The framework of the Magyar Nemzeti Bank's countercyclical capital buffer requirement for domestic exposures[1]

1. LEGAL FRAMEWORK

The application of the countercyclical capital buffer (CCyB) is **mandatory for all member states of the European Union (EU), including Hungary, as of 1 January 2016**, pursuant to Article 130 of the CRD[2]. Article 135(1)(b) of the CRD empowers the European Systemic Risk Board (ESRB) to issue guidelines to national designated authorities on the calculation of the so-called buffer guide required by Article 136(2) of the Directive. Article 135(1)(c) of the CRD also empowers the ESRB to issue guidelines on variables that indicate the build-up of system-wide risk associated with periods of excessive credit growth in a financial system. Currently, ESRB Recommendation 2014/1 on guidance for setting countercyclical buffer rates (hereinafter: ESRB Recommendation) fulfils these tasks.

The designated authority to determine the domestic CCyB rate is the central bank of Hungary, Magyar Nemzeti Bank (MNB). The Governor of the MNB determines the requirements for the build-up of the CCyB in a decree pursuant to Article 33(1) of Act CXXXIX of 2013 on the MNB. According to Article 33(2), the Financial Stability Council (FSC) determines the buffer guide on a quarterly basis within the strategic framework specified by the Monetary Council, to serve as the basis for setting the so-called applicable buffer rate for exposures to counterparties in Hungary. In determining the buffer guide, the FSC shall take into account the position of the credit cycle, the risks arising from excessive credit growth, the specificities of the Hungarian economy, the credit stock as a share of gross domestic product and the deviation of this ratio from its long-term trend, as well as the ESRB Recommendation.

2. DECISION-MAKING PROCESS

The institution-specific countercyclical capital buffer rates depend partly on the countercyclical capital buffer rate for exposures to counterparties in Hungary, which rate is the same for all domestic banks. This is called the **applicable buffer rate** and set by the MNB in proportion to the total risk exposure amount. Additionally, the institution-specific countercyclical capital buffer rates are influenced by the applicable buffer rates set by foreign macroprudential authorities or, under certain conditions, by the ESRB or the MNB for domestic banks' foreign exposures.

The determination of the applicable buffer rate is based on the logic of guided discretion. According to this principle, the regulator's decisions on the applicable buffer rate should take into account the rule-based monitoring system tracking relevant information and the recommended buffer rate it produces, the so-called **buffer guide**. The MNB determines the applicable buffer rate on a quarterly basis, considering the buffer guide and the monitoring system behind it, as well as the ESRB guidelines and any other factors related to the stability of the financial intermediation system. The decision-making process is briefly as follows (*Figure 1*).

1. Cyclical financial systemic risks are monitored by the indicators of the **cyclical systemic risk map** (CSRM). The **cyclical systemic risk index** (CSRI) summarizing a considerable part of the indicators' information content determines the **CSRI-based benchmark buffer rate** on a rule basis, which results in the **buffer guide** after any necessary corrections from expert judgement.
2. With this in mind and using all other relevant information, the FSC decides on the **applicable buffer rate**, which may differ from the buffer guide. One of the most important circumstances considered for the decision is that the MNB follows the strategy of **positive neutral CCyB** (PN CCyB). Accordingly, a 1 percent buffer rate

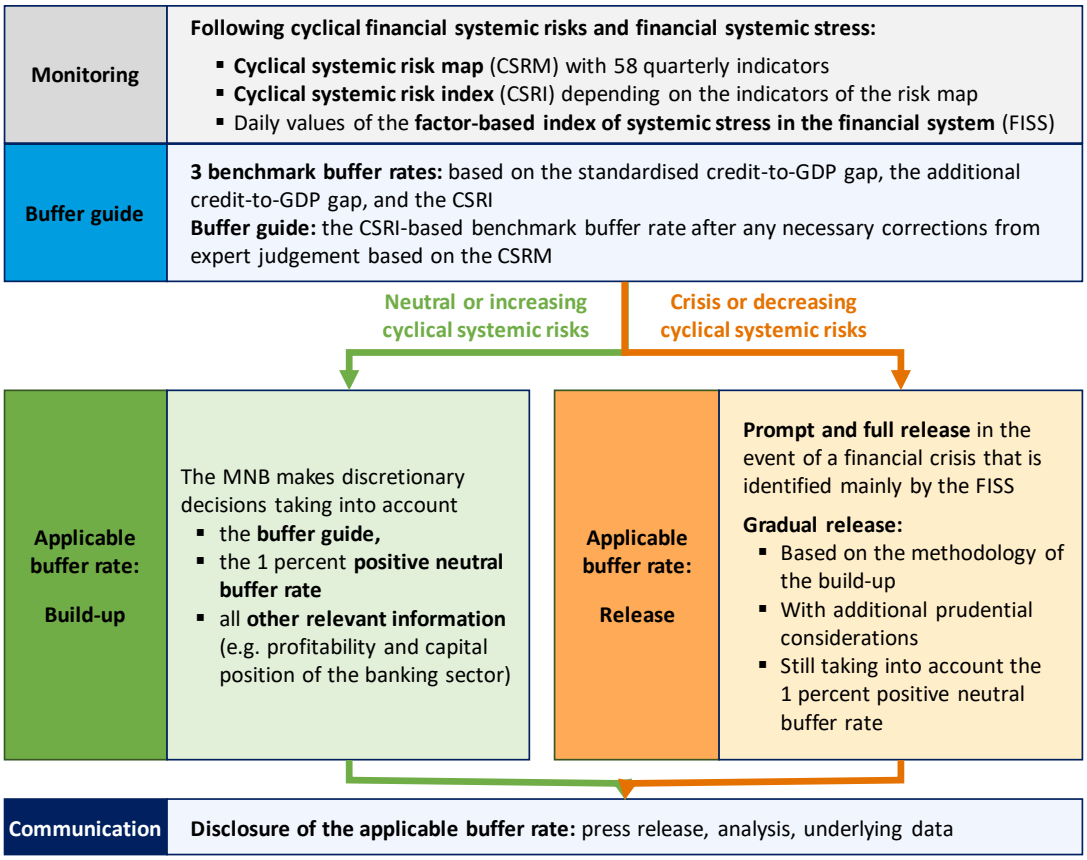
[1] This document shall also be considered a publication containing a description of the methodology for determining the buffer guide pursuant to Article 33(3) of Act CXXXIX of 2013 on the Magyar Nemzeti Bank.

