

Methodology underlying the determination of the benchmark countercyclical capital buffer rate and supplementary indicators signalling the build-up of cyclical systemic financial risk

The application of the countercyclical capital buffer (CCyB) is mandatory for all Member States of the European Union (EU), thus also for Hungary, from 1 January 2016. The public authority designated to determine the Hungarian countercyclical capital buffer rate is the Magyar Nemzeti Bank (hereinafter: MNB). Pursuant to Section 33 of Act CXXXIX of 2013 on Magyar Nemzeti Bank, the MNB establishes the benchmark countercyclical capital buffer rate serving as a buffer guide underlying the decision on the countercyclical capital buffer rate applicable to Hungarian exposures quarterly, and publishes the methodology underlying the definition of the benchmark capital buffer rate in a notice.

In the EU, the definition of the countercyclical capital buffer follows the principle of guided discretion along common standards. Article 135 of CRD IV¹ authorises the European Systemic Risk Board (ESRB) to issue guidance to designated national authorities with regard to the calculation of the benchmark countercyclical capital buffer rate prescribed in Article 136 (2). Article 135 of CRD IV also authorises the ESRB to provide guidance on the selection of variables that indicate the build-up of systemic risks associated with periods of excessive credit growth in the financial system.

The ESRB/2014/1 recommendation² on the guidance related to the calculation of the countercyclical capital buffer rates recommends the following basic methodology. First, it makes a proposal for the calculation of the standardised credit-to-GDP gap, which is the deviation of the stock of credits to gross domestic product (GDP), expressed as a percentage value, from its long-term trend. Second, it contains the rule applicable to the calculation of the capital buffer rate depending on the standardised credit-to-GDP gap (hereinafter: standardised capital buffer rate). Third, the proposed basic methodology recommends that upon making the decision on the capital buffer rate, the national authority should also consider a variety of supplementary indicators signalling the build-up of cyclical systemic financial risks. The recommendation specifies the following groups of these indicators: potential overvaluation of property prices, credit developments, external imbalance, strength of bank balance sheets, private sector debt burden, potential mispricing of risks. In addition, it also recommends taking into consideration indicators derived from models that combine the credit-to-GDP gap and a selection of the indicators belonging to the previous six categories.

On the other hand, the ESRB recommendation permits the national macroprudential authorities to depart from this basic methodology to account for special features of the individual countries'

¹DIRECTIVE 2013/36/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 June 2013 on access to the activity of credit institutions and the prudential supervision of credit institutions and investment firms, amending Directive 2002/87/EC and repealing Directives 2006/48/EC and 2006/49/EC.

²RECOMMENDATION OF THE EUROPEAN SYSTEMIC RISK BOARD of 18 June 2014 on guidance for setting countercyclical buffer rates (ESRB/2014/1) (2014/C 293/01).

financial intermediation system. The national authorities may calculate self-calibrated capital buffer benchmark rates that depend on the so-called additional credit-to-GDP gap, instead of the standardised credit-to-GDP gap. In addition, the recommendation also provides significant room for manoeuvre in terms of the type of indicators used by the designated national authorities, and the form they take these indicators into consideration when formulating their decision on the capital buffer rate.

According to the above, the capital buffer benchmark rate is an important, but not exclusive element of the definition of the capital buffer rate to be applied. Both the legislative framework and the ESRB recommendation permit policy-makers to consider any other factors, deemed important by them, related to the stability of the financial intermediary system, when considering a decision about the rate to be applied.

The ESRB recommendation provides even greater freedom in the development of the methodology related to the release of the countercyclical capital buffer. The release of the CCyB may take place in two situations based on two types of consideration. Based on this, a distinction can be drawn between prompt release and gradual release.

The ESRB provides specific recommendations essentially with regard to *prompt release*. It proposes using three different types of indicators: (i) high frequency (even daily) market variables, (ii) variables of good short-term projection capacity, used for the build-up of the CCyB, and (iii) the banking sector's losses or the indicators reflecting asset quality.

