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Financial stability and macroprudential policy in European countries: From national reports to a European synthesis using AI tools

Martin Kotlář, Pavel Neumann, Patrik Maňas

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FINANCIAL STABILITY AND MACROPRUDENTIAL POLICY IN EUROPEAN COUNTRIES: FROM NATIONAL REPORTS TO A EUROPEAN SYNTHESIS USING AI TOOLS

Martin Kotlář, Pavel Neumann, Patrik Maňas[1]

This article shows how AI can be used to systematically process national financial stability reports and transform them into a coherent European synthesis. Based on a sample of 463 financial stability reports from 28 European countries over 2015–2025, comprising around 35,200 pages in total, it traces the development and changing nature of the main cyclical and structural risks: from an environment of very low interest rates and rising credit and property prices, through the pandemic shock, to the inflation surge, energy crisis and subsequent rapid tightening of monetary conditions. It also shows how macroprudential policy responded to these changes, particularly through capital buffers (the countercyclical capital buffer and the systemic risk buffer) and borrower-based measures (LTV, DTI and DSTI). The result is not only a synthesis of national experiences, but also the identification of broader European patterns and differences in individual countries' approaches to maintaining financial stability.

INTRODUCTION

Financial stability in European countries is regularly assessed by means of national reports covering current systemic risks, the resilience of the financial sector and macroprudential policy responses. These documents are an important source of information on the financial cycle, the structural characteristics of individual financial systems and the measures adopted by competent authorities to strengthen financial stability. However, differences in report structure, the scope of analytical coverage and country-specific economic conditions make cross-country comparison both time-consuming and analytically demanding. Identifying common European trends is particularly difficult, as risks perceived as dominant in one country may be of only limited importance in another economy or may materialise there with a distinct delay.

The development of artificial intelligence (AI) tools is creating new opportunities to systematically process, classify by theme and unify large volumes of mostly unstructured textual information and use it to identify both common European trends and national specificities. Modern language models can not only retrieve relevant passages from large sets of documents, but also compare semantically similar statements and summarise recurring arguments. In this way, they can complement traditional quantitative analyses based on financial and macroeconomic indicators with a systematic assessment of the qualitative information contained in national reports.

This article presents an application of AI tools[2] to the analysis of 463 financial stability reports published in 28 European countries[3] between 2015 and 2025, comprising around 35,000 pages in total. The period under review encompasses several markedly different phases of economic and financial development: an environment of exceptionally low interest rates and a gradual recovery of European economies, peaking credit and property price growth, the pandemic shock, the subsequent rapid recovery, the inflation and energy crisis, and a sharp tightening of monetary and financial conditions.

The aim of the analysis is to capture how the main cyclical and structural risks evolved over the period under review and how individual national macroprudential authorities responded to these developments through capital buffers and limits on mortgage lending. Particular attention is paid to risks associated with the credit and real estate cycles, household and corporate indebtedness, borrowers' sensitivity to changes in interest rates, the interconnectedness between the banking and public sectors, and the growing importance of non-bank financial intermediation. The analysis also examines new sources of systemic risk, including geopolitical tensions, energy dependence and energy intensity, climate risks, the digitalisation of

1 Martin Kotlář, Czech National Bank, Financial Stability and Resolution Department, martin.kotlar@cnb.cz.
Pavel Neumann, Czech National Bank, Financial Stability and Resolution Department, pavel.neumann@cnb.cz.
Patrik Maňas, Czech National Bank, Financial Stability and Resolution Department, patrik.manas@cnb.cz.
The authors are responsible for any errors and omissions.

2 The following tools were used to produce the outputs presented in this article: ChatGPT, Perplexity AI, MS Copilot and Notebook LM.

3 The cluster analysis covers 31 European countries listed in Appendix 3, as financial stability reports in English were unavailable for three countries.

financial services and the growing importance of cyber threats. It is complemented by the perspective of the European Systemic Risk Board (ESRB)[4] on systemic risks perceived at the European level.[5]

The analysis of capital- and borrower-based instruments, in particular the countercyclical capital buffer, the systemic risk buffer and LTV, DTI and DSTI limits, is complemented in the final section by a cluster analysis that identifies groups of countries according to their approach to setting these instruments. The resulting synthesis thus highlights not only the common responses of European countries to major economic shocks, but also persistent differences arising from national vulnerabilities, institutional arrangements, legal frameworks and the historical development of macroprudential policies.

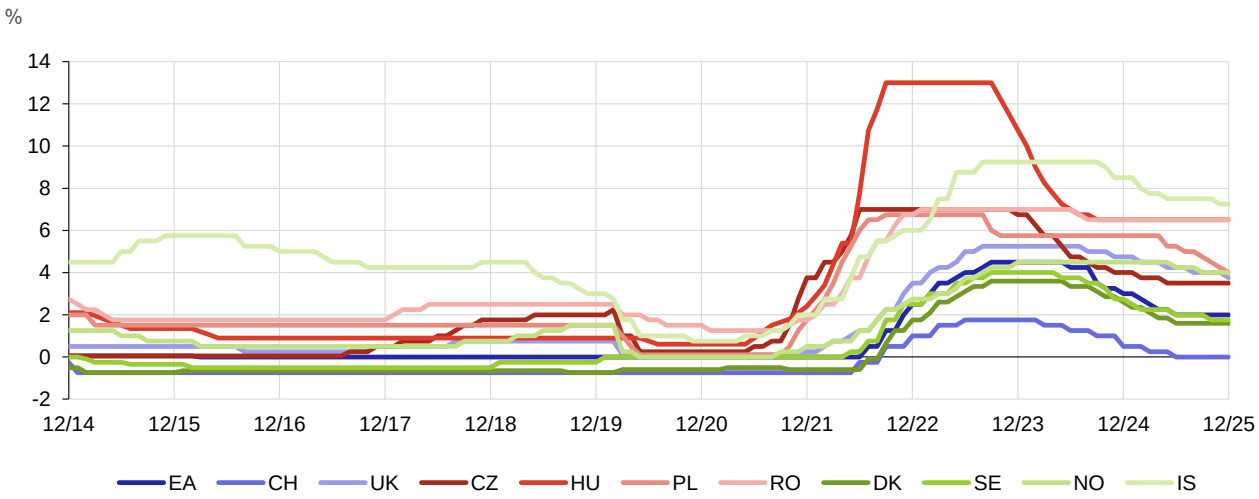
SYSTEMIC RISKS TO FINANCIAL STABILITY AND MACROPRUDENTIAL INSTRUMENTS FOR MITIGATING THEM

SIGNIFICANT CYCLICAL RISKS OVER 2015–2025

The cyclical risks in the European financial system have changed over the past decade as a result of major macroeconomic, monetary policy and geopolitical developments. Each period has been characterised by different sources of tension, ranging from a recovery phase and accommodative conditions, through the pandemic shock, to a sharp tightening of monetary policy rates, and each has shaped the nature of risks through different mechanisms.

The period 2015–2019 was marked by more stable economic growth in the European financial system, but also by increasing cyclical imbalances. European economies were in a recovery phase strongly supported by accommodative monetary policy (see Chart 1). This environment encouraged lending, while at the same time creating conditions for the accumulation of vulnerabilities related to overall household indebtedness, predominantly through mortgage loans, as well as in property markets and financial asset valuations. The cyclical risk profile across Europe gradually shifted from concerns about weak credit growth at the beginning of the period to concerns about overheating towards its end, while the timing of the onset and course of the financial cycle differed across economies.

Chart 1: Monetary policy rates in European countries



Source: BIS

In the first two years of the period, the dominant cyclical theme was persistently subdued credit growth (see Chart 2) and low inflation, which led central banks in the EU to maintain highly accommodative financial conditions. In many countries, low interest rates reduced borrowers' debt servicing costs and supported loan portfolio quality, while the concurrent compression of interest margins constrained banks' profitability. Banks thus benefited from low credit risk costs, but their ability to generate additional capital was limited by low net interest income. In countries with a high share of variable-rate loans, borrowers' sensitivity to future interest rate increases grew. In countries with negative rates, investors' search for yield intensified. This began to translate into rising activity in both the commercial real estate (CRE) and residential real estate (RRE) markets. In economies highly dependent on foreign financial groups (e.g. the Baltic states),

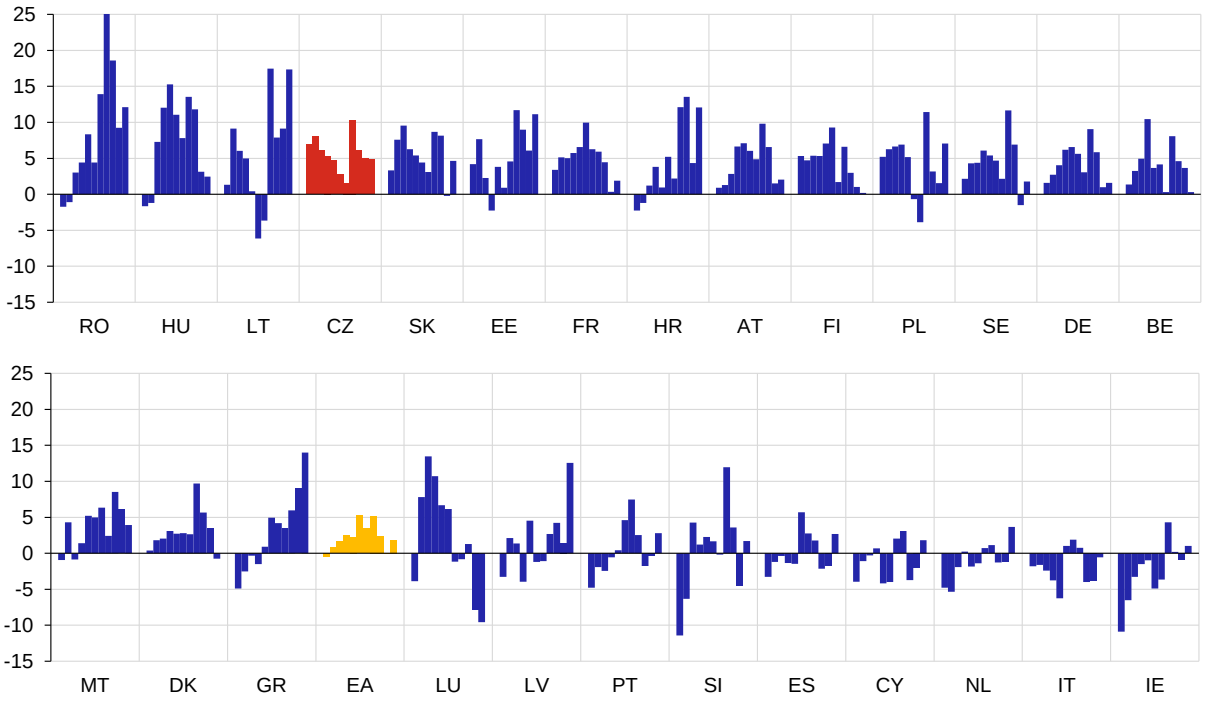
4 For more information on the ESRB, see its website.

5 This article presents only a selection of the outputs of this broader analysis. In addition to the thematic synthesis of risks and developments in macroprudential instruments, other aspects of the reports, such as their length and structure, were examined.

cyclical risks were amplified by external systemic shocks (e.g. from SE), which dampened credit growth and increased banks' prudence.