[2] DIRECTIVE 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.

is applicable in a neutral risk environment. The increase in the applicable buffer rate usually applies after 1 year from the date of the decision, but this adaptation period can be shortened if necessary.

3. Cyclical financial systemic risks typically build up over a longer period, so decisions on the applicable buffer rate typically involve small increases and decreases. This process can be overridden by the onset of a financial crisis, which usually occurs unexpectedly. The main tool for identifying a financial crisis is the **factor-based index of systemic stress in the financial system** (FISS) observed on a daily frequency. At the onset of a financial crisis, the applicable buffer rate should be immediately reduced to 0 percent, as the primary objective of the CCyB is to increase the resilience of the banking system during a financial crisis.

Figure 1: The process of setting the applicable buffer rate for domestic exposures



Source: MNB

3. CONSTRUCTION OF THE BUFFER GUIDE

3.1. Cyclical systemic risk map

The CSRM is the main information source for determining the applicable buffer rate. Cyclical financial systemic risks can take many forms, and there is no comprehensive, accurate and widely accepted measure of them. Therefore, the evolution of cyclical systemic risks can be adequately characterized by a joint assessment of several indicators. The MNB's cyclical systemic risk map can be expected to include a sufficiently large number of indicators that provide sufficiently accurate early warning signals of a crisis, for the significant majority of any potentially occurring banking crises. A detailed description of the indicators is included in *Annex 1*.

The indicators have a quarterly frequency (either by default or by conversion to a quarterly frequency), which is aligned with the quarterly review of the applicable buffer rate. Most recent values of the indicators stem from one or two quarters before the quarter of the decision. For easier interpretation of the risk map, the value from two quarters before the decision is displayed as the latest observation for each indicator. However, more recent data available that carry important additional information can also be used in analyses related to the risk map.

Indicators of the risk map are grouped into risk categories defined by certain aspects of lending, because **the relevant cyclical financial systemic risks are primarily connected to lending**. Important circumstances can be classified relatively clearly according to whether they are related to (1) various forms of risks assumed by lenders, or (2) the ability of debtors to meet debt service obligations, or (3) the overvaluation of investment assets (typically real estate and securities) that often serve as collateral for loans (which also tends to indicate excessive optimism among lenders and borrowers) (*Table 1*). Finally, the fourth risk category includes foreign spillovers that strengthen domestic cyclical systemic risks. These four categories can also be understood as a consolidated version of the six-element division in the ESRB Recommendation, where only indicators of the sixth category (potential mispricing of risk) were added to different categories in the MNB's four-element division.

Table 1: The structure of the cyclical systemic risk map

Risk category	Number of indicators	Developments monitored
I. CREDIT INSTITUTIONS		
I.A. Development of loan portfolios	12	Change in and cyclical position of credit-to-GDP ratios (including credit-to-GDP gaps in ESRB Recommendation 2014/1)
I.B. Asset–liability mismatch	8	Leverage along with maturity, liquidity and currency mismatch in the banking system
I.C. Concentration of assets and liabilities	9	Concentration of assets by loan types and industries, concentration of unstable funds
I.D. Excessive competition threatening financial stability	7	Interest rate spreads, change in lending conditions, profitability of credit institutions
II. DEBTORS		
Repayment capacity of the private non-financial sector	6	Income, debt service, indebtedness, interest rate risk of households and non-financial corporations
Repayment capacity of the public sector	4	Indebtedness of the public sector, exchange rate risk and refinancing risk
III. COLLATERALS		
Asset overvaluation	5	Excessive optimism regarding investments in residential real estate, commercial real estate and securities
IV. EXTERNAL IMBALANCES		
External vulnerabilities	3	External balance of the country and the banking system
Financial systemic risks abroad	4	Credit cycle position of different country groups and the level of realized systemic financial stress

Source: MNB

All individual indicators and indicator types recommended by the ESRB for monitoring are included in the monitoring system supporting decisions on the applicable buffer rate.[3] Of these, the ESRB considers the so-called standardised credit-to-GDP gap to be particularly important, and it recommends that macroprudential authorities in the member countries calculate this indicator according to a specified methodology. In addition, the ESRB Recommendation allows macroprudential authorities to create the so-called **additional credit-to-GDP gap** using a different method if this alternative indicator better reflects the specificities of the given national economy. The MNB calculates and monitors both indicators. (The exact method of calculation and the justification for the differences are included in *Annex 2*.) The indicators together with their narrowed versions for households and private non-financial corporations are included in the risk category called "Credit institutions: Development of loan portfolios" of the risk map.

[3] The CSRI index corresponds to the proposal for a composite indicator that is formulated in point 2.(g) of Recommendation C. The CSRI, however, is not included in the risk map, but it belongs to the monitoring system. All other proposals made in Recommendation C are met by the indicators of the risk map.

Each indicator of the risk map can provide **5 different risk signals**, reflecting the contribution of monitored events to cyclical financial systemic risks. The low, moderate, medium and high risk signals are obtained by applying 3 thresholds that divide the potential indicator values into 4 ranges. An indicator signals persistently high risk if it has indicated high risk in the last consecutive quarters for at least 4 quarters. The primary goal in calibrating the thresholds was to ensure that indicators provide as accurate as possible early warning signals of subsequent banking crises.[4] This principle could be applied to a rather limited extent, as even the indicators with the longest time series cover a period including only one banking crisis (starting in 2008) and extending back only to the 1990s. Therefore, historical distribution of indicator values, international references and expert judgements played a major role in determining the thresholds. For most indicators, high values, but for some, low values, and in one case, both values signal high risk.

3.2. Cyclical systemic risk index

The indicators in the CSRM describe cyclical systemic risk patterns in detail, but it is difficult to determine the aggregate level of systemic risks from the risk map. This is what the CSRI is used for, as it contains a significant part of the information of the risk map.