As regards *gradual release*, the ESRB provides more of a conceptual definition. However, it notes that when making the decision on the release, there is more emphasis on the designated authority's discretionary powers, since – particularly in the case of gradual release – the decision must be based on the complex analysis of the financial system's condition.

Standardised credit-to-GDP gap and standardised capital buffer rate recommended by ESRB

According to the ESRB recommendation, the definition of outstanding loans used for the standardised credit-to-GDP gap under the basic methodology includes all loans granted by resident and non-resident entities drawn down by domestic households and non-financial corporations, as well as the loans extended by domestic financial institutions to non-resident households and non-financial corporations. The recommended GDP value is the sum of the last four quarters' nominal GDP at current prices.

The ESRB recommendation proposes to derive the standardised credit-to-GDP gap from the credit-to-GDP time series using the Hodrick-Prescott Filter (HP Filter), specifically a one-sided, univariate HP Filter with a smoothing parameter (λ) of 400,000. According to

methodological background study³ of ESRB, all available data of the credit-to-GDP time series should be used for the production of the gap indicator.

Based on the ESRB recommendation, the standardised capital buffer rate is derived from the standardised credit-to-GDP gap, in accordance with the following rule: the capital buffer rate is higher than zero only when the standardised credit-to-GDP gap exceeds 2 per cent, above which it has a linear relationship with the gap such that it takes the maximum value of 2.5 per cent when the gap is 10 percentage points. The ultimate value of the standardised capital buffer rate is produced by rounding the result of the previous calculation to multiples of 0.25 per cent.

The Hungarian additional credit-to-GDP gap and the benchmark buffer rate

The characteristics of Hungarian financial intermediation differ in several important attributes from those of the euro area countries, which are in the focus of the ESRB recommendation. Hence instead of the standardised credit-to-GDP gap and the resulting standardised capital buffer, the MNB developed a methodology for determining the univariate additional credit-to-GDP gap and the resulting benchmark capital buffer.

First, the definition of outstanding loans in the additional credit-to-GDP gap has become a narrower aggregate: outstanding lending by all domestic financial institutions to resident and non-resident non-financial corporations and households.⁴ The reason for this is that the credit aggregate proposed by the ESRB is deemed too broad for Hungary compared to loans extended by the range of institutions that may be directly influenced by the CCyB requirement. The largest difference is that the ESRB definition also includes loans granted by parent companies to their domestic subsidiaries, which in most cases could be classified as capital grant rather than credit. Taking into consideration the size and classification difficulties of these stocks and the operational mechanism of the countercyclical capital buffer, the MNB narrowed the stock of loans used for the additional credit-to-GDP gap to outstanding lending by financial institutions.

Second, for the additional credit-to-GDP gap the exchange rate-adjusted values of the above outstanding lending were used in order to ensure that exchange rate movements, which are much more volatile than the financial cycle, do not generate wide fluctuations in the values of the credit-to-GDP gap. The exchange rate-adjusted figures were gained by converting outstanding foreign currency credit portfolios into forint at each point in time using the exchange rates applied for the conversion of household foreign currency mortgage loans into forint, which

³ European Systemic Risk Board (2014): Operationalising the countercyclical capital buffer: indicator selection, threshold identification and calibration options. *European Systemic Risk Board, Occasional Paper 5*.

⁴ The outstanding loans data originate from the national economy's financial accounts data published by the MNB. The credit aggregate used for the credit-to-GDP gap indicator comprises of the following items. In the case of households: housing loans from credit institutions, consumer credits and other loans from credit institutions, housing loans from other financial enterprises and other loans from other financial enterprises. In the case of non-financial enterprises: loans from credit institutions, loans from other financial enterprises, debt securities.

took place in the first quarter of 2015. The pegging of this exchange rate ensures that the time series of exchange rate adjusted outstanding loans does not have a structural break at the time when foreign currency denominated loans were converted to forint denominated ones, which is advantageous in respect of sub-dividing the series into a trend and a gap.