Chart 2: Average annual growth rate of bank loans to non-financial corporations in European countries

%



Source: ECB

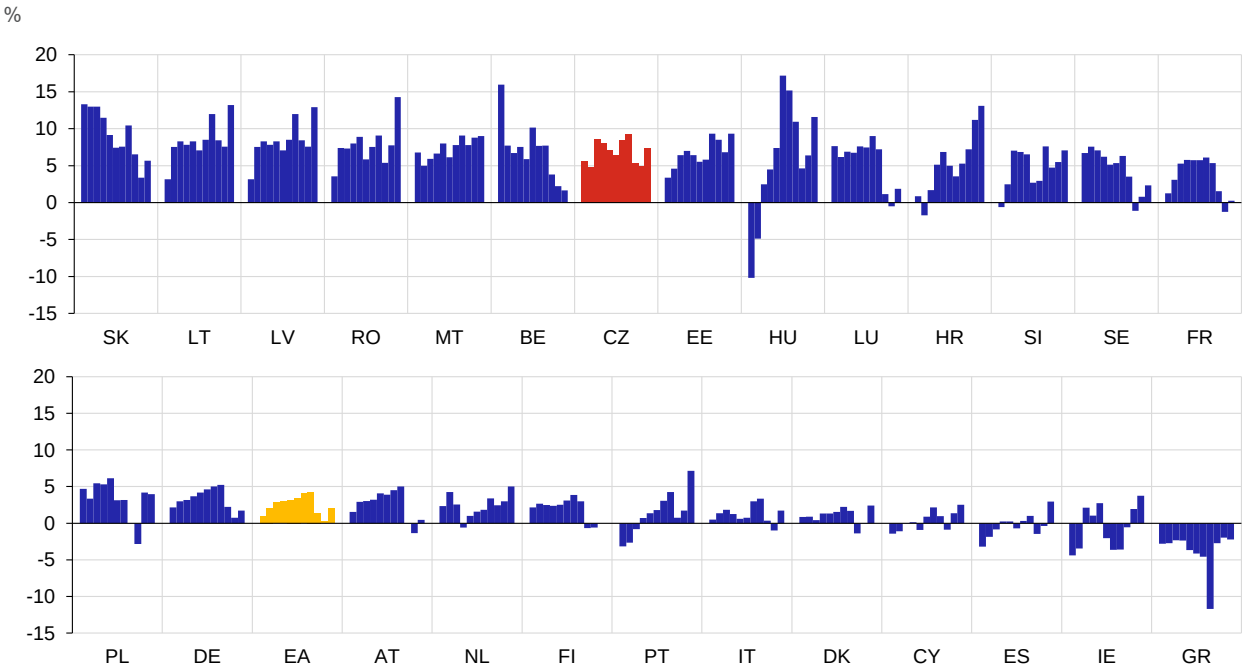
Note: The individual bars show the values for 2015–2025.

In 2017, the cyclical risks began to shift significantly towards excessive credit growth and rapidly rising property prices, particularly in northern and central Europe. The risk of overheating in the household mortgage lending market came to the fore, supported by persistently low interest rates and intense competition. Household indebtedness rose in a number of countries (e.g. SE, NO, CZ, SK and HU) (see Chart 3), while RRE prices began to outpace real income growth. In some countries (e.g. SE, SK and AT), there were signs of an easing of lending standards, growth in the share of mortgages with highly risky LTV and DTI ratios, and lengthening maturities. Prices in the CRE segment rose in many countries (e.g. FR, DE and IE), driven mainly by low yields rather than fundamental growth in rents. This made valuations more sensitive to a possible tightening of monetary policy.

In 2018, the financial cycle reached its peak phase in numerous economies. Credit growth was the strongest since the financial crisis and financial conditions remained unusually accommodative. Rapid growth in household debt created the potential for future cutbacks in consumption in the event of an interest rate or income shock. A general increase in household indebtedness was evident in both the Nordic countries and central Europe. In some countries (e.g. SE, CZ and DK), the risk of overvaluation became more pronounced, particularly in CRE prices, where valuations are especially sensitive to changes in market conditions. Market asset prices often reflected an environment of extremely low yields rather than fundamentals, increasing the likelihood of sudden corrections.

In 2019, the situation intensified further. Economic growth slowed, but lending remained strong and interest rates reached historical lows. In many countries, the financial system was at an advanced stage of the expansionary phase and was highly vulnerable to any future deterioration in sentiment, monetary policy tightening or external shock. Numerous European countries assessed property markets as overheated and credit growth as strong, while pointing to a growing share of highly indebted households. Vulnerability was identified as pronounced in countries with a high share of variable-rate loans (e.g. ES, PT, IT, FI and IE) and in economies where house prices had long exceeded fundamentals (e.g. SE, NL, DE, CZ and HU). CRE segments also remained vulnerable, particularly in the Nordic countries, where valuations were underpinned by low yields, high leverage and expectations of persistently cheap financing.

Chart 3: Average annual growth rate of bank loans to households in European countries



Source: ECB

Note: The individual bars show the values for 2015–2025.

The years 2020–2022 represent an exceptional episode in which the COVID-19 pandemic led very quickly to a sharp economic contraction, followed by a rapid and strongly policy-supported recovery and then a marked tightening of financial conditions driven by inflation, monetary policy normalisation and geopolitical shocks in the form of the war in Ukraine.

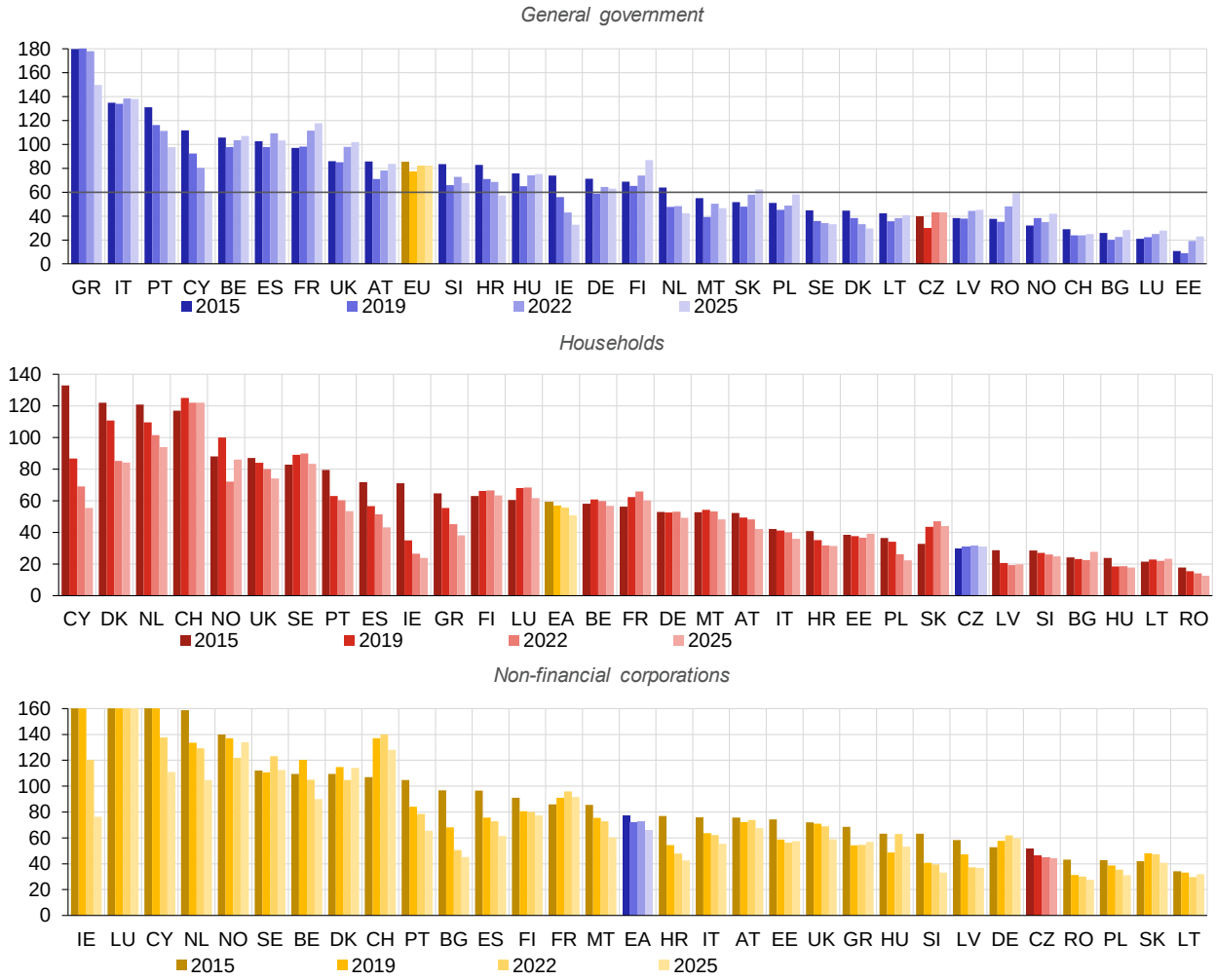
In 2020, the dominant cyclical risk for European countries was the sudden and deep macroeconomic contraction caused by the COVID-19 pandemic. Economic activity fell sharply across Europe, uncertainty increased and financial market volatility rose. The main cyclical risk lay in the potential materialisation of credit losses accumulated during the preceding expansionary phase of the financial cycle as a result of a drop in the income of households and firms. In most countries, however, there was no immediate increase in non-performing loans (NPLs), owing to extensive fiscal support, debt moratoria and government guarantees. Cyclical risk was thus largely "deferred" and shifted from an immediate liquidity crisis to a potential delayed rise in defaults following the withdrawal of support measures and an increase in government indebtedness (see Chart 4). In response, the ESRB recommended careful monitoring of the effects of these measures.[6] In the CRE segment, emphasis was placed on the risk of a sudden drop in rental income and a deterioration in debt servicing capacity in the hotel and office segments (e.g. in DE, NL, SE, NO, FR, IT, ES, PT, GR and IE).

In 2021, the cyclical risk profile changed fundamentally in most countries. With the economy recovering rapidly and financial conditions remaining highly accommodative, the focus of risks shifted from recessionary pressure towards the risk of overheating in some parts of the financial system, particularly the RRE market. RRE prices rose markedly in most European economies, often faster than household incomes (e.g. CZ, SI, HU, PT and NL; see Chart 5). Credit growth strengthened, particularly in mortgage lending, and signs of asset price overvaluation emerged in a number of countries. Cyclical risk therefore consisted primarily in the accumulation of vulnerabilities during the recovery phase, supported by persistently low interest rates and high liquidity. The trends in the CRE segment were mixed. In an environment of very low interest rates and surplus liquidity, CRE prices rose in a number of countries, often driven by declining yields rather than fundamental growth in rents (e.g. NO, SE, DE, NL and IE). In these countries, attention was drawn to the risk of overvaluation and the sensitivity of valuations to future increases in interest rates. In southern European countries, CRE prices stabilised or increased, but risk was more closely linked to sectoral heterogeneity (offices versus hotels) and continued dependence on tourism.

6 *Recommendation of the European Systemic Risk Board on monitoring the financial stability implications of debt moratoria, and public guarantee schemes and other measures of a fiscal nature taken to protect the real economy in response to the COVID-19 pandemic* (ESRB/2020/8).

Chart 4: Non-financial sector debt ratios in European countries

% of GDP



Source: Eurostat, ECB, BIS

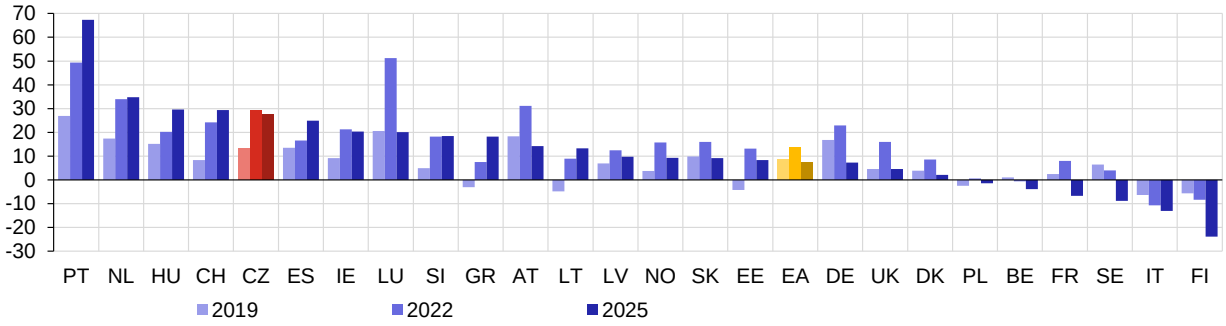
Note: The horizontal line for general government debt indicates the Maastricht public debt criterion. The 2015 figure refers to the first quarter, the 2019 and 2022 figures to the fourth quarter, and the 2025 figure to the third quarter. For non-financial corporations, the debt ratio in IE was 284% in 2015 and 173% in 2019; in LU it was 248%, 239%, 271% and 253%; and in CY it was 216% in 2015 and 183% in 2019.

In 2022, the cyclical risks shifted markedly once again. High inflation, the energy shock and rapid monetary policy tightening became the dominant factors. Interest rates rose sharply across Europe, increasing the debt servicing burden on households and firms while at the same time triggering corrections in financial asset and property prices (see Chart 6 and Chart 7). Cyclical risk thus shifted to borrowers' ability to service debt in an environment of higher interest rates and weaker economic growth. Whereas the risk of overheating had dominated in 2021, the risk of a sudden and potentially non-linear correction prevailed in 2022. In the CRE sector, falling valuations and increasing refinancing risk were most pronounced in SE, NO, UK, DE and FR, while they were less dominant in eastern European countries. Rising economic and geopolitical uncertainty prompted the ESRB to issue a general warning drawing attention to the increasing intensity and likelihood of risks and emphasising the need for macroprudential authorities, private sector institutions and market participants to maintain a prudent approach.[7]

7 *Warning of the European Systemic Risk Board on vulnerabilities in the Union financial system* (ESRB/2022/7).