The index is calculated in two steps. In accordance with the purpose of the risk map, the redundancy among indicators is low, therefore we first selected the most important indicators instead of performing directly an information compressing procedure. We searched for the indicator set that improves the most the prediction of the risk of significant declines in Hungarian GDP for 8 quarters ahead in an appropriate Growth-at-Risk (GaR) model. To achieve the most accurate result, we extended the time series of certain indicators with proxy data that are not published on the MNB website. Based on the applied Lasso regularization, an optimal set of 8 indicators could be determined in a sufficiently clear manner. The comprehensive nature of the risk map is confirmed by the fact that 5 out of the 7 main risk categories (i.e. categories I.A., I.B., I.C., I.D., II., III., IV. in *Table 1*) are represented in the selected indicator set. The following 8 indicators have currently been selected:

- Standardized credit-to-GDP gap
- Additional credit-to-GDP gap, households
- TREA as a share of total assets
- Sector-wide LCR
- Exposures to general government as a share of balance sheet total
- Public debt-to-GDP, 1-year change
- MNB house price gap
- Households' investment in risky financial assets

Second, the selected indicators were aggregated employing a factor model. The final index is the weighted average of the three most important factors using the proportion of explained variance as weights. A dynamic non-stationary factor model is applied, which has the great advantage of producing a low-volatility index, thereby clearly showing the estimated cyclical position (*Figure 2*).[5] The values of the index could be determined from the first quarter of 2005, because the length of time series of related indicators did not allow for an earlier start.

3.3. Benchmark buffer rates

The ESRB Recommendation considers the so-called **rule-based benchmark buffer rates** guiding decision-makers as an important element of cyclical financial systemic risk monitoring. None of these coincides with the buffer quide to be described in the next subsection. According to the ESRB Recommendation, the **benchmark buffer rate based on the standardised credit-to-GDP gap** is derived from the standardised credit-to-GDP gap according to the following rule.

[4] The specific procedure was the so-called "univariate signalling" method, which also appears in the ESRB methodological background study: ESRB (2014): Operationalising the countercyclical capital buffer: indicator selection, threshold identification and calibration options. ESRB Occasional Paper Series, No. 5.

[5] For the details about the applied factor model, see Varga K. and Szendrei T. (2025): Non-stationary financial risk factors and macroeconomic vulnerability for the UK, *International Review of Financial Analysis*, Vol. 97, No. 103866.

Below a standardised credit-to-GDP gap of 2 percentage points, the buffer rate is 0 percent; above a standardised credit-to-GDP gap of 10 percentage points, it is 2.5 percent; and between the two thresholds, the gap determines the buffer rate according to a linear function, which is finally rounded to multiples of 0.25 percent.

According to the ESRB Recommendation, if a national macroprudential authority also defines an additional credit-to-GDP gap, as the MNB does, it should also define a **benchmark buffer rate based on the additional credit-to-GDP gap** with a calculation method that may differ from the one applied to the benchmark buffer rate based on the standardised credit-to-GDP gap. The MNB decided that the function between the gap and the buffer rate should be the same for the benchmark buffer rates based on the standardised and additional credit-to-GDP gaps. This means that the additional credit-to-GDP gap would have resulted in a benchmark buffer rate of 2.5 percent in the fourth quarter of 2006, well before the only Hungarian financial crisis. The lower threshold of 2 percentage points is the 71st percentile of the values of the additional credit-to-GDP gap between the first quarter of 1995 and the second quarter of 2024, while the upper threshold of 10 percentage points is the 93rd percentile.

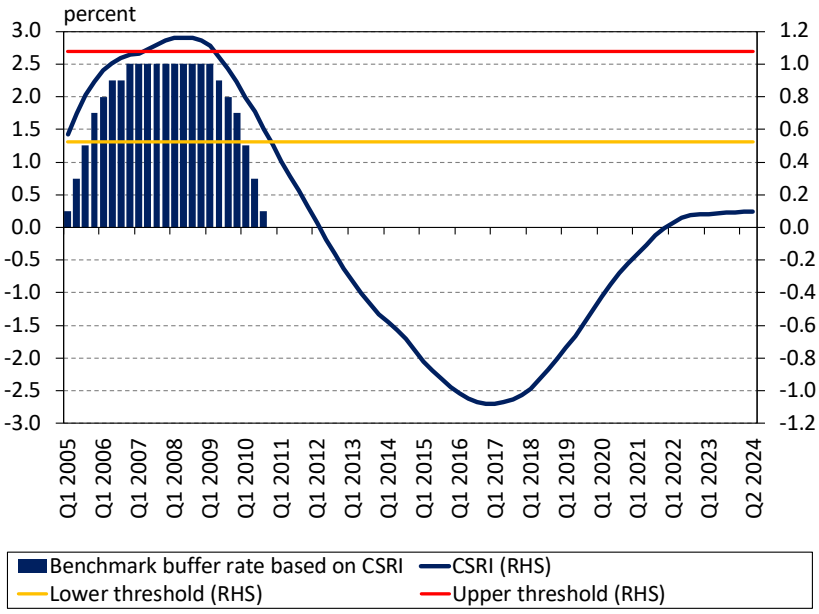
The CSRI, which estimates the aggregate level of cyclical financial systemic risks, summarizes more relevant information for decisions on the applicable buffer rate than the above-mentioned credit-to-GDP gaps. Therefore, the CSRI is particularly suitable as the basis for a rule-based benchmark buffer rate that guides decision-makers. Its calculation is similar to the methods above. The **benchmark buffer rate based on the CSRI** is built up linearly between the two threshold values of the CSRI in 0.25 percentage point increments, taking a value of 0 percent below the lower threshold and 2.5 percent above the upper threshold. The two threshold values are the 70th and 90th percentiles of the historical distribution of the CSRI values between the first quarter of 2005 and the second quarter of 2024.

3.4. Buffer guide

Since the buffer guide that summarizes the lessons of the cyclical financial systemic risk monitoring is the most important reference point for decision-makers, **it should be based on the most informative benchmark buffer rate, which is the CSRI-based benchmark buffer rate**. By construction, this benchmark buffer rate represents a larger part of the information content of the CSRM than the two other benchmark buffer rates based on credit-to-GDP gaps. Furthermore, it would have also supported a more accurate and more decisive build-up of the CCyB before the 2008 crisis. It would have recommended a substantive CCyB requirement for domestic exposures as early as 2005 and would have reached the value of 2.5 percent by mid-2006 (*Figure 2*). Given the two-quarter data lag and the one-year period normally available to meet the rising CCyB requirements, this 2.5 percent buffer rate recommendation could have become effective by the end of 2007, which would still have been in time before the onset of the banking crisis in the third quarter of 2008.

