDP gap data for all EU countries and these estimates are published through ESRB Risk Dashboard. The latest June 2016 dashboard reveals the domestic credit-to-GDP gap in the Czech Republic at roughly 6 percentage points in 2015 Q4 which is indicating a credit boom calling for setting a non-zero CCyB rate. Figure 2 shows this standardised credit-to-GDP gap signalled the need for non-zero CCyB rate for the exposures located in the Czech Republic from the start of the global financial crisis until recently. This could be considered as dubious result as simple economic logic would suggest releasing the hypothetical buffer as a crisis emerges (in particular a crisis of the extent of the one that spread out in 2008).

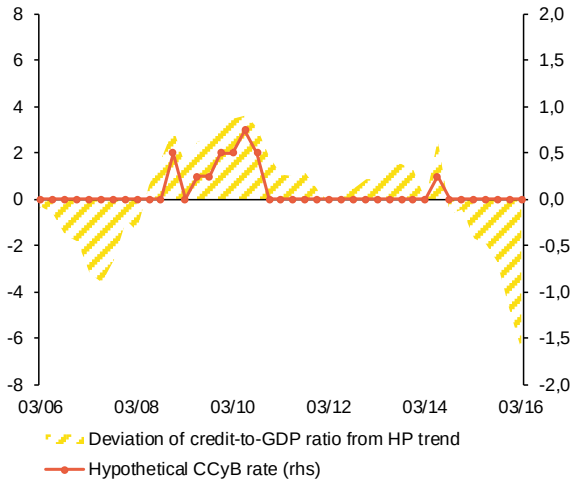
Figure 2 Standardised credit-to-GDP gap
(deviation in pp; right axis: rate in % of RWA)



Source: CNB
Notes: Trend (1995-) estimated by HP filter, lambda = 400000.

There is one strong factor to which this odd result can be attributed to. The Czech economy underwent a banking crisis during late 1990s which was followed by banking sector restructuring/deleveraging in late 1990s and early 2000s. During this period a pile of non-performing loans was written off from banks' balance sheets, and in turn, credit-to-GDP decreased quite substantially. For this reason, the CNB estimates also additional credit-to-GDP gap based on shorter time series which does not include periods with write-offs of non-performing loans (i.e. on the time series starting in 2004, other aspects of the methodology are the same). However, such gap (Figure 3) signalled a non-zero CCyB rate for the period of the global financial crisis only which is also against the basic CCyB logic.

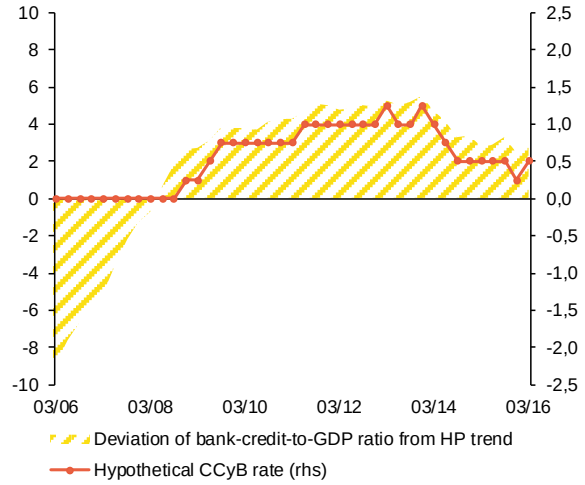
Figure 3 Additional credit-to-GDP gap
(deviation in pp; right axis: rate in % of RWA)



Source: CNB
Notes: Trend (2004-) estimated by HP filter, lambda = 400000.

Since bank loans represent more than 60% of total credit in the Czech economy the development of total credit to private sector in the Czech Republic is dominated by development of bank loans. Other credit aggregates such as loans from non-bank intermediaries or debt securities represent roughly 20% of total credit while the rest is external funding to non-financial corporates provided by foreign parent firms. Having in mind the structure of the Czech financial sector, alternatively defined additional credit-to-GDP gap based on bank credit only could be used as a double-check (Figure 4). Up to date, the estimates from this particular gauge do not change the picture obtained by standardised credit-to-GDP gap based on total credit significantly.