Chart 5: Price-to-income ratio for RRE in selected European countries

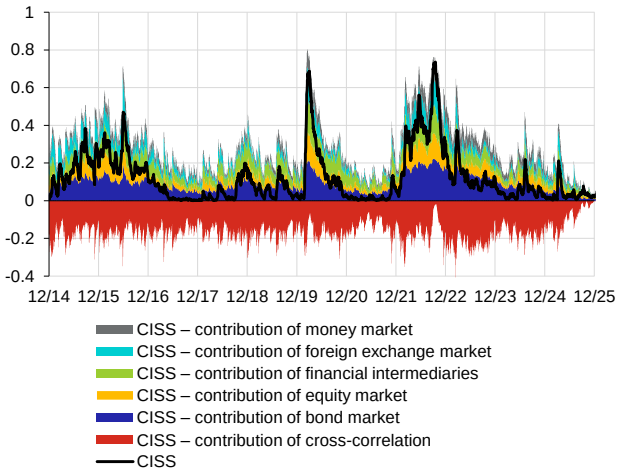
difference in index relative to 2015



Source: OECD

Chart 6: Composite Indicator of Systemic Stress (CISS)

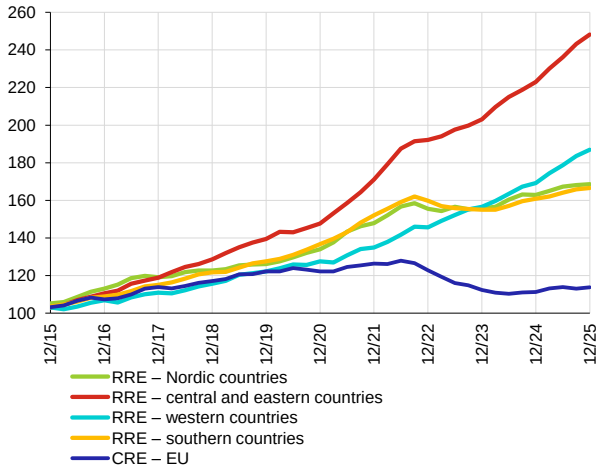
points



Source: ECB

Chart 7: CRE and RRE price indices

index: March 2015 = 100



Source: ECB, Eurostat, BIS

Note: The figures for each geographical grouping are calculated as the simple average of the indices for the countries concerned. Nordic countries: DK, FI, SE, NO, IS. Central and eastern European countries: BG, CZ, EE, HR, HU, LT, LV, PL, RO, SI, SK. Southern European countries: CY, ES, GR, MT, PT, IT. Western European countries: the remaining EU countries plus CH and UK.

In 2023–2025, cyclical risks in the European financial system were concentrated primarily around the consequences of the rapid and synchronised tightening of monetary policy. The dominant factor was the interest rate shock, which brought about both a repricing of financial assets and an increase in interest payments on debt. The core of the cyclical risks thus shifted from the preceding phase of accumulation of vulnerabilities to a phase of potential materialisation thereof in an environment of higher rates, weaker economic growth and greater financial market volatility.

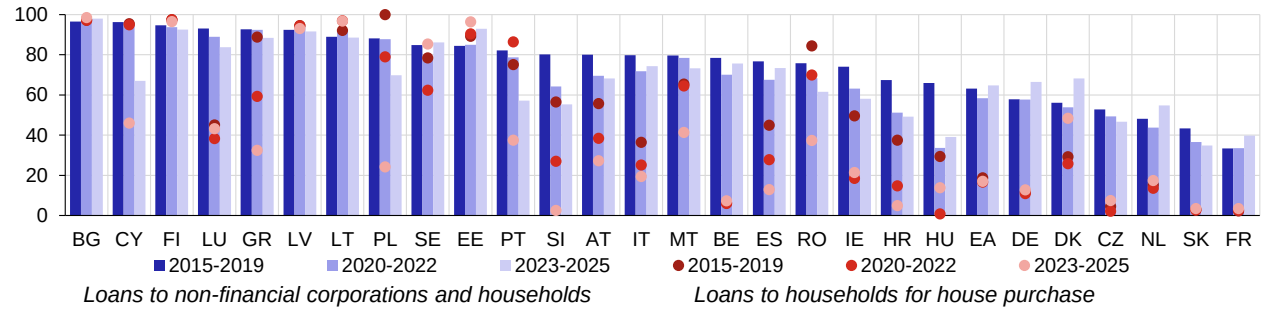
The key risk transmission channel was the interest rate channel, associated with extensive repricing of assets. The rising interest rates led to a significant decline in the market value of fixed-rate instruments. This mechanism was strongest in countries with a high share of long-term assets and structurally longer balance sheet duration (e.g. DE, FR, NL, AT and CH, but also CZ, PL and HU). For banks, valuation losses were concentrated mainly in portfolios of government and other high-quality bonds purchased during the period of very low yields. For some of these assets, the decline in market prices was reflected directly in equity through revaluation, whereas losses on bonds held to maturity remained unrealised for accounting purposes. Although these latent losses did not directly weaken regulatory ratios, they made banks more sensitive to any liquidity stress, which could have resulted in fire sales. A potential cyclical risk therefore lay in the possible gradual erosion of capital buffers due to revaluation. A specific episode was the stress in parts of the banking sector in spring 2023 triggered by problems at several US regional banks and the Credit Suisse crisis. These events highlighted the risk arising from the combined effects of interest rate and liquidity risk, with a loss of confidence leading to rapid deposit outflows and the potential materialisation of previously unrealised losses on bond portfolios.

Another important channel through which risks could potentially materialise was the household credit channel and households' sensitivity to rising interest rates. In countries with a high share of variable-rate loans or short initial

rate fixation periods, the higher rates fed through into repayments almost immediately, increasing the pressure on disposable income and consumption (e.g. SE, NO, DK, FI and the Baltic states; see Chart 8). In Poland, the increase in rates led to a sharp rise in the debt servicing burden and a slowdown in credit growth. In the Czech Republic, the substantial rise in rates caused a sharp decline in new lending and a marked tightening of credit conditions. Cyclical risk thus shifted from the preceding brief post-COVID phase of credit expansion towards the risk of a higher debt burden and a potential increase in credit losses in an environment of weaker economic growth.

Chart 8: Share of loans with a variable rate or an initial rate fixation of up to one year in new business in European countries

average for period in %



Source: ECB

Note: Loans to households for house purchase are also included in loans to non-financial corporations and households.

A major new source of cyclical risk materialisation during this period was the CRE market. The combination of higher discount rates, persistent weaker fundamentals in parts of the office segment following the pandemic and worse financing conditions led to declining valuations and rising refinancing risk in several countries. These developments were most pronounced in the Nordic countries, DE, UK and FR, which are characterised by higher indebtedness and greater reliance on market financing. The rising interest rates also increased refinancing risk for non-financial corporations. Over 2023–2025, the amount of debt maturing in an environment of substantially higher financing costs gradually increased. This made the corporate sector more sensitive to declining profitability and slowing economic activity. Vulnerabilities were particularly pronounced in energy-intensive sectors, which faced the combined pressures of high energy prices and rising interest expenses, and among real estate companies with higher leverage and greater reliance on market financing. These pressures were especially evident in DE, FR, IT and central Europe, while in the Nordic countries they were more heavily concentrated in the real estate sector.

STRUCTURAL RISKS: THE STORY OF REAL ESTATE AND ITS INTERCONNECTEDNESS WITH THE BANKING SECTOR

The first and almost universal structural risk was the strong link between the financial system and property markets. High household mortgage debt (see Chart 4) and concentration of bank exposures in the RRE sector (see Chart 9) were repeatedly identified as major sources of risk in almost all countries, the exceptions including RO and IT. In addition, structural characteristics of lending products – long maturities, foreign currency loans, deferred principal repayments and specific forms of housing finance – made the financial sector more sensitive to macroeconomic shocks (e.g. PL, FI, SE, NL, DK and BE). In countries with a higher share of variable-rate mortgages, the effect of interest rate increases on credit risk was stronger (e.g. NO, FI, PT, ES and the Baltic states). Similarly, the concentration of credit exposures to the CRE sector was highlighted in a number of countries (see Chart 10), particularly where these exposures are sensitive to falling property prices, deteriorating occupancy rates or tighter refinancing conditions (e.g. SE, DK, NL, DE, AT, FI, IE and FR).

In 2016, the ESRB also issued warnings[8] to selected countries (AT, BE, DK, FI, LU, NL, SE and UK) drawing attention to medium-term systemic risks associated with rising household indebtedness, households' ability to service their mortgage loans, RRE prices and mortgage lending. In 2019, after assessing[9] vulnerabilities in the RRE sector, the ESRB followed

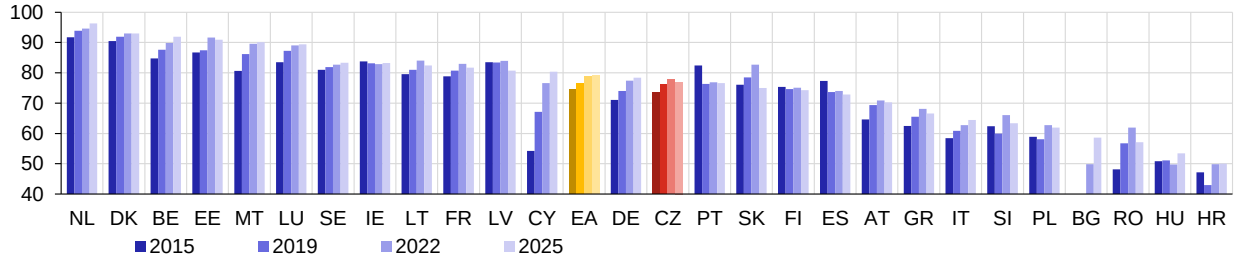
8 Warnings ESRB/2016/05 (AT), ESRB/2016/06 (BE), ESRB/2016/07 (DK), ESRB/2016/08 (FI), ESRB/2016/09 (LU), ESRB/2016/10 (NL), ESRB/2016/11 (SE) and ESRB/2016/12 (UK).

9 *Vulnerabilities in the residential real estate sectors of the EEA countries*, September 2019.

up by **issuing a set of recommendations**[10] to countries that had not responded adequately to its earlier warnings (BE, DK, FI, LU, NL and SE). It also **issued new warnings**[11] to another group of countries (CZ, DE, FR, IS and NO) where it had identified vulnerabilities stemming from RRE prices, growth in mortgages, household indebtedness and loose lending standards. **At the end of 2021, following a further assessment, the ESRB recommended**[12] that Germany and Austria introduce policies to reduce vulnerabilities in the RRE sector, further to the warnings issued to Germany in 2019 and to Austria in 2016. It also **issued a further set of warnings**[13] on medium-term risks stemming from the RRE sector to a number of European countries (BG, HR, HU, LI and SK). At the same time, an assessment of compliance with the recommendations issued in 2019 was carried out based on the "act or explain" mechanism.[14] In 2022, the ESRB adopted a recommendation on risks arising from the CRE sector, emphasising the need for better monitoring, subsector analysis and preparedness for macroprudential responses.[15]

Chart 9: Share of bank loans to households for house purchase in European countries

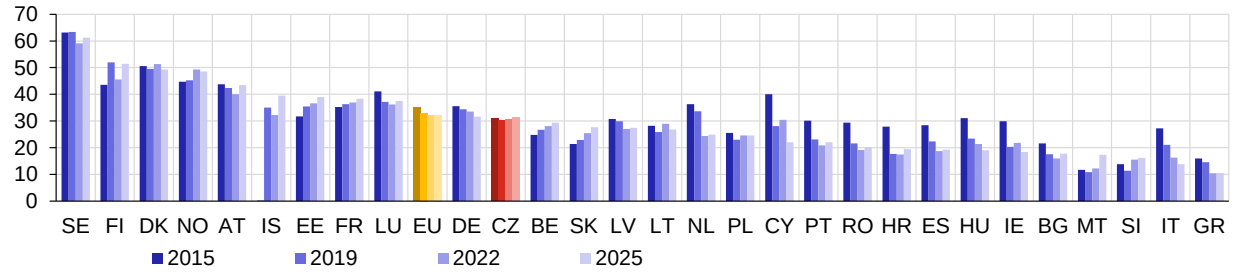
% of total loans to households



Source: ECB

Chart 10: Share of exposures to non-financial corporations arising from real estate and construction activities in European countries

% of banking sector's total exposures to non-financial corporations



Source: EBA

The second major structural risk was the interconnectedness between the banking and public sectors, particularly in economies with high public debt and a significant concentration of sovereign exposures in banks (e.g. southern Europe, BE, HR, FR, HU, PL and RO). This interconnectedness increased sharply during the pandemic. Governments issued unprecedented amounts of new debt to finance fiscal stimulus measures, while domestic banks absorbed these government bonds into their balance sheets on a large scale (see Chart 11). The market risk associated with this accumulation of debt was temporarily mitigated by the unconventional measures adopted by some central banks (see Chart 12), but governments also provided extensive guarantees on bank loans, creating an additional potentially strong indirect contagion channel. With the onset of high inflation, central banks ended their asset purchase programmes and raised interest rates sharply. This led to a significant decline in the market value of older bonds. This macroeconomic reversal exposed banks' potential vulnerability to interest rate risk arising from their holdings of government bonds.