The MNB determines the buffer guide based on a combination of the CSRI-based benchmark buffer rate and the expert assessment of the signals of the CSRM. Potential corrections of the CSRI-based benchmark buffer rate ensure that the information content of the risk map is sufficiently integrated into the buffer guide in all cases. Such a correction would have taken place until the fourth quarter of 2024 only due to the immediate and full release of the CCyB because of the banking crisis started in the third quarter of 2008.

Figure 2: Development of the CSRI and the benchmark buffer rate based on the CSRI, 2005-2024



Note: The benchmark buffer rate based on the CSRI is a rule-based buffer rate, from which the buffer guide may differ if the indicators of the CSRM or other relevant information justifies it. Therefore, the benchmark buffer rate based on the CSRI does not reflect full releases, such as the one assumed for the crisis period between Q4 2008 and Q4 2010. The lower and upper thresholds are the 7th and 9th deciles of the CSRI values between Q1 2005 and Q2 2024. Source: MNB

4. INCREASING THE APPLICABLE BUFFER RATE

The MNB determines the applicable buffer rate by considering the buffer guide and any other relevant factors related to the stability of the financial intermediation system, in particular the so-called **positive neutral buffer rate** introduced by the CCyB decision of June 2024. Decisions on reducing the applicable buffer rate should involve partly different concerns than those on increasing it. This section presents the considerations to be taken into account for both types of decisions, and the following section presents the specifics regarding the reduction.

4.1. Integration of the positive neutral buffer rate

The MNB applies **a positive neutral buffer rate of 1 percent from 1 July 2025** in order to strengthen banks' resilience by ensuring an adequate level of capital buffers that the regulator can release. Accordingly, at times other than severe financial stress situations and their immediate aftermath, the applicable buffer rate should be at least 1 percent regardless of the current level of cyclical systemic risks. The aim of the positive neutral CCyB strategy is to ensure that the banking system has a significant amount of CCyB that can mitigate an unexpected financial stress situation even when current cyclical systemic risks do not predict or underestimate the occurrence of such a stress situation. The schematic decision rule for the applicable buffer rate is shown in the chart below.

max { *buffer guide*; *positive neutral buffer rate* } ± *other factors*

↓

applicable buffer rate

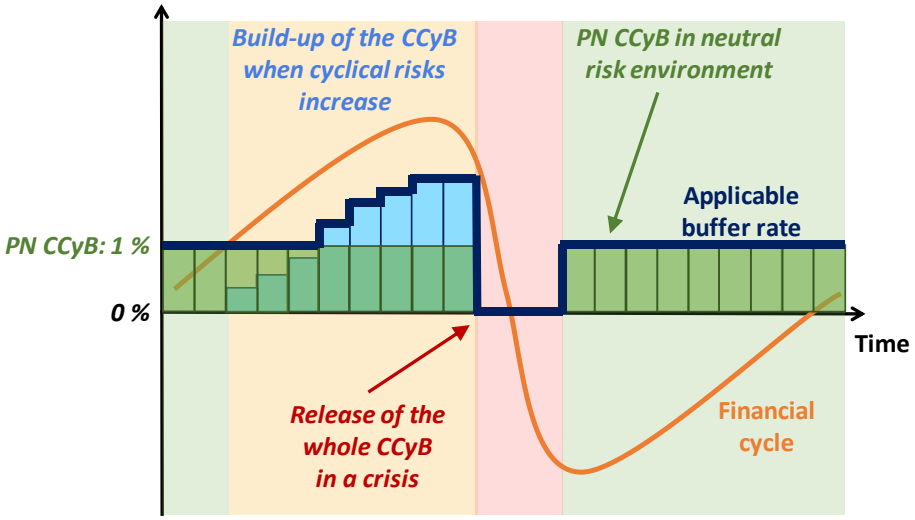
In different phases of the financial cycle, the applicable buffer rate may develop as follows (*Figure 3*):

- **Periods of elevated cyclical systemic risks:** In such cases, the buffer guide exceeds 1 percent. If the MNB follows the buffer guide when determining the applicable buffer rate, then the positive neutral CCyB strategy

is not effective in this situation. Therefore, during periods of elevated cyclical systemic risks, the positive neutral buffer rate does not increase the applicable buffer rate.

- **Crisis periods**: When a situation with high systemic financial stress arises due to the materialization of systemic risks or when the immediate aftermath of such situations takes place, the full release of CCyB comes into effect (for more information, see *Section 5.2*). This contingency corresponds to "other factors" in the decision rule above. The positive neutral CCyB strategy is also not effective in this situation.
- **Periods with a neutral, "normal" risk environment**: The positive neutral CCyB strategy is effective in times other than the above two. In such cases, the higher from the positive neutral buffer rate and the buffer guide prevails. That is, in the absence of significant cyclical systemic risks, the 1 percent positive neutral buffer rate provides the main reference point for determining the applicable buffer rate.

Figure 3: Setting the applicable buffer rate



Source: MNB

5. REDUCTION OF THE APPLICABLE BUFFER RATE

5.1. Special issues in the gradual release of the capital buffer

When cyclical systemic risks gradually decrease (soft landing), and the reduction of the applicable buffer rate, but not the immediate drop to 0 percent (see *section 5.2*) becomes a realistic option, **other special considerations come into play in addition to those described in the previous section**. In the case of a gradual release of the CCyB, two types of risks need to be minimized. One threat is that cyclical financial systemic risks justify a rate cut currently, but there is a high chance that they will increase again in the near future. In this case, the conservative regulatory approach supports maintaining the applicable buffer rate instead of temporarily reducing it. The other threat is that the CCyB, and thereby the resilience of the banking system decreases just before a financial crisis.