Third, for annualised GDP the sum of last four quarters' seasonally adjusted nominal GDP at current price was used, where the departure from the ESRB recommendation is represented by seasonal adjustment.

Fourth, for the sub-division of the trend and gap, the use of the univariate HP Filter with a smoothing parameter of 400,000 was kept, but, in order to obtain more intuitive gap values, the filtering commenced from the first quarter of 1998 such that in the first four years the division received from the two-sided HP filtering ran for the full time series (from 1998 Q1 to 2015 Q1) was used, and the one-sided HP filtering was used only for the dates thereafter.

The rule for defining the Hungarian benchmark capital buffer rate differs from the standardised capital buffer rate rule included in the ESRB recommendation in two respects. First, the benchmark capital buffer rate depends on the additional, rather than on the standardised credit-to-GDP gap. Second, the lower threshold was raised from 2 per cent to 4 per cent due to two main reasons. One of these reasons is that the optimisation process used in the ESRB methodological background study returns 3.9 per cent as lower threshold based on domestic data. This means that, according to the previous Hungarian experience, the additional credit-to-GDP gap exceeding 3.9 per cent signalled excessive credit growth that also carried the systemic risk of a financial crisis. Another reason for raising the threshold is that the deepening of the Hungarian financial system is expected to continue in the near future, which may raise credit-to-GDP gap values without generating systemic risk.

The Hungarian supplementary indicators

By considering the supplementary indicators corresponding to the domestic features an even more accurate and detailed view of the development of the cyclical systemic financial risks and the underlying processes is obtained, in addition to the additional credit-to-GDP gap. That is, the credit-to-GDP gap indicators are not perfect early warning indicators of financial crises. This is reflected by the fact that prior to the previous financial crises of certain EU Member States the credit-to-GDP gaps remained low, i.e. they failed to signal the build-up of the systemic financial risks in due course. Furthermore, it is not guaranteed that the credit-to-GDP gap values will also increase to an extent that they would issue an adequate warning before a financial crisis that has, at least partially, different attributes than those of the previous ones.

The ESRB methodological background study assessed a wide range of the indicators based on consolidated data of the EU 28 member states. The aim of the study is to determine the degree to which the indicators' values were capable of forecasting past financial crises. The MNB selected the supplementary indicators to be considered for the purpose of defining the countercyclical capital buffer rate applicable to Hungarian exposures using this methodology, also involving other indicators based on its own data collection and testing the sensitivity of the

results. The list of selected Hungarian supplementary indicators covers all the categories recommended by the ESRB. The MNB allocated these indicators to two groups, one of which contains the indicators measuring the overheating of the financial system, while the other group includes those that measure the vulnerability of the financial system to external shocks.

Overheating indicators are:

- credit-to-GDP gap indicators with various credit definitions (in addition to the aggregates used for the standardised and additional credit-to-GDP gap, the aggregate of credits extended by the domestic credit institutions to non-financial corporations and households), in various sectoral breakdowns (granted to households, granted to non-financial corporations, total), and calculating with exchange rate adjusted and exchange rate unadjusted outstanding loans;
- credit-to-GDP gap developed by Hosszú et al. (2015)⁵
- property price in proportion to household income;
- banking sector leverage;
- three-month reference interest rate;
- interest rate spread;
- ROE of the banking sector;
- market share of the five largest banks;
- non-financial corporations' and households' credit-to-GDP growth.

Vulnerability indicators are:

- credit-to-GDP applicable to the global credit portfolio in the ESRB methodological background study;
- households' debt service burdens as a per cent of disposable income;
- gross external debt as a per cent of GDP;
- loan-to-deposit ratio of the banking sector;
- ratio of foreign currency loans in outstanding loans by the domestic financial institution to households and non-financial corporations;
- ratio of foreign currency loans in the previous stock of lending including the loans of domestic non-financial corporations from abroad;
- current account balance as a per cent of GDP;
- capital adequacy ratio of the banking sector.