10 Recommendations ESRB/2019/04 (BE), ESRB/2019/05 (DK), ESRB/2019/06 (LU), ESRB/2019/07 (NL), ESRB/2019/08 (FI) and ESRB/2019/09 (SE).

11 Warnings ESRB/2019/10 (CZ), ESRB/2019/11 (DE), ESRB/2019/12 (FR), ESRB/2019/13 (IS) and ESRB/2019/14 (NO).

12 Recommendations ESRB/2021/10 (DE) and ESRB/2021/11 (AT), in relation to *Vulnerabilities in the residential real estate sectors of the EEA countries*, February 2022.

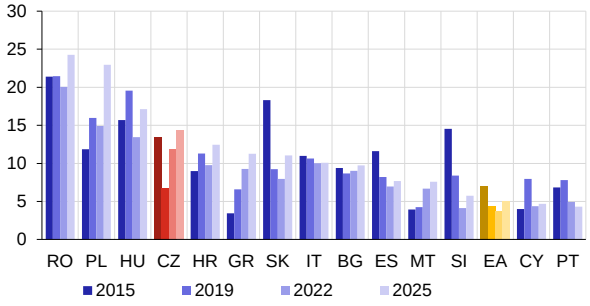
13 Warnings ESRB/2021/12 (BG), ESRB/2021/13 (HR), ESRB/2021/14 (LI), ESRB/2021/15 (HU) and ESRB/2021/16 (SK).

14 See the Compliance Reports for 2021, 2022 and 2023.

15 *Recommendation of the European Systemic Risk Board on vulnerabilities in the commercial real estate sector in the European Economic Area* (ESRB/2022/9).

Chart 11: Bonds issued by the domestic public sector and held by the domestic banking sector

share of banking sector financial assets in %

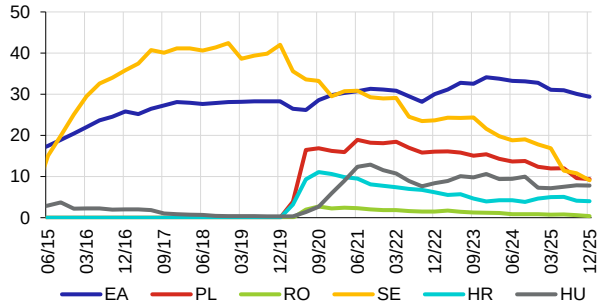


Source: ECB

Note: In the other EU countries, the share is below 5% throughout the period under review.

Chart 12: Bonds issued by the domestic public sector and held by the central bank

share of central bank financial assets in %

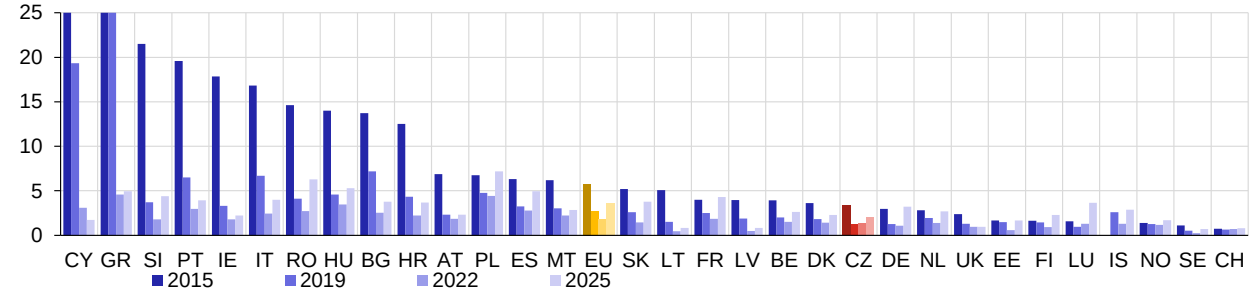


Source: ECB

The third structural issue was lower banking sector profitability, particularly in a situation of low monetary policy rates. The combination of low rates in previous years and higher operating costs constrained banks' ability to strengthen their capital. Although the rise in rates in 2022 increased interest margins, this effect was generally assessed as cyclical and could potentially have been outweighed by higher credit losses. In southern Europe in particular (IT, ES, PT, GR and CY), profitability was constrained in 2015–2020 by a combination of low interest rates and credit losses owing to high NPL ratios (see Chart 13), a legacy of the financial crisis and the long-standing weakness of the institutional framework.[16] In some countries (e.g. AT, DE and UK), low profitability was exacerbated by competitive pressures or a structurally higher cost base (see Chart 14). In Poland, legal obligations associated with foreign currency loans also weighed on profitability, while in Switzerland losses arising from Credit Suisse's exposure to the Archegos fund attracted attention. Credit Suisse was subsequently taken over by its competitor UBS. As the concerns about higher credit losses did not materialise, and owing also to higher interest margins and a falling share of NPLs in banks' portfolios in southern European countries, banking sector profitability improved after 2022 and this risk declined in intensity across the EU.

Chart 13: NPL ratio in European countries

%



Source: EBA, IMF

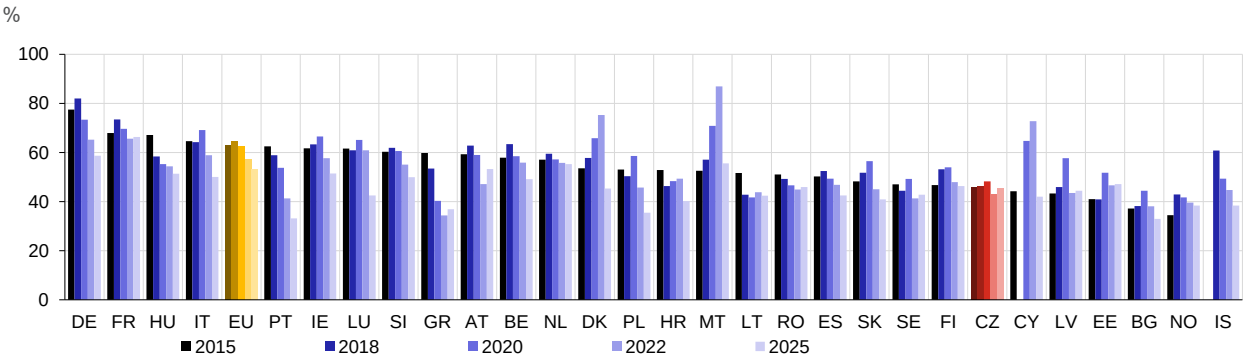
Note: For UK, the source is the EBA for 2015 and 2019 and the IMF for 2022 and 2025. For CY, the figure for 2015 is 49%. For GR, the figure for 2015 is 46% and the figure for 2019 is 35%.

In some regions, strong cross-border integration of banking groups was also a structural risk. The most prominent example was the Nordic-Baltic region, where the Baltic states were heavily dependent on Nordic banks, which owned up to 90% of the banking sector. In this environment, a macroeconomic, reputational or market shock in a parent bank's home country could quickly have put pressure on liquidity and stability across the region. Similarly, for Austrian banks, large exposures in central and eastern Europe represented a key channel for the transmission of risks. In 2019, the ESRB issued a recommendation aimed at strengthening the exchange of information on branches of credit institutions having their head office in another Member State or in a third country.[17]

16 The decline in NPLs after 2019 in both GR and CY was due to securitisations, sales, write-offs and restructurings. Non-performing exposures were thus transferred to a significant extent to the credit servicing sector.

17 *Recommendation of the European Systemic Risk Board on exchange and collection of information for macroprudential purposes on branches of credit institutions having their head office in another Member State or in a third country* (ESRB/2019/18).

Chart 14: Banking sector cost-to-income ratio in European countries



Source: EBA

Note: Banking sector cost efficiency is calculated as the ratio of administrative and depreciation expenses to net total operating income.

New cross-cutting structural risks also came to the fore across jurisdictions, most notably risks associated with **the transition to a low-carbon economy and the physical impacts of climate change,** reflecting the EU's strategy to achieve climate neutrality by 2050. During the 2022 energy shock, economies with higher energy intensity and a lower share of renewable energy sources were hit harder by elevated costs, as highlighted in their national reports. The digital transformation of the financial sector likewise gave rise to an entirely new type of systemic risk. **Cyber incidents** began to represent a potential source of large-scale disruption to financial markets and payment systems. This risk gradually grew in importance across Europe, but was most pronounced in highly digitalised regions (typically the Nordic and Baltic countries). It also rose when Russia invaded Ukraine and as geopolitical tensions mounted. In response to the growing intensity of this risk, the ESRB issued a recommendation in 2021 on coordination in the event of systemic cyber incidents.[18]

Geopolitical risk had already begun to feature in the reports following the annexation of Crimea and in connection with Brexit and the trade wars between the USA and China. However, it did not come to the fore until 2022. Russia's invasion of Ukraine was not only a short-term macroeconomic shock, but led to a far-reaching restructuring of trade, energy and financial links. For financial institutions, the introduction of sanctions regimes against Russia and Belarus meant increased legal, reputational and compliance risks, including the need to rapidly adapt their systems for screening sanctions, freezing assets and monitoring cross-border transactions. The structural nature of this risk lay in a long-term increase in operational complexity and persistent uncertainty regarding the future configuration of economic relations between the EU and eastern markets. This risk was emphasised most strongly in central and eastern European countries and the Baltic states, which are geographically and commercially closer to the conflict, while Austria faced indirect effects through its banks' exposures in central and south-eastern Europe.

Closely related to the geopolitical shock was **the energy channel**, which was also structural in nature. The sharp reduction in supplies of Russian gas and the subsequent rise in energy prices (see Chart 15) revealed differences in energy dependence across economies. Countries with more energy-intensive industry or strong dependence on Russian energy sources faced a combination of cost pressures, declining competitiveness and heightened investment uncertainty. For the financial sector, this meant greater sensitivity of loan portfolios to the profitability of energy-intensive firms and to long-term shifts in industrial structure. The structural risk lay in the possibility of a sustained weakening of parts of the industrial base and a redirection of capital flows within the European economy.

Other cross-cutting risks included **demographic developments** (e.g. HR, IT, RO and SK), affecting both long-term growth and **public debt sustainability**.