In order to moderate the costs of the gradual release, **the MNB considers a gradual decrease of the applicable buffer rate when the following conditions are met jointly**:

- The CSRI has not increased in any of the last 4 quarters compared to the preceding quarter, the benchmark buffer rate based on the CSRI supports a reduction in the applicable buffer rate, and the indicators of the CSRM show a decrease in cyclical financial systemic risks, as well.
- The values of the FISS have not indicated systemic financial stress above the normal level (for the normal level, see *Figure 4*) during the three months preceding the decision.

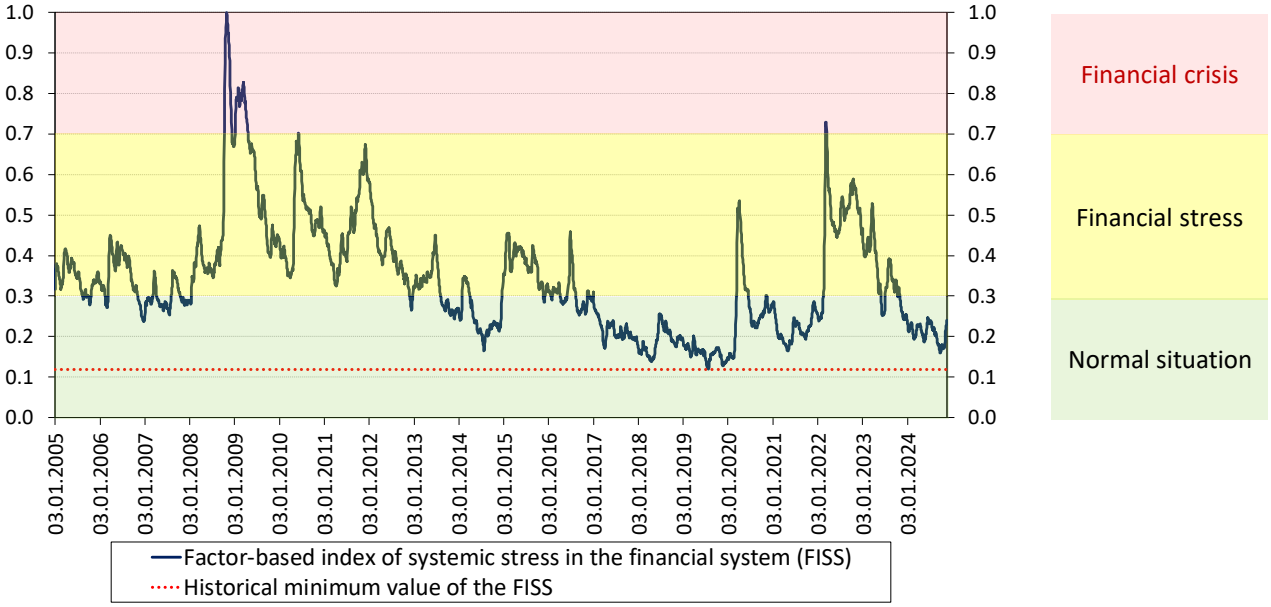
The guidance of decreasing cyclical financial systemic risks and thereby of a decrease in the buffer guide is limited by the 1 percent positive neutral buffer rate, since the applicable buffer rate can only be reduced to 1 percent at most within the framework of gradual release.

5.2. Prompt and full release of the capital buffer

In the event of a financial crisis, the MNB immediately and fully releases the CCyB, which can mitigate the decline in lending activity due to the crisis by covering losses and maintaining the capacity for lending. The MNB shall time this decision to the point when the stress level in the financial system becomes so high that it can be identified as a crisis. The discretionary element of the decision plays a prominent role, as a complex economic situation must be assessed when deciding on the full release of the CCyB.

The MNB uses the FISS to measure stress (*Figure 4*).[6] The FISS calculated on daily frequency contains 4 factors that aggregate 19 stress indicators of the 4 subsystems of the Hungarian financial system and summarize nearly 90 percent of the information content of the basic indicators. The 4 factors can be broadly associated with the stress level in the Hungarian government securities market, foreign exchange market, capital market, banking system and interbank market. The final index is obtained by averaging the four factors and then normalizing it between 0 and 1. Higher values indicate more severe stress. It is a fast response indicator that is particularly sensitive to the co-movements of the financial markets considered.

Figure 4: Development of the factor-based index of systemic stress in the financial system, 2005-2024



Note: The figure shows the FISS calculated in the fourth quarter of 2024. Source: MNB.

The MNB decides on the immediate and full release of the CCyB taking into account the current values of the FISS. This is in line with the ESRB Recommendation, which, in addition to other possible and available indicators, advises the use of such indicators for this purpose. If the FISS reaches the threshold value that was calibrated with historical values of the index, currently 0.7 percent, the FISS indicates a financial crisis. **In the event of such a FISS signal, the MNB makes the decision on the immediate and full release of the CCyB after a detailed analysis of the economic environment.**

6. TRANSPARENCY

The public communication of quarterly decisions on the applicable buffer rate consists of (1) **a press release** containing the most important strategic messages from the decision-makers, (2) **an analysis** explaining the decision by detailing the expert assessment of the situation, and (3) **information from the monitoring system** used for the decision. These

[6] For methodological details see Szendrei, T. and Varga, K. (2020): FISS – A Factor Based Index of Systemic Stress in the Financial System. *Russian Journal of Money and Finance*, 79(1), pp. 3–34.

communication materials, which are published regularly both in Hungarian and in English, are accompanied by a reporting obligation to the ESRB in the event of a change in the applicable buffer rate.

The MNB publishes the following elements from its monitoring system for cyclical financial systemic risks.

- **The MNB publishes entire time series of the indicators in the CSRM on its website**, which are updated quarterly when decisions are made on the applicable buffer rate. Risk signals of individual indicators are not public because of potential controversies about expert judgements involved in their determination. However, the idiosyncratic inaccuracies partially offset each other when these risk signals are aggregated to the level of the 7 main risk categories (i.e. categories I.A., I.B., I.C., I.D., II., III., IV. in *Table 1*); therefore, entire time series of the aggregated risk signals are also posted on the MNB website.
- **The MNB publishes the entire time series of the CSRI index on its website**, which is updated quarterly when decisions are made on the applicable buffer rate. The calculation method of the CSRI is reviewed annually. Between revisions, the time series of the index is expanded according to one-sided logic, i.e., by fixing the previously established index values, the set of selected indicators is unchanged, and only their aggregation is recalculated from quarter to quarter.
- **The MNB publishes entire time series of all three benchmark buffer rates and the credit-to-GDP ratios used for the credit-to-GDP gaps on its website**, which are updated quarterly when decisions are made on the applicable buffer rate. This practice is in line with the ESRB Recommendation.
- **The MNB publishes the entire time series of the buffer guide on its website**, which is updated quarterly when decisions are made on the applicable buffer rate.
- **The MNB publishes the entire time series of the FISS on its website**, which is updated quarterly when decisions are made on the applicable buffer rate.