Multivariate credit-to-GDP gap

The MNB also monitors a newly developed credit-to-GDP gap as a supplementary indicator. This is a multivariate credit-to-GDP gap based on data from the additional credit-to-GDP, which takes

⁵ Zs. Hosszú; Gy. Körmendi and B. Mérő (2015): Univariate and multivariate filters to measure the credit gap *MNB Occasional Papers* 118

into consideration not only the historical values of the credit-to-GDP ratio, but also the development of the economic environment, as the evolution of the credit-to-GDP gap is explained by additional variables describing macroeconomic fundamentals. This methodological innovation gives a clearer picture on the development of cyclical fluctuations, and the time series adjusted for these fluctuations yields trends which are structurally and in terms of economic context more interpretable. It is novelty that the multivariate model is able to tackle household lending and corporate lending separately. As these segments differ in their driving factors, different explanatory variables are fitted for the subsectors. The final, aggregate model is given as the sum of the separated household and corporate trends and cycles.

The evolution of the multivariate credit-to-GDP gap will be monitored by the MNB as a supplementary indicator in addition to the standardised and the additional credit-to-GDP gap indicators. According to the plan, after a test period the multivariate methodology will replace the current additional credit-to-GDP gap methodology in defining the benchmark capital buffer rate.

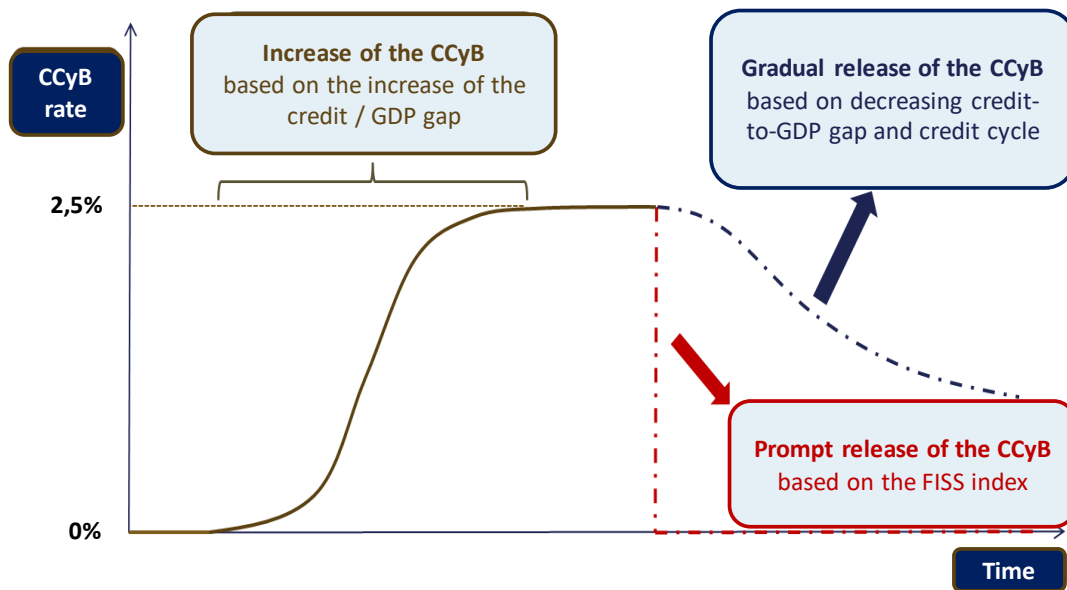
Release of the countercyclical capital buffer

The operation of the capital buffer is based on the principle that in periods of build-up of cyclical systemic risks the macroprudential authority prescribes the accumulation of additional capital for the banking sector, depending on the level of risks. This is released at times of crisis, which may mitigate the downturn occurring as a result of a sudden drop in lending activity. If no crisis occurs, but the systemic risks that justified the level of the CCyB rate decrease, the macroprudential authority may prescribe a lower CCyB rate depending on the degree of the decrease in the risks.