The growing importance of the non-bank financial sector became another structural source of systemic risk. Amid persistently low or even negative interest rates (see Chart 1), the search for yield intensified, market interconnectedness increased and financing shifted outside the banking sector. This made insurance companies and pension funds more vulnerable to reinvestment risk, longer maturities, riskier assets and property market developments (AT, BE, CH, DE, IT and CY). Investment funds meanwhile grew in importance (see Chart 16), with liquidity mismatches, leverage and procyclical behaviour becoming increasingly evident, particularly in advanced western European economies (BE, FR, DE, IE, NL, NO, SE, UK and ES). Other significant vulnerabilities included growing exposures to RRE and especially CRE, which strengthened the link between institutional investors and the real estate cycle (CH, SE, DK, NL, DE, IE, FR, UK, NO, BE and AT), and stronger interconnectedness between the non-bank financial sector and public finances through holdings

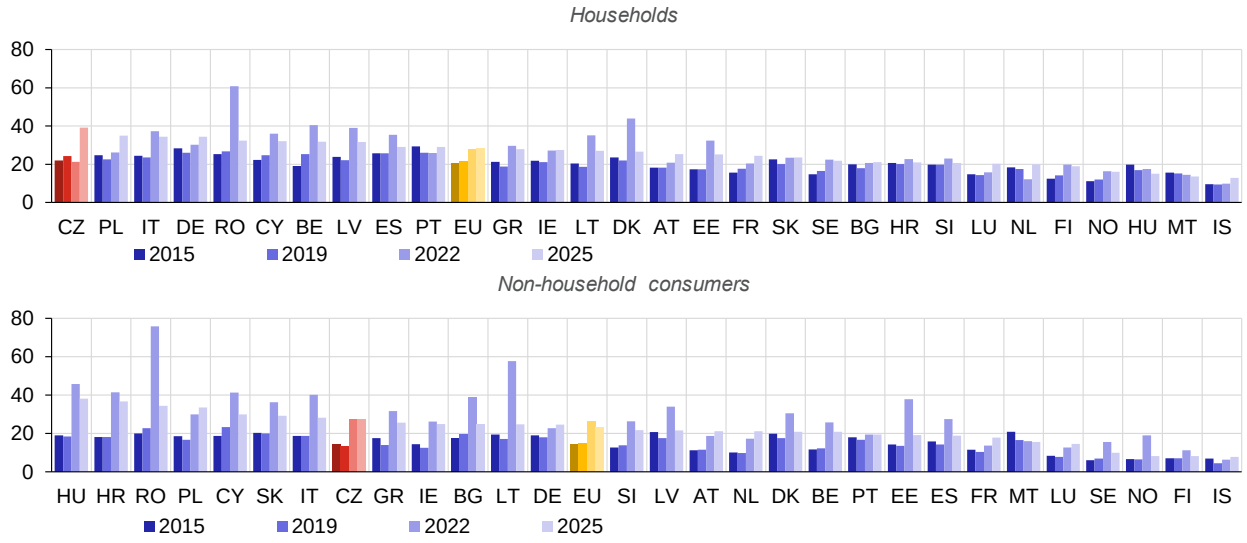
18 *Recommendation of the European Systemic Risk Board on a pan-European systemic cyber incident coordination framework for relevant authorities* (ESRB/2021/17).

of government bonds (HR, RO, IT and BE). These vulnerabilities became fully apparent during the market turmoil of 2020 in the "dash for cash" episode[19] and resurfaced later in the environment of high inflation and rapid monetary policy tightening (see Chart 6), when margin requirements, the risk of fire sales and liquidity pressures on pension funds and other investors all increased (NO, SE, FI, FR, DE, UK and AT). Assets managed by non-bank institutions continued to expand, as did the importance of electronic money institutions and payment companies (LT, IE and UK), while in Ireland the need for a macroprudential response to the procyclicality of real estate funds also became more prominent. Although the systemic importance of the non-bank financial sector remained lower in central and eastern Europe, exposures to real estate and sensitivity to external shocks increased there as well.

The ESRB also responded to the sector's growing importance. In 2017, it recommended[20] strengthening the framework for investment fund liquidity and leverage. This followed concerns that fire sales and liquidity mismatches in funds could exacerbate market stress. In connection with the COVID-19 pandemic, the ESRB **issued a recommendation in 2020**[21] on coordinated supervision of the liquidity preparedness of selected funds and their ability to meet investor redemptions, particularly in segments with significant exposures to corporate debt and real estate.

Chart 15: Electricity prices including taxes and levies in European countries

purchasing power standards (PPS) per 100 kWh

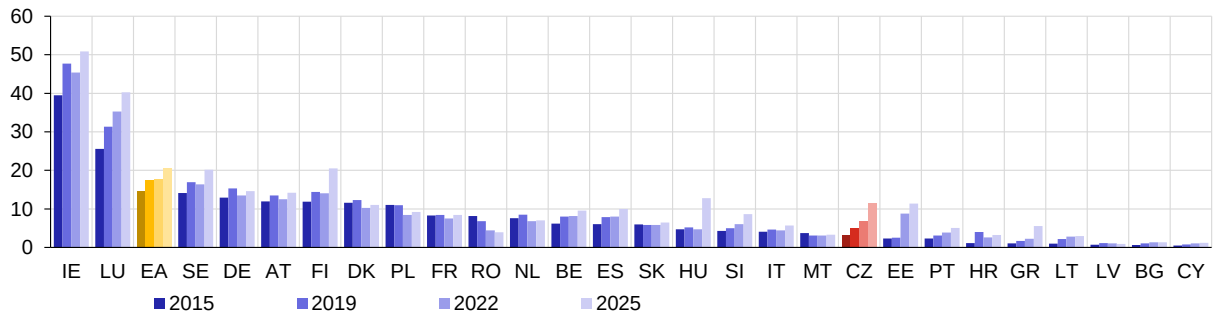


Source: Eurostat

Note: The EU aggregate for 2015 is not available, so the chart shows the figure for 2017. For IS, the figures for non-household consumers refer to 2016 instead of 2015 and to 2024 instead of 2025. For households, the prices shown are for medium-sized consumers with an annual consumption between 2,500 kWh and 5,000 kWh; for non-household consumers, they are for medium-sized consumers with an annual consumption between 500 MWh and 2,000 MWh.

Chart 16: Investment funds' share of financial assets in European countries

% of private financial sector financial assets



Source: ECB

19 For more information, see Barone et al. (2023): *The global dash for cash: Why sovereign bond market functioning varied across jurisdictions in March 2020*.

20 *Recommendation of the European Systemic Risk Board on liquidity and leverage risks in investment funds* (ESRB/2017/6).

21 *Recommendation of the European Systemic Risk Board on liquidity risks in investment funds* (ESRB/2020/4).

MACROPRUDENTIAL POLICY RESPONSES TO CYCLICAL AND STRUCTURAL RISKS

The macroprudential instruments most widely used over the period under review can be divided into two main categories: **releasable capital buffers (CCyB and SyRB) and borrower-based measures (LTV, DSTI and DTI/LTI)**.

Capital buffers

Developments in macroprudential **capital buffers** in European countries over 2013–2019 were fundamentally shaped by the implementation of Basel III into EU law.[22] **Central banks were initially cautious in introducing a non-zero countercyclical capital buffer (CCyB) rate.** Most countries kept the rate at 0% because lending remained subdued. As the economy gradually recovered and loans and RRE prices began to grow more rapidly, however, more and more countries started to raise the CCyB rate, particularly in northern and central Europe, where it became the main countercyclical instrument used to respond to risks stemming from overvalued property markets and surging credit growth.

The systemic risk buffer (SyRB) – intended to strengthen resilience to long-term and non-cyclical risks – **simultaneously became more widely used.** Countries justified its use, for example, by the size and concentration of the banking sector, the openness of the economy, or high indebtedness (particularly EE, FI, HU, BG and AT). In some countries (e.g. PL, RO and HU), the SyRB became the main macroprudential policy instrument where the credit cycle was not strong enough to warrant activating the CCyB. Buffers for global and other systemically important institutions (G-SIIs and O-SIIs) also became part of the macroprudential framework in order to mitigate systemic risk associated with banks that were "too big to fail". In many cases (e.g. AT and CZ), the O-SII buffer initially operated in combination with the SyRB.[23]

At the onset of the pandemic, most countries that had built up releasable capital buffers also actively used them. CCyB rates were reduced or kept at zero, and banks were encouraged to use their buffers to absorb losses and maintain the supply of credit. Restrictions on dividend distributions complemented this approach, in line with the ESRB recommendation.[24] Reductions were made not only to the CCyB, but also to the O-SII buffer (in HU, NL and FI) and SyRB. In some countries, the SyRB was also merged with the O-SII buffer during the implementation of CRD V, with the O-SII buffer subsequently being used exclusively for this purpose.

From 2021 onwards, approaches began to diverge. Countries experiencing rapid credit growth and overheating property markets began to rebuild the CCyB, while other jurisdictions kept it at zero on the grounds that tightening financial conditions were already exerting a restrictive effect (particularly southern Europe). In 2022, inflation, the tightening of ECB monetary policy and the accumulation of systemic risks led to further increases in rates. At the same time, partly in connection with the review of the EU macroprudential framework,[25] sectoral SyRBs began to be used more extensively for exposures to the mortgage market. Belgium and Lithuania decided to introduce such buffers as early as 2021, and other countries followed suit in subsequent years.[26]

The view of the role of the CCyB also changed after 2020. Many countries entered the COVID-19 crisis with a rate of 0% and were therefore unable to reduce the buffer in response to the shock. This was reflected in the review of the EU macroprudential framework,[25] where the role of a "positive neutral CCyB rate" was discussed. This shift in paradigm became evident after 2021, when most countries that had previously not used the CCyB began to increase the rate. The CCyB thus ceased to be merely a response to an evident credit expansion and became an instrument for building banking sector resilience pre-emptively to absorb unexpected losses, allowing capital to be released even in response to shocks that had not originally been a source of cyclical risk accumulation. This is also evident from the cluster analysis below.

Countries' approaches to setting macroprudential capital buffers over 2013–2025 can be divided into five clusters (groups). The cluster analysis (see Diagram 1) was carried out using AI tools based on Appendix 1 and Appendix 2. Owing to legislative changes and to the post-COVID approach to setting the CCyB described above, the variables used are divided into the pre-pandemic and post-pandemic periods. In the case of the SyRB, the buffer was excluded from the analysis where it had been introduced because of the systemic importance of individual banks and subsequently merged with the O-SII buffer following the implementation of CRD V. The following variables were used in the analysis:

22 Through the CRR and the CRD.

23 The relationship between the O-SII buffer and the SyRB was covered in the ESRB's *Final report on the use of structural macroprudential instruments in the EU*.

24 *Recommendation of the European Systemic Risk Board on restriction of distributions during the COVID-19 pandemic* (ESRB/2020/7).

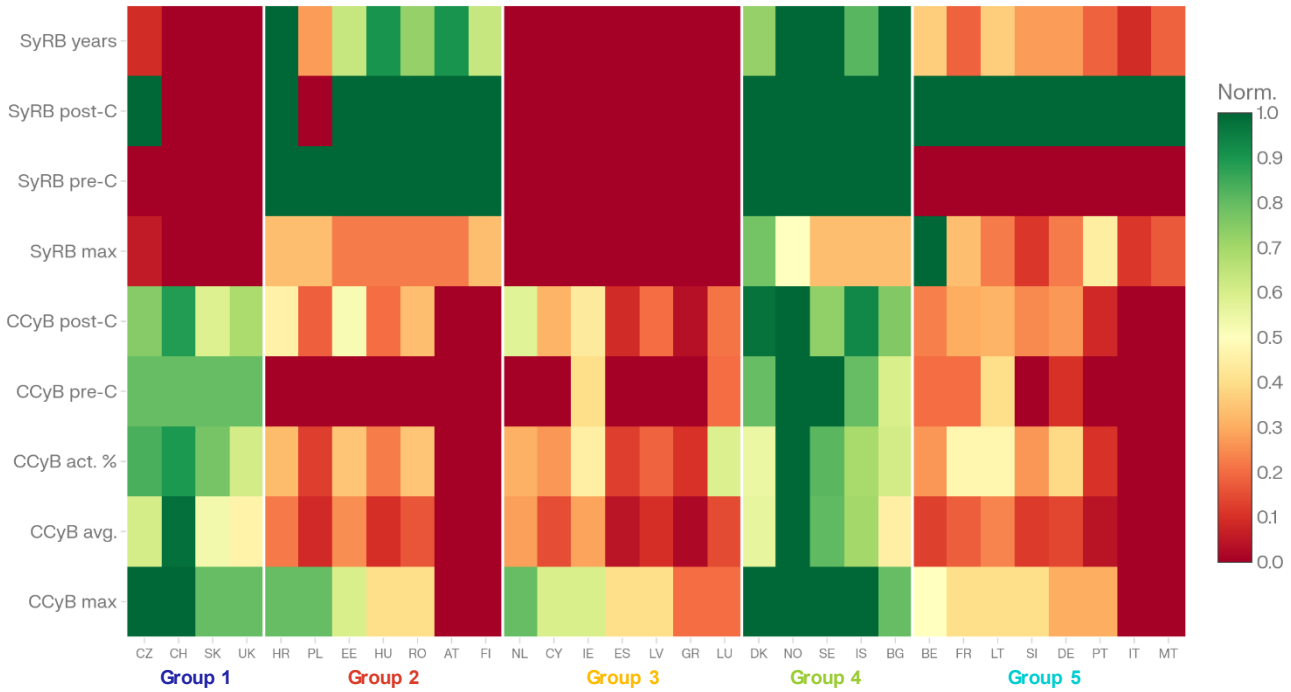
25 *Review of the EU macroprudential framework for the banking sector*, March 2022.