ANNEX 1: INDICATORS OF THE CYCLICAL SYSTEMIC RISK MAP

Nr.	Indicator	Unit of measure	Start date	Description
I.A. Credit institutions: Development of loan portfolios				
1	**Standardized credit-to-GDP gap**	percentage point	Q1 1995	Deviations of credit-to-GDP ratios from their trend values measure the cyclical position of lending. The standardised version, as well as its components for households and non-financial corporations, are calculated according to the ESRB recommendation, no. 2014/1: broadest definition of credit stock to the private non-financial sector, 4-quarter moving sum of quarterly GDP, one-sided HP filter with a smoothing (lambda) parameter of 400 000.
2	**Standardized credit-to-GDP gap, households**	percentage point	Q1 1995	
3	**Standardized credit-to-GDP gap, non-financial corporations**	percentage point	Q1 1995	
4	**Additional credit-to-GDP gap**	percentage point	Q1 1995	Deviations of credit-to-GDP ratios from their trend values measure the cyclical position of lending. According to the ESRB recommendation, no. 2014/1, the additional version, as well as its components for households and non-financial corporations, reflect the specificities of the Hungarian economy better than the standardised versions. They differ from the latter in two aspects: the credit definition only includes credit provided by domestic financial intermediaries and loans are exchange rate adjusted.
5	**Additional credit-to-GDP gap, households**	percentage point	Q1 1995	
6	**Additional credit-to-GDP gap, non-financial corporations**	percentage point	Q1 1995	
7	**Credit-to-GDP gap calculated by Christiano–Fitzgerald filter**	percentage point	Q1 2000	Deviations of credit-to-GDP ratios from their trend values measure the cyclical position of lending. According to Hosszú and Lakos (2021), these are the best specifications besides the additional credit-to-GDP gap. They differ from the additional version: (1) shorter cycle length and CF filter, (2) even shorter cycle length and wavelet filter used with credit-to-GDP time series extended with 4-quarter forecasts.
8	**Credit-to-GDP gap calculated by wavelet filter**	percentage point	Q1 2000	
9	**Credit-to-GDP gap developed by Hosszú et al. (2015)**	percentage point	Q1 2002	Deviations of credit-to-GDP ratios from their trend values measure the cyclical position of lending. The trend-cycle decompositions of the credit-to-GDP ratio also used for the additional credit-to-GDP gap are performed applying explanatory variables unlike the other credit-to-GDP gaps in this risk map. For details, see Hosszú et al. (2015) and Kocsis and Sallay (2018).
10	**Credit-to-GDP gap developed by Kocsis and Sallay (2018)**	percentage point	Q1 2002	
11	**Credit-to-GDP, households, 1-year change**	percentage point	Q1 1998	Rapid growth in credit penetration is a sign of excessive lending. 1-year changes in the credit-to-GDP ratios used for household and non-financial corporation components of the additional credit-to-GDP gap.
12	**Credit-to-GDP, non-financial corporations, 1-year change**	percentage point	Q1 1998	
I.B. Credit institutions: Asset–liability mismatch				
13	**Leverage ratio**		Q1 2003	The higher the total risk exposure amount and the lower the core capital (Tier 1 capital) compared to the balance sheet total, the greater the ability of the owners of credit institutions to pass on large potential losses of the banks to depositors and creditors, while the expected higher profits remain largely theirs. Calculated with a system-wide balance sheet.
14	**TREA as a share of total assets**	percent	Q1 2003	

Nr.	Indicator	Unit of measure	Start date	Description
15	**Loan-to-deposit ratio**	percent	Q1 1999	Financing problems arise if the long-term and illiquid loan portfolio is coupled with a small portion of short-term, but relatively stable deposit portfolio. Calculated with a system-wide balance sheet.
16	**Sector-wide LCR**	percent	Q4 2015	CRR requires all institutions to have a liquidity coverage ratio (LCR) of at least 100 percent to have liquid assets of sufficient quality and quantity to with-stand a 30-day liquidity shock. Calculated with a system-wide balance sheet.
17	**Sector-wide NSFR**	percent	Q2 2021	CRR requires all institutions to have a net stable funding ratio (NSFR) of at least 100 percent to have an adequate amount of stable funding for assets that demand stable funding. Calculated with a system-wide balance sheet.
18	**Sector-wide foreign exchange funding adequacy ratio (FFAR)**	percent	Q4 2012	By regulating the FFAR, MNB requires all institutions to have enough stable foreign currency denominated funding for foreign currency denominated assets demanding stable funding. Calculated with a system-wide balance sheet.
19	**Sector-wide foreign exchange coverage ratio (FECR)**	percent	Q1 2017	By regulating the FECR, MNB caps currency mismatch between assets and liabilities of each institution as a share of its balance sheet total. Calculated with a system-wide balance sheet.
20	**Operative liquidity reserves as a share of deposits**	percent	Q4 2009	The numerator, which consists of banks' liquid assets and the contractual net flows of treasury operations within 30 days, shows how much actual liquidity the banking sector has to fulfill transactions with customers.
I.C. Credit institutions: Concentration of assets and liabilities				
21	**Residential real estate backed mortgage loans of households as a share of total credit**	percent	Q4 1998	Overly concentrated exposures to individual asset classes impair diversification of risks and increase the likelihood that shocks to a given asset class will escalate into systemic financial stress events. This is particularly true for lending with respect to residential and commercial real estate, as the housing market and especially the commercial real estate markets are prone to significant cyclical fluctuations.
22	**Commercial real estate project loans as a share of total credit**	percent	Q3 2002	
23	**Consumer loans of households as a share of total credit**	percent	Q4 1998	
24	**FX loans as a share of total credit**	percent	Q4 1998	
25	**Exposures to general government as a share of balance sheet total**	percent	Q4 1998	
26	**Prop. of variable rate loans within outstanding housing mortgages of households**	percent	Q1 2017	Imprudently taken interest rate risk concerning housing loans that impose a significant debt service burden on households over a long period increases the likelihood of mass defaults. Calculated with data on outstanding loans.
27	**Standard deviation of corporate credit-to-GDP between sectors**	percent	Q1 2008	Large variations in indebtedness across different sections of economic activities point to excessive indebtedness concentrated in individual sections, which helps local sectoral shocks to escalate into systemic financial stress.
28	**Liabilites other than capital and deposits as a share of total liabilites**	percent	Q3 1990	The increase in the proportion of funds other than the relatively stable capital and deposits, especially those provided by financial corporations raises the likelihood of liquidity and financing problems through the expansion of opportunities for a sudden and large withdrawal of funds.
29	**Funding from financial corporations as a share of total liabilities net equity**	percent	Q4 2003	