Accordingly, the release of the CCyB may be necessary in two situations:

1. *Prompt release:* When a financial crisis occurs, the macroprudential authority reduces the prescribed level of the countercyclical capital buffer rate to zero in a single step.
2. *Gradual release:* If no crisis occurs, but a steady decrease may be observed in the systemic risks, the macroprudential authority gradually reduces the prescribed rate of the capital buffer in proportion to the decrease in the risks.

Chart 1: Conceptual model of the prompt and gradual release



Prompt release

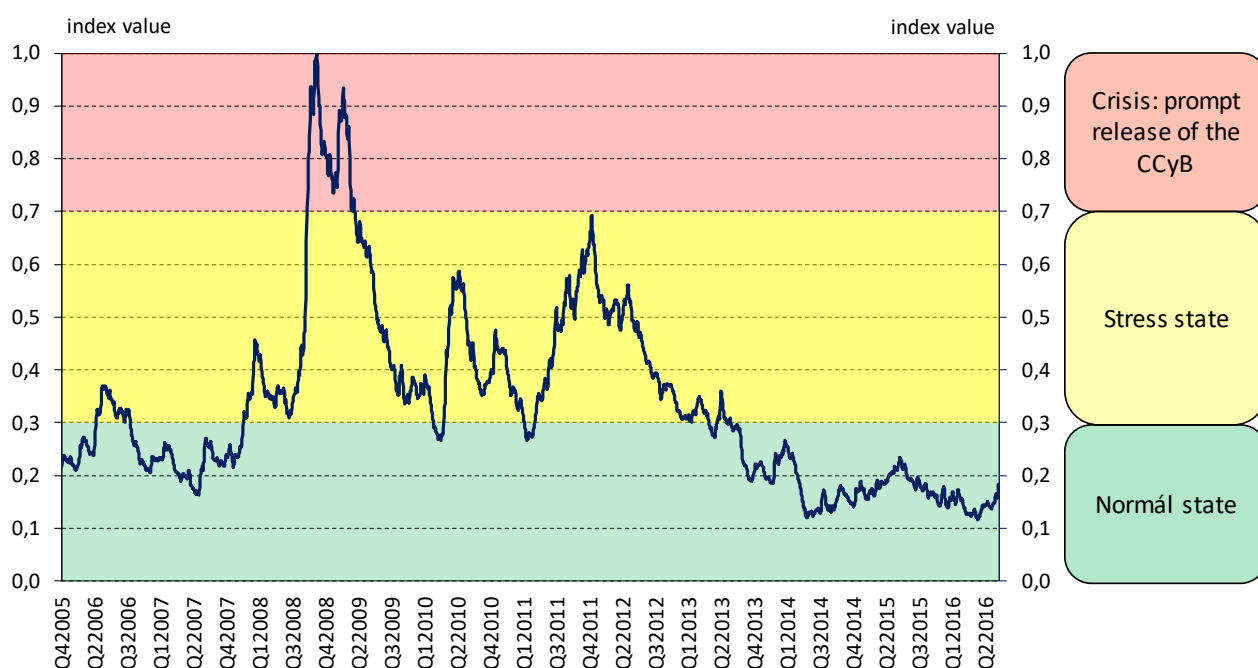
Upon prompt release, the regulatory authority reduces the level of the prescribed countercyclical buffer rate to zero. Its purpose is to cover the banks' losses and to maintain lending activity at times of crisis. Accordingly, the MNB makes the timing of the decision conditional upon the financial system's stress crossing the line that signals a crisis situation. The discretionary powers of the authority play an important role in the decision, since for the decision on the release it must consider the complex economic situation reflected by the higher stress level of the financial system.