26 In Belgium, the sectoral SyRB replaced the previously active Article 458 CRR; see the ESRB notification. A similar change took place in France, which had applied Article 458 CRR to exposures to large, heavily indebted non-financial corporations and subsequently replaced it with a sectoral SyRB; see HCSF.

CCyB max – the highest CCyB rate ever set by the country over the entire period under review. It indicates the maximum level at which its countercyclical macroprudential policy was set.
CCyB avg. – the arithmetic mean of the CCyB rate over the entire period under review. It indicates the long-term level of the instrument.
CCyB act. % – the share of the entire period under review during which the CCyB rate was non-zero. It measures the duration of active countercyclical macroprudential policy.
CCyB pre-C – the maximum CCyB rate in the period from January 2013 to January 2020. It captures whether, and how strongly, countries built up the CCyB in the pre-pandemic period.[27]
CCyB post-C – the average CCyB rate in the period from February 2021 to April 2025. It captures the speed and strength of the rebuilding of the CCyB following its pandemic-related reduction in 2020.
SyRB max – the highest SyRB (or sectoral SyRB) rate applied.
SyRB pre-C – a binary variable capturing whether the structural buffer had already been introduced before the pandemic period.
SyRB post-C – a binary variable capturing whether the structural buffer was introduced after the pandemic period.
SyRB years – the total length of time for which the SyRB was actively applied. This supplements the binary variables with a quantitative dimension of continuity, distinguishing countries that used the SyRB only for a short time from those where it has been used for longer.

The intensity of green in the chart indicates that the relevant instrument parameter in the given country attained positive or maximum values, while the intensity of red indicates non-use or a lower intensity of use of the instrument.

Diagram 1: Classification of countries into clusters according to their approach to setting macroprudential capital buffers



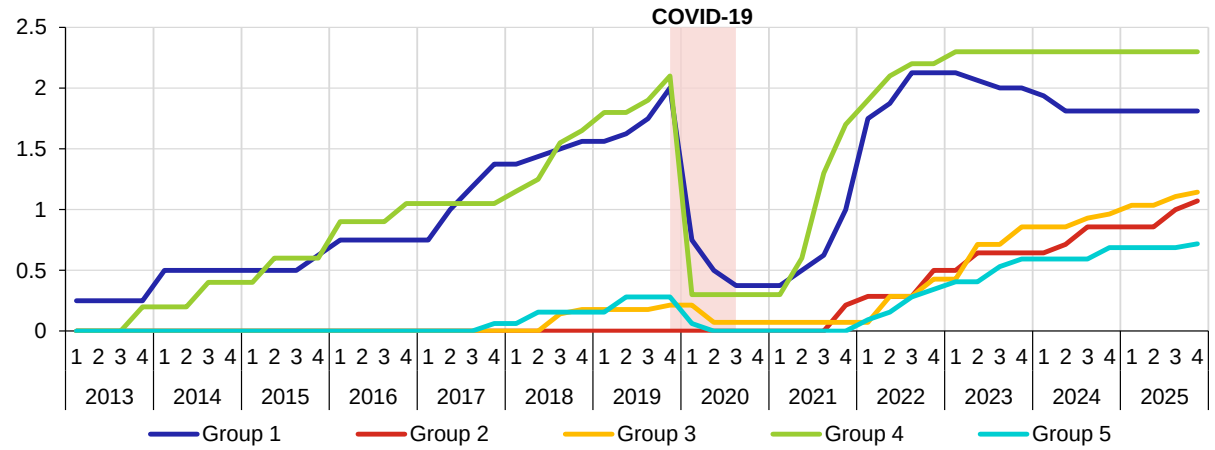
Source: Authors' calculations and heatmap generation using Perplexity AI (Claude Sonnet 4.6 model) based on Appendix 1 and Appendix 2
Note: The variables were normalised to a range of 0–1.

The first group contains the Czech Republic, Slovakia, Switzerland and the UK. Their common feature is that they use the CCyB as their primary macroprudential instrument, actively calibrating it according to the phase of the credit cycle (see Chart 17). The Czech Republic announced the introduction of the SyRB in 2024, at a rate of 0.5%, thereby complementing its macroprudential strategy with a more comprehensive approach to structural risks. A specific feature of Switzerland is the application of a sectoral CCyB only to mortgage loans financing RRE located in Switzerland.

27 For *CCyB pre-C*, the maximum rate reached is used, unlike the average rate used for *CCyB post-C*, owing to the phase-in of the relevant legislative frameworks in individual countries. Any inactivity at the beginning of the period under review could be due to this.

Chart 17: Average announced CCyB rate for the countries in each group

%



Source: Authors' calculations using Perplexity AI (Claude Sonnet 4.6 model), based on Appendix 1

The second group (AT, EE, FI, HR, HU, PL and RO) is characterised by a macroprudential framework historically based primarily on the SyRB as a structural instrument, with the CCyB being used more actively only in recent years following the pandemic. Austria and Finland apply the SyRB as a long-term structural buffer; neither has used the CCyB to date. Croatia, Hungary and Romania have long used a general SyRB and have been building up the CCyB as a complementary cyclical instrument. Estonia is a specific case in this context: in the fourth quarter of 2021, it abolished the SyRB and replaced it with a dynamically managed CCyB in line with a change in its macroprudential strategy. Poland is included in this group owing to its active use of the SyRB in 2017–2020, although it deactivated the buffer by releasing it during the pandemic and has not reinstated it to date; it only began building up the CCyB in the third quarter of 2024.

The third group comprises countries (CY, ES, GR, IE, LU, LV and NL) that made relatively little use of macroprudential capital buffers over the period under review. None of them ever introduced a SyRB (the Dutch SyRB was excluded from the analysis because it was subsequently merged with the O-SII buffer). These countries have either activated the CCyB only in recent years or used it at relatively low rates. The southern EU countries entered the buffer-building phase only in 2022 (Cyprus) or 2024 (Spain and Greece), following years in which their banking sectors underwent restructuring and reduced the share of impaired assets in the form of NPLs. Luxembourg set the CCyB rate at 0.5% before the pandemic and then left it unchanged. Latvia and the Netherlands set positive neutral CCyB rates of 1% and 2% respectively after the pandemic, with a gradual phase-in. Ireland pursued the most active CCyB policy in this group. It reduced the CCyB rate from 1% to 0% during the pandemic and gradually raised it to 1.5% when rebuilding the buffer afterwards.

The fourth group (DK, NO, SE, IS and BG) consists mainly of the Nordic countries, which have used macroprudential capital buffers consistently over the long term and generally at more prudent levels. They were among the first countries in Europe to activate the CCyB and maintained it at relatively high levels for most of the period under review. They have also long used the SyRB, also at relatively high rates.[28] The simultaneous presence of both instruments indicates an effort to achieve comprehensive risk coverage: the CCyB responds to cyclical fluctuations in credit growth, while the SyRB addresses structural vulnerabilities. Bulgaria also belongs to this group based on its SyRB rate; it is the only country from central and eastern Europe to use both buffers with similar intensity. The response to the pandemic in 2020 was rapid in this group: buffers were released immediately but were rebuilt just as quickly.

The key common feature of **the final group (BE, DE, FR, IT, LT, MT, PT and SI)** is that they introduced a sectoral SyRB[29] exclusively after the pandemic while making moderate use of the CCyB in terms of both the level of the rate and the overall duration of its use. Germany, Belgium, Lithuania, Malta, Portugal and Slovenia introduced sectoral SyRBs targeting exposures to RRE in response to mortgage market developments and concerns about a property market correction. Slovenia subsequently extended the buffer to other exposures to natural persons. France introduced a unique sectoral SyRB in 2023 targeting exposures to indebted corporations. The sectoral SyRB in Italy is intended to cover risks associated

28 However, the form of the buffer (sectoral or general) and the exposures to which it is applied (domestic only, all…) must also be taken into account here.

29 The sectoral SyRB is also discussed in more detail in the cnBlog article *Sektorová kapitálová rezerva ke krytí systémového rizika v zemích EU a u nás* (*The sectoral systemic risk buffer in EU countries and the Czech Republic*, in Czech only).

with geopolitical tensions and the expected increase in default rates on loans to households and non-financial corporations. As it applies to all exposures in Italy, its scope is close to that of a general SyRB.

Finally, the influence of institutional factors on approaches to setting macroprudential instruments must also be highlighted. This can be seen in the geographical breakdown of countries. The Nordic countries have long used macroprudential capital buffers proactively and with high intensity, whereas southern European countries only began introducing them in 2022 and at relatively low rates. No significant differences are apparent among the other groups – countries in central, eastern and western Europe. Once borrower-based measures, particularly mortgage lending limits (LTV, DSTI and DTI/LTI), are also taken into account, however, the differences between western European countries and central and eastern European economies become clear: the latter pioneered these limits and use them to a greater extent, or more restrictively.

Borrower-based measures

Borrower-based measures (BBMs) were introduced in some countries as early as 2000 and, under the current EU legislative framework, fall exclusively within national competence. This has resulted in considerable cross-country heterogeneity in their definitions, calibration, binding nature and legal basis. Although the ESRB explicitly included them in its set of macroprudential instruments[30] and began issuing country-specific warnings and recommendations on their calibration, in its contribution to the review of the EU macroprudential framework it emphasised that, given this heterogeneity, full harmonisation of their parameters would not be appropriate and that decisions on activation, release and calibration should remain at national level.[25]

Before 2015, BBMs were used to a more limited extent in Europe and were centred primarily on the LTV limit. DSTI and DTI/LTI limits were less common at the time. Even then, specific national features were evident – for example, Hungary and Romania differentiated limits according to the currency in which the loan was denominated, as foreign currency mortgages represented a source of systemic risk in these countries.

Between 2015 and 2019, BBMs began to be used more widely and became a standard feature of European macroprudential policy. Alongside LTV limits, income-based limits (DTI and DSTI) and recommendations on stress testing, loan maturities and amortisation started to be used more frequently. Approaches thus became increasingly differentiated. For example, the UK introduced a flow-based LTI limit – rather than imposing an absolute limit on the LTI ratio at borrower level, it capped the lender's share of new lending at an LTI above a specified threshold. Sweden introduced a requirement for highly indebted households to amortise a specified portion of the mortgage principal, while Norway brought in a regionally targeted limit: a stricter LTV limit on purchases of second homes in Oslo, where imbalances in the RRE market were larger than in the rest of the country.

Over 2020–2025, the pandemic did not lead to the widespread abolition of BBMs. Most countries kept them in place, regarding them as a structural safeguard against a deterioration in the quality of new mortgages. Easing was generally selective: for example, the Czech Republic temporarily deactivated DTI and DSTI and relaxed LTV, while Sweden allowed temporary exemptions from the amortisation requirements. Once the acute phase of the pandemic had passed, the trend shifted towards tightening policy or transitioning to legally binding limits. Lithuania, for example, tightened the conditions applying to second and subsequent residential properties, while Iceland lowered LTV and introduced DSTI limits differentiated by borrower type. Greece and Croatia introduced LTV and DSTI limits for the first time with effect from 2025.

Overall, with the contribution of the ESRB, European approaches shifted from a simple LTV limit towards much more complex regimes combining collateral value, borrower income and type, and loan maturity or purpose. Unique features illustrate how countries adapted the instruments to their own structural vulnerabilities: Hungary differentiated DSTI according to the length of the initial rate fixation period and the currency of the loan; Portugal linked the maximum mortgage maturity to the borrower's age; the Netherlands remained unusual in applying a 100% LTV limit; and Switzerland relied more on self-regulation and affordability tests than on conventional statutory limits. By contrast, some large economies, notably Germany, Italy and Spain, relied more heavily on supervision, capital buffers and monitoring of lending standards.