Figure 4 Bank credit-to-GDP gap
(deviation in pp; right axis: rate in % of RWA)



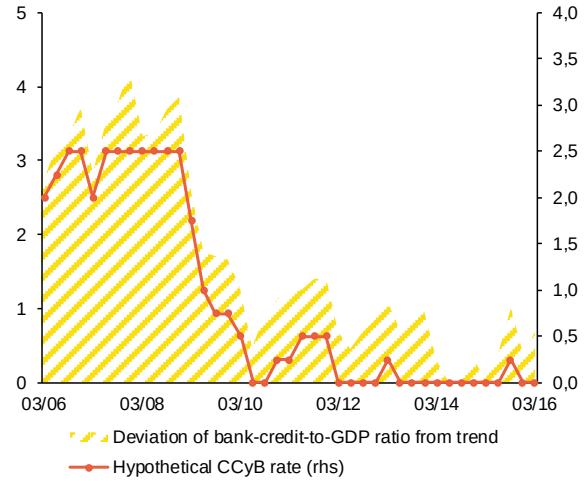
Source: CNB
Notes: Trend (1995-) estimated by HP filter, lambda = 400000.

Shifting away from data-related issues, the use of the HP filter method which is often used to determine trends in macroeconomic variables has some drawbacks as well. To begin with, a time series trend obtained by the HP filter is dependent to a significant extent on the length of the chosen time series. In the case of post-transition economies characterized by relatively short time series, the credit growth is automatically incorporated into the trend by the HP filter (Cottarelli et al., 2005). This implies the method's inability to take into account economic fundamentals which affect the fundamentally driven trajectory of loans.

As a reaction to the limitations of the HP filter, the CNB started to estimate alternatively defined bank credit-to-GDP gap in order to obtain more robust information. The underlying idea derives from the seminal work of Burns and Mitchell (1946) and the estimation is based on analysis of local extremes. The gap as presented in Figure 5 is calculated as a difference between the current ratio and the minimum ratio attained in past quarters.[4] The most important aspect of this alternative framework is the ability to eliminate the problem of the removal of old loans from banks' balance sheets after the late-1990s crisis. Moreover, unlike the HP filter, this method is not a subject to revision as new observations arrive (with the exception of retrospective revision of underlying data). Still, the application of this methodology may suffer from the very short time series available.

[4] Described more formally as: $R_t^{egap} = \frac{c_t}{\sum_{i=t-n+1}^{t}(y_i)} - \min_n \left\{ \frac{c_z}{\sum_{i=z-n+1}^{z}(y_i)} \right\}_{z=t-n+1}^{t}$ for quarters $t = 1, \dots, T$. where R_t^{egap} is labelled as expansionary credit gap since it can be used to reveal extremes indicating credit expansion. n is the number of past quarters and in the CNB application, the number of past quarters is equal to 4. Different length of horizon of past quarters was tested as well, the results remained, however, largely unchanged.

Figure 5 Alternative bank-credit-to-GDP gap
(deviation in pp; right axis: rate in % of RWA)



Source: CNB

Notes: Trend estimation based on analysis of local extremes. Calculated gap is regarded as expansionary credit-to-GDP gap in some CNB publications (e.g. FSR 2015/2016).

3 Setting the CCyB through answering several layers of fundamental questions

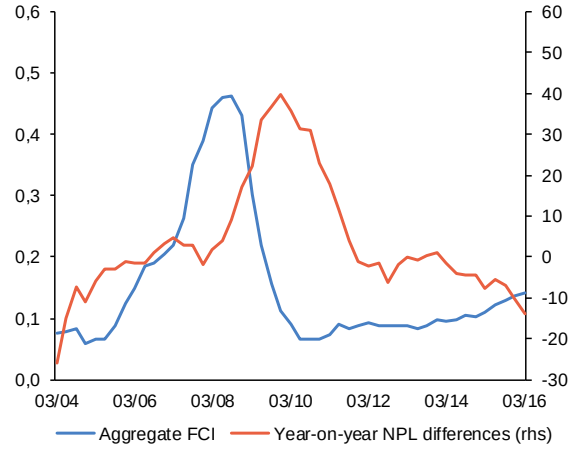
As explained in previous section, though the credit-to-GDP ratio provides valuable information about indebtedness of the domestic private non-financial sector, there are important limitations of this gauge for conclusions on setting the CCyB rate. Macroprudential authority has therefore take into account other indicators that have a capacity to identify excessive credit growth and the accumulation of systemic risk. To this end the CNB uses a wider range of indicators (including composite and simple indicators of financial cycle, credit dynamics and systemic risk changes) in order to answer several layers of fundamental questions regarding the position of the economy in the credit cycle and the sources of systemic risk.