The MNB uses the *Factor Based Index of Systemic Stress (FISS)*⁶ for measuring the level of stress. This is a rapid-reaction stress indicator efficiently capturing the fundamentals of the financial system, which was designed to reflect the current stress level of the financial system considering the individual submarkets of the financial system as a whole, bearing in mind co-movements.

The macroprudential authority decides on the prompt release of the countercyclical capital buffer taking into account the current values of FISS. If this exceeds a threshold value, calibrated on the basis of the historic values of the index, it indicates a financial crisis. The chart below illustrates the calibration result and the historic FISS values. Upon the FISS signal the MNB prepares a detailed analysis covering the fundamentals of the economic environment, and the Financial Stability Board makes its decision in view of this.

⁶ For the detailed description of the FISS methodology see: Szendrei, Varga (2017): A Factor Based Index of Systemic Stress in the Financial System, MNB Working Papers 9.

Chart 2: Historic FISS values and the potential threshold for a prompt release proposal



Gradual release

Gradual release may take place when the systemic risks underlying the accumulation of the countercyclical capital buffer decrease. With this method the designated authority gradually reduces the level of the prescribed capital buffer rate.

When the cyclical systemic risks are on a steadily declining path and the countercyclical capital buffer guide rate justified by the build-up indicators – primarily the credit-to-GDP gap – falls below the prevailing capital buffer rate, it may be justified to reduce the applicable countercyclical capital buffer rate. Policymakers should act prudently when applying gradual release, as there is the risk of reducing the capital buffer – and thereby the banking sector's shock absorbing capacity – right before a financial crisis. Hence, the decision on gradual release must be made on the basis of a fundamental analysis, capturing the current status of the economy and the lending cycle.

Upon gradual release of the countercyclical capital buffer two types of risks must be minimised:

- i. Erroneous release, when the trends in systemic risks would justify a higher countercyclical capital buffer rate already in the medium term, which however may be difficult to raise again within 12 months, due to the time needed for the accumulation of the capital buffer in the usual course of business.
- ii. Premature release, when the authority decides on the gradual release in a close-to-crisis economic environment, although in the medium run even a prompt release could be justified.

Due to the aforementioned risks, it is justified to make the gradual release conditional upon minimum criteria that take into account their implementation costs. The first three of the

following minimum criteria minimise (i) the risk of erroneous release, while the fourth one minimises the (ii) the risk of premature release:

1. The growth rate of the nominal credit aggregate (total exchange rate adjusted nominal credit aggregate intermediated by domestic financial institutions) has continuously declined in the previous 3 quarters that preceded the decision.
2. The value of the benchmark countercyclical capital buffer rate four quarters ago is lower than the countercyclical capital buffer rate to be applied by the credit institutions at present.
3. The countercyclical capital buffer guide rate has not increased in any of the last 4 quarters compared to the previous quarter.
4. The level of FISS, the indicator used for prompt release, signals no systemic risk exceeding the usual degree, i.e. it has not exceeded the predetermined threshold value during the three months that preceded the decision.

If these minimum criteria are satisfied, the macroprudential authority prepares an analysis on the fundamental condition of the financial system, and considers gradual release in the view of this. If gradual release of the capital buffer is justified, its maximum rate may be the difference between the level of the countercyclical capital buffer justified by the capital buffer build-up indicators 12 months before the decision, and the currently applicable countercyclical capital buffer rate, thereby also considering the time needed for the accumulation of the capital buffer.

Development of the methodology applied by the MNB

The MNB annually reviews and continuously develops the methodology for determining the benchmark countercyclical capital buffer rate, and supplementary indicators and methodologies supporting the decision to be made on the rate to be applied. The countercyclical capital buffer is also a new regulatory instrument by international standards, and experience with regard to its use and impact is gradually accumulated. The MNB continuously monitors these experiences and best practices, and also attempts to expand those with its own analyses and research.