Nr.	Indicator	Unit of measure	Start date	Description
I.D. Credit institutions: Excessive competition threatening financial stability				
30	**Interest rate spread, new housing loans of households**	percentage point	Q1 2020	In the case of proper competition between banks, interest rate spreads of new loans above loan type specific reference rates cover costs of credit risk, operating costs and the profit expected under fair business practices. Low spreads indicate excessive lending activity and excessive risk-taking, which can lead to significant subsequent debt service problems and bank losses.
31	**Interest rate spread, new conusmer loans**	percentage point	Q1 2020	
32	**Interest rate spread, new corporate loans below 1 million euro**	percentage point	Q1 2020	
33	**Change in lending standards, new household loans**	percentage point	Q4 2004	Loose non-price conditions of lending (e.g. scoring of borrowers, collateral requirements, maximum size of credit lines) allow broad access to loans and lead to greater risk-taking by banks. The indicators are based on the responses in the Senior Loan Officer Opinion Survey on Bank Lending Practices conducted quarterly by the MNB among credit institutions that provide the vast majority of household and corporate loans.
34	**Change in lending standards, new corporate loans**	percentage point	Q4 2004	
35	**Average LTV of new housing loans**	percent	Q1 2004	When housing loans that involve a notable debt service burden over a long period are provided with low collateral, banks are likely acquiring customers by taking on excessive risks, which can cause large losses in case of defaults.
36	**ROA of credit institutions, 4-quarter rolling value**	percent	Q1 1999	Excessive profitability indicates market practices that are unsustainable and potentially the results of excessive risk-taking.
II. Debtors: Repayment capacity of the private non-financial sector				
37	**Debt service ratio of households**	percent	Q1 2002	When a notable share of households' income is spent on debt service, or when a significant slowdown in the income dynamics is expected, mass defaults of household loans are more likely in the future. This could lead to declining consumption and, in severe cases, a widespread economic downturn with large losses in the banking sector.
38	**Expected evolution of households' real income**	percentage point	Q3 2011	
39	**Average DSTI of new household loans**	percent	Q1 2015	When households take out loans that involve a significant interest rate risk or relatively high monthly instalments compared to their income, the sector level repayment capacity of households deteriorates with the negative consequences detailed above at the previous two indicators. The debt service-to-income (DSTI) ratio is capped by the MNB within the framework of the debt brake rules. Variable rate loans consist of loans with an interest rate fixation period of up to one year.
40	**Proportion of variable rate loans within new household loans**	percent	Q1 2003	
41	**Interest payment obligations of coprorations as a share of gross operating surplus**	percent	Q1 2005	When a notable share of corporations' gross earnings is spent on interest payments, or corporations take out loans that involve a significant interest rate risk, sector level debt service problems of corporations deteriorates. This could lead to declining investment and employment and, in severe cases, a widespread economic downturn with large losses in the banking sector.
42	**Proportion of variable rate loans within new corporate loans**	percent	Q1 2004	
II. Debtors: Repayment capacity of the public sector				
43	**Public debt-to-GDP**	percent	Q4 1995	High level of public debt relative to the country's income-generating capacity, and the rapid growth of this ratio threaten with sovereign default, which increases not only credit risk with respect to sovereign debt, but also the probability of a sudden tightening of fiscal policy and significant disruptions to operations of the state. The indicators are based on the so-called Maastricht debt of the general government.
44	**Public debt-to-GDP, 1-year change**	percentage point	Q4 1996	