In order to decipher where the Czech economy stands in the financial cycle, the CNB uses Financial Cycle Indicator (FCI) designed to facilitate communication between statisticians, policy makers and general public. The FCI is based on the methodology of the composite indicator of systemic stress (Holló et al, 2012) and it was introduced in Plašil et al (2014).[5] One of the main strengths of the FCI is the ability to take into account the changing cross-correlation structure and takes its highest values at times of rising synchronisation between the monitored

[5] The FCI takes the following form:$FCI_t = (w \circ s_t)' C_t (w \circ s_t)$, where $w = (w_1, w_2, \dots, w_9)$ is a vector indicating the relative importance of the individual subindicators, $s_t = (s_{1,t}, s_{2,t}, \dots, s_{9,t})$ is the vector of subindicators at a time t and $(w \circ s_t)$ represents the element-by-element multiplication of these vectors (known as the Hadamard-product). Matrix C_t contains the values of the cross-correlation coefficients $\rho_{t,ij}$ determining how strong the relationship between subindicators i and j is at time t. Subindicators $s_{1,t}, s_{2,t}, \dots, s_{9,t}$ are selected based on their ability to reflect the cyclical swings in financial risk perceptions in the financial and real sector and they include: credit growth, property prices, lending conditions debt sustainability in non-financial corporations and households, asset prices and the adjusted current account deficit-to-GDP ratio. By using aforementioned aggregation, the result is a composite indicator defined on the interval $(0, 1)$. The higher the indicator is, the higher the degree of financial risk tolerance generally observed among market participants in the economy is.

variables characterising various aspects of the financial cycle. Moreover, the weights of the individual variables in the composite indicator are calibrated so that the indicator best identifies the loan impairment losses observed in the Czech banking sector, i.e. the risks in the systemic materialisation stage (Figure 6). The evolution of the proposed indicator suggests it identifies the potential future materialisation of credit risks approximately 6 to 8 quarters ahead.

Figure 6 FCI and risk materialisation
(FCI value; right-hand scale: CZK billions)



Source: CNB

Focusing subsequently on the developments of the FCI subindicators allows the CNB to evaluate whether the increased pace is high also in historical terms. Special attention is being paid to the dynamics of bank loans. In order to assess whether credit growth is excessive and in which segments it is increasing the most, the CNB focuses on the dynamics of both – the stock of credit and new credit. Intuitively, the dynamics of stock of credit sheds some light on development of the overall leverage while dynamics of new credit rather entails implications for current tendencies in the credit market. Another possibility is to investigate variables that are naturally linked to the credit aggregate of interest. For instance, if the credit growth in households' sector is high, it makes sense to focus on property prices and evaluate potential implications of their development for the future path of housing loans. The CNB applies formalised approach for estimation of overvaluation or undervaluation of residential property prices combines four statistical and econometric models and they include: (i) supply and demand model, (ii) adjusted price-to-income ratio, (iii) adjusted price-to-rent ratio and (iv) accelerator model.

Using the comprehensive analysis the CNB set the CCyB rate for local exposures at above-zero level for the first time at its December 2015 meeting on financial stability issues. It decided that

0.5% rate will be applicable from January 2017. The main driver of the decision was bank credit growth that was assessed “stronger but not excessive”. The CNB communicated that the Czech economy had shifted within the financial cycle to a phase of stronger credit recovery accompanied by an easing of bank lending standards, and that accelerated speed in which private sector accumulated debt had been leading to higher vulnerability to sudden economic shocks. An increasing risk of a spiral between property prices and loans used to finance property purchases (with combination of an economic recovery and very low lending interest rates being a driver) was also declared as an important signal. The CNB accompanied its decision by regular forward guidance saying that “should the acceleration of credit growth, easing of credit standards and growth in investor optimism continue, the CNB will stand ready to increase the CCyB rate further”.

4 Conclusion

Even though the credit-to-GDP provides valuable insight about indebtedness of the domestic private non-financial sector and credit-to-GDP gap about its implications for systemic risk, there are important limitations of this gauge for conclusions on setting the CCyB rate. The process of decision-making upon the CCyB in the Czech National Bank is therefore based on answering fundamental questions through both composite and simple indicators of financial cycle, credit dynamics and systemic risk changes. Such approach can be labelled discretion guided by multiple-factor analysis. Putting more weight on formal approaches can only be expected in the future dependent on the accomplishments of research in modelling the financial cycle.

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