Countries' approaches to setting borrower-based limits over 2015–2025 can be divided into five clusters (groups). The cluster analysis (see Diagram 2) was carried out using AI tools based on selected variables from Appendix 3. The following variables were used in the analysis:

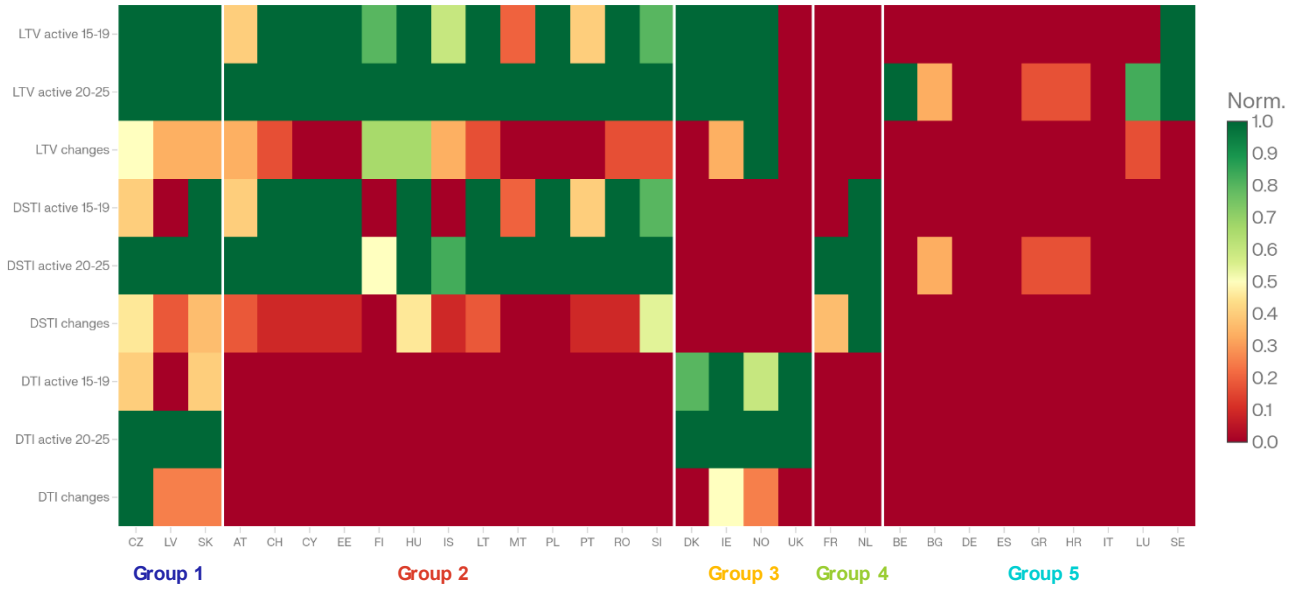
LTV active 15–19 – the share of years in which the LTV limit was active over 2015–2019.
LTV active 20–25 – the share of years in which the LTV limit was active over 2020–2025.
LTV changes – the number of changes to the calibration of the LTV limit over 2015–2025.
DSTI active 15–19 – the share of years in which the DSTI limit was active over 2015–2019.
DSTI active 20–25 – the share of years in which the DSTI limit was active over 2020–2025.

[30] *The ESRB handbook on operationalising macroprudential policy in the banking sector*.

DSTI changes – the number of changes to the calibration of the DSTI limit over 2015–2025.
DTI active 15–19 – the share of years in which the DTI/LTI limit was active over 2015–2019.
DTI active 20–25 – the share of years in which the DTI/LTI limit was active over 2020–2025.
DTI changes – the number of changes to the calibration of the DTI/LTI limit over 2015–2025.

The intensity of green in the chart indicates a longer period of activation of the relevant instrument in the given country and period, or a greater number of changes to its calibration. Conversely, the intensity of red indicates non-use or a lower number of changes to the instrument's calibration.

Diagram 2: Classification of countries into clusters according to their approach to setting borrower-based limits



Source: Authors' calculations and heatmap generation using Perplexity AI (Claude Sonnet 4.6 model) based on Appendix 3

Note: The variables were normalised to a range of 0–1. The variables relating to DTI also include LTI variants. The data are based primarily on information reported by national authorities to the ESRB. They may therefore not capture all measures implemented, particularly those taking the form of recommendations.

The first group contains the Czech Republic, Latvia and Slovakia and is characterised by the most comprehensive approach to setting borrower-based limits. These are the only countries that use all three types of limits – LTV, DSTI and DTI/LTI – simultaneously and actively, with each having been recalibrated repeatedly over 2015–2025.

The second group comprises predominantly central and eastern European countries **(AT, CH, CY, EE, FI, HU, IS, LT, MT, PL, PT, RO and SI)**, whose common feature is extensive and stable use of LTV limits (continuously active over 2020–2025) combined with DSTI limits. By contrast, these countries do not use DTI/LTI limits at all.

For the third group of countries (DK, IE, NO and UK), the key feature is a preference for DTI/LTI debt limits over DSTI limits. This approach reflects a tradition of monitoring the total amount of household debt relative to income rather than the immediate debt servicing burden. The relatively low number of changes to the limits suggests that DTI/LTI limits are set more as permanent structural features than as instruments activated cyclically.

The fourth group consists of the Netherlands and France, the only countries that use DSTI alone as a borrower-based limit – neither country applies LTV or DTI/LTI limits.[31] The Netherlands is an extreme case, with 11 changes to the DSTI limit over the period under review, the highest number in the entire sample. This reflects the annual recalibration of DSTI limits differentiated by household income group and interest rate. France has a similar profile, relying exclusively on DSTI. This limit was active over 2020–2025 and was changed four times while in force.

The countries in the fifth group (BE, BG, DE, ES, GR, HR, IT, LU and SE) are characterised by minimal or no use of borrower-based limits over the period under review. Some of Europe's largest economies (DE, ES and IT) do not use them at all. Other countries introduced them only recently (BG, GR and HR) or did so earlier and then left them unchanged. Sweden is one such example: it introduced an LTV limit of 85% back in 2010 and made no changes to it after that.

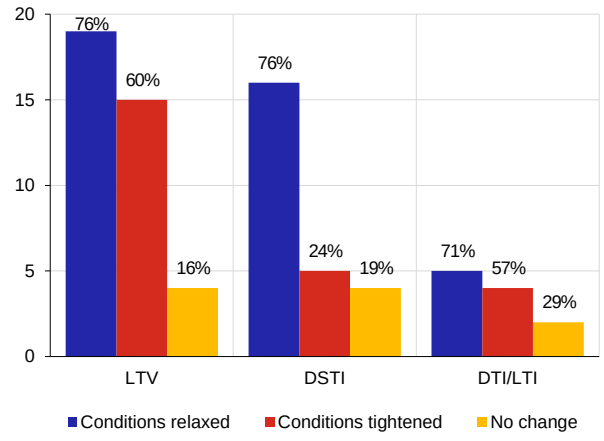
31 The Netherlands has an LTV limit of 100%; for the purposes of the analysis, this setting is regarded as inactive.

Beyond the cluster analysis, it is useful to highlight **exemptions from the borrower-based limits**, which add to the heterogeneity. Of the 25 countries whose LTV limit is regarded as active for the purposes of the analysis, 19 introduced exemptions allowing banks to grant loans subject to more lenient limits under certain conditions (see Chart 18). The most common were volume-based exemptions, allowing a certain percentage of loans to exceed the limits. In Croatia, for example, up to 20% of new loans could exceed the limit, although at least 75% of this volume had to be used to purchase a primary residence. Other common measures included higher limits for first-time buyers or younger borrowers (e.g. CZ, FI, GR, IS and MT) and for loans benefiting from certain government guarantees (e.g. EE and LV). A total of 15 countries also applied stricter LTV limits under certain conditions, often to restrict lending to riskier groups of borrowers. A typical example was a lower limit for the purchase of investment property (e.g. BE, IE, LT, LV and PT) or for foreign currency loans (HU and RO). The structure of exemptions for DTI and LTI limits was similar to that for the LTV limit (see Chart 18). Compared with the other two limits, DSTI limits displayed a higher proportion of exemptions resulting in a relaxation of the income-based limit and a lower proportion of stricter limits (see Chart 18). The exemptions were similar to those applying to the other limits, but differentiated levels by borrowers' nominal income were more common for DSTI limits (CY, HU and SI), while Latvia applied more lenient conditions to energy-efficient housing loans (also applicable to DTI).

As with capital buffers, differences in approach were also evident across geographical groupings. Nordic and central and eastern European countries have a longer tradition of introducing and using borrower-based limits, particularly LTV. By contrast, the largest economies (DE, ES, FR, NL, IT and UK) either do not have an LTV limit at all or have it set at 100%. The Netherlands and the UK have long relied solely on the income-based DSTI and LTI limits.

Chart 18: Exemptions from borrower-based limits

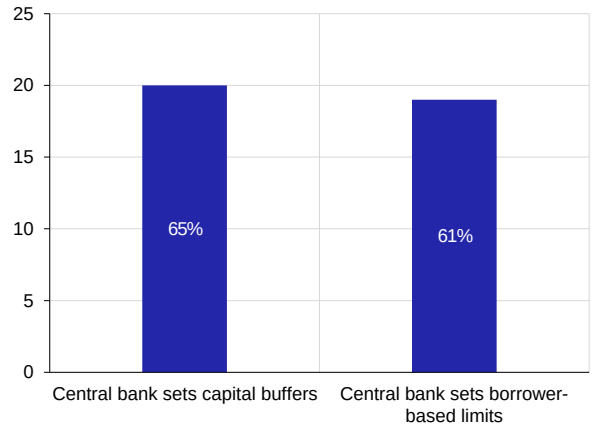
number of exemptions introduced; percentages indicate share of total number of limits introduced



Source: ESRB, national macroprudential authorities

Chart 19: Macroprudential instruments under the responsibility of central banks

number of central banks; percentages indicate share of total of 31 countries



Source: ESRB, national macroprudential authorities
Note: Norway is not included among the countries where the central bank sets capital buffers, as the central bank is only responsible for the CCyB, not the SyRB.

Finally, it should be noted that macroprudential policy frameworks also differ across countries in terms of the allocation of powers among individual institutions. Of the 31 countries under review, the central bank was responsible for setting capital buffers in 20 countries and borrower-based limits in 19 countries as of the end of 2025 (see Chart 19).[32] The allocation of institutional roles may affect the calibration of macroprudential instruments, as less independent responsible institutions may increase the risk of delayed action or inaction.[33] Most countries, however, coordinated macroprudential policy issues to some extent across institutions (the central bank, the government, the supervisory authority and other similar institutions), for example through financial stability committees.

In the Nordic countries specifically, responsibility for BBMs lies mainly with ministries of finance (DK and NO) or with financial stability committees and supervisory authorities (FI, IS and SE). In Iceland, however, the committee has formed part of the central bank since 2020. A similar division of responsibilities applies to capital buffers: in Norway, the central bank is only responsible for the CCyB (since 2021), while in Sweden capital buffers are the responsibility of the supervisory

32 The difference is due to the Netherlands, where responsibility for borrower-based measures lies with the government; in the case of the DSTI limit, this is based on a recommendation from the independent institution NIBUD.

33 The ESRB highlighted the need for independence in its *Recommendation on the macro-prudential mandate of national authorities* (ESRB/2011/3). The benefits of independence are also documented in studies such as Fraccaroli, N., et al. (2025): *Does regulatory and supervisory independence affect financial stability?* Journal of Banking & Finance, 170, 107318.

authority.[34] Other countries where macroprudential instruments are not set directly by the central bank include Belgium, France, Germany, Poland, Luxembourg, Switzerland and the Netherlands. In the Netherlands, the central bank only sets capital buffers. In Belgium, the activation of, or changes to, macroprudential instruments are subject to approval by the Ministry of Finance or the Council of Ministers. As for BBMs, the Belgian central bank may only issue non-binding recommendations, while binding limits are set by the government, with the central bank acting in an advisory capacity in the process. In the other countries where the central bank is responsible for setting macroprudential instruments, decisions are often taken in coordination with other institutions.

CONCLUSION

This analysis of national financial stability reports shows that the nature of perceived risks in the European financial system changed significantly over 2015–2025. The low interest rate environment supported growth in credit, indebtedness and property prices, while the pandemic, the inflation and energy shocks related to the conflict in Ukraine, and the subsequent tightening of monetary policy increased the risks associated with debt servicing, refinancing and asset repricing. The impacts varied across countries depending on the structure of lending, the level of indebtedness, the importance of the property market and reliance on market financing. Although the expected general increase in credit losses following the above shocks did not fully materialise in most countries (partly owing to fiscal support), the higher interest rates exposed the vulnerabilities accumulated previously.

Alongside cyclical risks, long-term structural vulnerabilities persisted. The most significant of these included high exposures of banks and non-bank institutions to retail and commercial real estate, interconnectedness between the banking and public sectors, cross-border links between financial groups and, in some countries, low profitability and high NPL ratios. At the same time, cross-cutting risks associated with digitalisation, cyber threats, climate change, geopolitical tensions, energy security and the growing importance of the non-bank financial sector came increasingly to the fore.

Macroprudential policy responses were not uniform across Europe. Nordic and some central European countries used capital buffers and borrower-based limits relatively actively over a long period, whereas some southern and western European countries only began introducing these instruments to a greater extent in recent years. The differences reflected the phase of the financial cycle, the structure of the financial sector, experience from previous crises and the institutional framework for macroprudential policy. The results of cluster analyses suggest that there is no single European model for combining capital buffers and borrower-based measures.