Nr.	Indicator	Unit of measure	Start date	Description
45	**Ratio of foreign currency public debt**	percent	Q1 2005	High share of public debt that is denominated in foreign currency or needs refinancing in the near future threaten with sovereign default involving the negative consequences mentioned above at the previous two indicators. High foreign currency debt also makes a crisis management containing devaluation less feasible. The indicators are based on the debt of the central government.
46	**Ratio of public debt maturing within 1 year**	percent	Q4 2002	
III. Asset overvaluation				
47	**MNB real house price index, annual growth rate**	percent	Q1 1991	Rapid house price growth and overvalued residential real estates can easily be coupled with excessive lending and increase the risk of a significant drop in house prices in the future. The combination of these could lead to large future losses in the banking sector. For details on the MNB house price index, see Banai et al. (2017). The house price gap is calculated as an aggregation of 5 cyclical indicators according to Figures 8 and 9 in the MNB Housing Market Report of November 2024.
48	**MNB house price gap**	percent	Q1 2005	
49	**Commercial real estate yields, deviation from long-term average**	percentage point	Q1 2004	The yield indicator is the weighted average of individual yields of investments in commercial real estates with respect to prime offices in Budapest, retail and industrial-logistics. Low yield (premium) indicates overvaluation of real estates that can also be coupled with excessive lending and significant subsequent price drops. Together, these can cause large potential future losses in the banking sector. Low yield premium also indicates neglect of the risks of real estate investments.
50	**Diff. in yields of commercial real estates and 10 year sovereign bonds, deviation from long-term average**	percentage point	Q1 2004	
51	**Households' investment in risky financial assets**	percent	Q4 1991	Debt securities (excluding government securities), listed shares, mutual fund shares, life insurance reserves. In times of overvaluation and excessive optimism, households' investment demand increases rapidly.
IV. External imbalances: External vulnerabilities				
52	**Current account balance-to-GDP**	percent	Q4 1995	A large current account deficit indicates a general macroeconomic imbalance and requires significant external financing. Both of these increase the risk of possible capital flight in the future.
53	**Gross external debt-to-GDP**	percent	Q1 2005	Excessive reliance on foreign funds increases the risk of refinancing difficulties and a sudden withdrawal of foreign funds.
54	**Gross external short-term debt of the banking sector as a share of balance sheet total**	percent	Q4 2005	The banking sector's excessive reliance on foreign short-term funds, which are usually concentrated, interbank, or large corporate funds, increases the risk of refinancing difficulties and a sudden withdrawal of foreign funds.
IV. External imbalances: Financial systemic risks abroad				
55	**Credit-to-GDP gap outside the EU**	percentage point	Q1 1990	Excessive lending in foreign countries indicates excessive risk-taking on a global scale, which can affect domestic risk-taking, and increases the likelihood of foreign financial stress, which can also spread to Hungary through contagion channels. The indicators use credit and GDP data in the BIS credit database from all countries included and aggregated by country groups. The gaps are calculated using the method of the standardised credit-to-GDP gap (see indicator 1).
56	**Credit-to-GDP gap in the EU**	percentage point	Q1 1990	
57	**VIX Index**	percent	Q1 2006	Significantly increased volatility in key foreign stock prices indicates the materialization of notable financial stress events. The VIX index measures implied stock market volatility as priced in options on the US Standard and Poor's 500 stock market index. The VDAX-NEW Index is an analogous indicator based on the German DAX stock market index.
58	**VDAX-NEW Index**	percent	Q1 2006	

Note: References are the following. Banai Á., Vágó N. és Winkler S. (2017): The MNB's house price index methodology, *MNB Occasional Papers*, No. 127. Hosszú Zs., Körmendi Gy. and Mérő B. (2015): Univariate and multivariate filters to measure the credit gap. *MNB Occasional Papers*, No. 118. Hosszú, Zs. and Lakos, G. (2021): Early forecasting ability of univariate credit/GDP gaps, MNB studies 142 Kocsis, L. and Sallay, M. (2017): Credit-to-GDP gap calculation using multivariate HP filter*, MNB Occasional Papers,* No. 136. Source: MNB

ANNEX 2: CALCULATION OF THE STANDARDISED CREDIT-TO-GDP GAP AND THE ADDITIONAL CREDIT-TO-GDP GAP

The ESRB Recommendation 2014/1 on guidance for setting countercyclical capital buffer rates provides precise instructions on the calculation of the so-called **standardised credit-to-GDP gap** with a quarterly frequency.

- **Credit**: According to the Recommendation, a broad definition of the stock of credit to the domestic private non-financial sector should be used for the indicator. In the Hungarian case, this includes all unconsolidated domestic and foreign loans and debt securities to the domestic private non-financial sector. Data are derived from Hungary's financial accounts starting from the first quarter of 1995. Hungary's financial accounts are published by the MNB.
- **GDP**: The ESRB Recommendation suggests the application of the sum of gross domestic products from the quarter of credit observation and the three preceding quarters (a 4-quarter moving sum). The MNB uses the 4-quarter moving sum of the seasonally adjusted and calendar adjusted values of quarterly GDP at current prices.
- **Calculation of the gap:** Trend values of the quarterly time series of the credit-to-GDP ratio are calculated by a one-sided Hodrick–Prescott filter with a smoothing (lambda) parameter of 400 000. Gap values are equal to the difference between the credit-to-GDP values and the calculated trend values, expressed in percentage points.

The ESRB Recommendation allows national macroprudential authorities to create the so-called **additional credit-to-GDP gap** using a different method than the one of the standardised credit-to-GDP gap if this alternative indicator better reflects the specificities of the given national economy. The MNB calculates the indicator as follows.

- **Credit:** The indicator uses a narrower credit definition than the standardised credit-to-GDP gap. This definition only contains the exchange rate adjusted loans and debt securities provided by domestic financial corporations to the domestic private non-financial sector. The time series of this credit stock starts from the first quarter of 1995 and is calculated as the sum of the following items in Hungary's financial accounts published by the MNB. In the case of households: housing loans from credit institutions, consumer and other loans from credit institutions, housing loans from other financial corporations, consumer and other loans from other financial corporations. In the case of non-financial corporations: loans from credit institutions, loans from other financial corporations, debt securities issued by non-financial corporations and held by financial corporations. Hungary's financial accounts are published by the MNB. Exchange rate adjustment means that the HUF value of foreign currency denominated loans is always calculated at the exchange rates at the end of the first quarter of 2015.
  The reasons for deviation from the credit definition of the standardised credit-to-GDP gap are as follows. (1) The definition was narrowed because the broad measure of credit recommended by the ESRB for the standardised loan-to-GDP gap is too broad in Hungary compared to the credit stock provided by institutions that can be directly influenced by CCyB regulation. The largest and in itself significant difference is that the broad definition also includes loans provided by parent companies to their domestic subsidiaries, which can also be classified as capital transfers rather than providing loans in many cases. (2) The exchange rate adjustment of foreign currency denominated loans adding up to a significant amount is applied primarily to prevent excessive fluctuations in the credit-to-GDP gap values due to exchange rate movements that are much more volatile than the financial cycle. The specifically applied method also ensures that there is no break in the time series of the exchange rate adjusted credit at the time of the mass conversion of household foreign currency loans to HUF in the first quarter of 2015.
- **GDP:** The 4-quarter moving sum of the seasonally adjusted and calendar adjusted quarterly gross domestic product at current prices is used. This is the same data we use for the standardised credit-to-GDP gap.
- **Calculation of the gap:** Trend values of the quarterly time series of the credit-to-GDP ratio are calculated by a one-sided Hodrick–Prescott filter with a smoothing (lambda) parameter of 400 000. Gap values are equal to the difference between the credit-to-GDP values and the calculated trend values, expressed in percentage points. This is the same calculation we use for the standardised credit-to-GDP gap.