The experience of the pandemic highlighted the importance of pre-built releasable capital buffers. Countries with a positive countercyclical capital buffer rate were able to reduce it rapidly and thereby support banks' ability to continue lending. This experience helped further the concept of a positive neutral CCyB rate, aimed at building capital resilience even in periods when there are no clear signs of excessive credit growth. The CCyB thus gradually evolved from an instrument responding primarily to overheating in the financial cycle into a more general preventive tool for absorbing unexpected systemic shocks.

In the area of borrower-based limits, European approaches have shifted from simple LTV restrictions towards more complex regimes combining collateral value, income, total indebtedness, debt servicing burden, maturity and borrower characteristics. Considerable heterogeneity nevertheless remains in terms of legal enforceability, calibration and the scope of exemptions. This diversity reflects the adaptation of instruments to the specific characteristics of national mortgage and property markets, but at the same time limits direct comparability of policy settings across countries.

The use of AI tools made it possible to transform a large body of national documents into a consistent European synthesis and to identify common patterns of behaviour as well as differences that would have been difficult to capture through conventional manual processing. Their contribution lies particularly in the ability to systematically identify recurring themes, compare similar risks and track their evolution over time and across countries. AI tools can therefore significantly improve the efficiency of processing large information sets, broaden the scope for comparative financial stability analysis and support better-informed macroprudential policy decision-making.

34 With effect from 1 April 2026, however, the power to set the CCyB was transferred from the supervisory authority Finansinspektionen to the central bank, while powers relating to BBMs were transferred to the legislature.

APPENDIX 1 – ANNOUNCED CCyB RATES

Country	1/13	4/13	1/14	3/14	2/15	4/15	1/16	3/16	4/16	2/17	3/17	4/17	1/18	2/18	3/18	4/18	1/19	2/19	3/19	4/19	1/20	2/20	3/20	2/21	3/21	4/21	1/22	2/22	3/22	4/22	1/23	2/23	3/23	4/23	1/24	2/24	3/24	4/24	1/25	3/25	4/25
CZ						0.50				1.00		1.25		1.50		1.75		**2.00**			1.00	0.50		1.00	1.50	2.00	2.50					2.25	2.00		1.75	**1.25**					
CH	1.00		**2.00**																		0.00						**2.50**														
SK								0.50			1.25				1.50				**2.00**			1.50	1.00					**1.50**													
UK							0.50	0.00		0.50		1.00								**2.00**	0.00					1.00			**2.00**												
HR																											0.50			1.00		1.50									**2.00**
PL																																					1.00			**2.00**	
EE																										1.00				**1.50**											
HU																																0.50				**1.00**					
RO																										0.50				**1.00**											
AT																																									
FI																																									
NL																												1.00				**2.00**									
CY																														0.50		1.00							**1.50**		
IE															**1.00**							0.00						0.50		1.00		**1.50**								
ES																																					0.50			**1.00**	
LV																																		**1.00**							
GR																																						0.25			**0.50**
LU																0.25				**0.50**																					
DK													0.50		1.00				1.50	**2.00**	0.00			1.00		2.00	**2.50**														
NO		1.00			1.50				2.00							**2.50**					1.00			1.50		2.00	**2.50**														
SE				1.00	1.50		2.00								**2.50**						0.00				1.00			**2.00**													
IS							1.00		1.25					1.75			**2.00**				0.00				2.00					**2.50**											
BG															0.50		1.00			**1.50**	0.50				1.00	1.50			**2.00**											
BE																		**0.50**			0.00												1.00							**1.25**
FR														0.25				**0.50**				0.00						0.50		**1.00**									
LT												0.50		**1.00**							0.00								**1.00**											
SI																														0.50				**1.00**							
DE																		**0.25**			0.00						**0.75**													
PT																																						**0.75**			
IT																																									
MT																																									

Source: ESRB, SNB

Note: Switzerland (CH) applies a sectoral CCyB only to mortgage loans financing RRE located in Switzerland. For each country, the values before the reduction in the CCyB because of pandemic in 2020 and the most recent announced rate are shown in bold. The pandemic phase of rate reductions is highlighted in red.

APPENDIX 2 – ANNOUNCED (s)SyRB RATES

Country	Rate in %	Type	Period and scope
CZ	1–3	general	Sep 2014: SyRB announced on all exposures at sub-consolidated level within specified range depending on systemic importance of individual banks. Oct 2021: **abolished** and merged with O-SII buffer.
	0.5	general	Jun 2024: SyRB announced at rate of 0.5% on domestic exposures of all banks.
SK	0.5–1	general	May 2015: SyRB announced on domestic exposures of systemically important banks. May 2021: **abolished** with effect from Jan 2022 and merged with O-SII buffer.
UK	1–2	general	Mar 2019: SyRB announced on all exposures of significant banks within specified range. Dec 2020: **abolished** and merged with O-SII buffer.
HR	1.5–3	general	May 2014: SyRB announced on all exposures of banks. Two rates applied depending on banks' market share – 1.5% and 3%. Dec 2020: decision taken to apply uniform rate of 1.5%.
PL	3	general	Jan 2017: SyRB announced on domestic exposures of all banks. Mar 2020: decision taken to **deactivate** with immediate effect.
EE	0–2	general	May 2014: SyRB announced on all exposures of all banks. Apr 2016: decision taken to change rate from 2% to 1%, applied to domestic exposures. Apr 2020: decision taken to reduce rate to 0%. Dec 2021: **abolished** and replaced by CCyB.
HU	0–2	general	Oct 2015: SyRB announced on domestic CRE exposures for individual banks within range of 0–2% depending on exposure. Jun 2019: rate reduced across the board to 0%, with subsequent recalibration postponed due to COVID-19 by decision taken Mar 2020. May 2024: range of 0–2% reintroduced for individual banks depending on exposure.
RO	0–2	general	Nov 2015: SyRB announced at rate of 1% on all exposures of selected banks according to specified criteria. Dec 2016: decision taken to deactivate with effect from Mar 2017. From Dec 2017: applied at rates of 0%, 1% and 2% on all exposures of selected banks according to specified criteria.
AT	0.5–2	general	Nov 2015: announced on all exposures of individual banks within specified range.
	1	sectoral	Jun 2025: sectoral SyRB announced on exposures to non-financial corporations operating in real estate activities, excluding limited-profit housing associations.
FI	0–3	general	Jun 2018: SyRB announced on all bank exposures at rate of 1%. Individual rates of 1.5–3% applied to three banks. Apr 2020: decision taken to reduce rate to 0%. Mar 2023: decision taken to apply uniform rate of 1%.
NL	1.5–3	general	Apr 2014: 3% rate announced on all exposures of systemically important banks. Apr 2020: rate partially reduced to range of 1.5–2.5% in response to COVID-19. Oct 2020: **abolished** with effect from Dec 2020 and merged with O-SII buffer.
DK	0.5–3	general	Oct 2014: SyRB announced on all exposures within specified range depending on systemic importance of individual banks. Dec 2020: **abolished** and merged with O-SII buffer.
	1–2	general	May 2017: announced on domestic exposures in Faroe Islands. Jun 2018: decision taken to increase rate to 2%.
	7	sectoral	Apr 2024: sectoral SyRB announced on exposures to real estate companies based in Denmark (exemption for exposures secured by real estate with LTV of 0–15%).
NO	3–4.5	general	May 2014: SyRB announced on all exposures of all banks. From Dec 2020: two rates applied – 4.5% on domestic exposures for AIRB banks and 3% on all exposures for STA and FIRB banks. Sep 2024: decision taken to apply uniform rate of 4.5% with effect from Dec 2024.
SE	3	general	Nov 2014: SyRB announced on all exposures of three selected banks.
IS	2–3	general	Mar 2016: SyRB announced on domestic exposures of all banks. Dec 2024: decision taken to reduce rate from 3% to 2%.
BG	3	general	May 2014: SyRB announced on domestic exposures of all banks.

Country	Rate in %	Type	Period and scope
BE	0–9	sectoral	Dec 2021: sectoral SyRB announced on retail exposures secured by RRE. Jul 2023: decision taken to reduce rate from 9% to 6%. Oct 2025: decision taken to deactivate rate with effect from Jul 2027.
FR	3	sectoral	Jul 2023: sectoral SyRB announced for seven largest banking groups on exposures to large, heavily indebted corporations. Jun 2025: decision taken to **deactivate** with immediate effect.
LT	2	sectoral	Nov 2021: sectoral SyRB announced on retail exposures to natural persons secured by RRE.
SI	0.5–1	sectoral	Apr 2022: sectoral SyRB announced on retail exposures to natural persons secured by RRE at rate of 1%. For other exposures to natural persons, rate is 0.5%. Dec 2023: decision taken to reduce rate from 1% to 0.5% with effect from Jan 2025.
DE	1–2	sectoral	Mar 2022: sectoral SyRB announced on exposures secured by RRE located in Germany. Apr 2025: decision taken to reduce rate from 2% to 1%.
PT	4	sectoral	Sep 2023: sectoral SyRB announced on retail exposures to natural persons secured by RRE located in Portugal.
IT	1	sectoral	Apr 2024: sectoral SyRB announced on all domestic credit exposures.
MT	1.5	sectoral	Feb 2023: sectoral SyRB announced on domestic retail exposures to natural persons secured by RRE. Dec 2025: extended to domestic exposures to legal persons secured by CRE.

Source: ESRB

Note: For the purposes of this article, the position as of 31 December 2025 is taken into account.

APPENDIX 3 – BORROWER-BASED LIMITS

Country	Limit	Share of years active 2015–2019	Share of years active 2020–2025	No. of changes 2015–2025	Other conditions leading to:	
					easing of limits	tightening of limits
CZ	LTV	100%	100%	3	YES	YES
	DSTI	40%	100%	5	YES	NO
	DTI	40%	100%	4	YES	YES
LV	LTV	100%	100%	2	YES	YES
	DSTI	0%	100%	2	YES	NO
	DTI	0%	100%	1	YES	NO
SK	LTV	100%	100%	2	YES	NO
	DSTI	100%	100%	4	YES	NO
	DTI	40%	100%	1	YES	YES
AT	LTV	40%	100%	2	YES	NO
	DSTI	40%	100%	2	YES	NO
CH	LTV	100%	100%	1	YES	YES
	DSTI	100%	100%	1	NO	NO
CY	LTV	100%	100%	0	YES	NO
	DSTI	100%	100%	1	NO	YES
EE	LTV	100%	100%	0	YES	NO
	DSTI	100%	100%	1	YES	NO
FI	LTV	80%	100%	4	YES	YES
	DSTI	0%	50%	0	YES	NO
HU	LTV	100%	100%	4	YES	YES
	DSTI	100%	100%	5	YES	YES
IS	LTV	60%	100%	2	YES	NO
	DSTI	0%	83%	1	YES	NO
LT	LTV	100%	100%	1	NO	YES
	DSTI	100%	100%	2	YES	NO
MT	LTV	20%	100%	0	YES	YES
	DSTI	20%	100%	0	YES	NO
PL	LTV	100%	100%	0	NO	NO
	DSTI	100%	100%	0	NO	NO
PT	LTV	40%	100%	0	YES	YES
	DSTI	40%	100%	0	YES	NO
RO	LTV	100%	100%	1	YES	YES
	DSTI	100%	100%	1	YES	YES

Country	Limit	Share of years active 2015–2019	Share of years active 2020–2025	No. of changes 2015–2025	Other conditions leading to:	
					easing of limits	tightening of limits
SI	LTV	80%	100%	1	NO	YES
	DSTI	80%	100%	6	YES	NO
DK	LTV	100%	100%	0	NO	NO
	DTI	80%	100%	0	NO	NO
NO	LTV	100%	100%	6	YES	YES
	DTI	60%	100%	1	YES	YES
UK	LTI	100%	100%	0	NO	NO
IE	LTV	100%	100%	2	YES	YES
	LTI	100%	100%	2	YES	YES
FR	DSTI	0%	100%	4	YES	NO
NL	LTV	100%	100%	0	NO	NO
	DSTI	100%	100%	11	NO	NO
BE	LTV	0%	100%	0	YES	YES
BG	LTV	0%	33%	0	NO	NO
	DSTI	0%	33%	0	NO	NO
DE	–	–	–	–	–	–
ES	–	–	–	–	–	–
GR	LTV	0%	17%	0	YES	YES
	DSTI	0%	17%	0	YES	YES
HR	LTV	0%	17%	0	YES	NO
	DSTI	0%	17%	0	YES	YES
IT	–	–	–	–	–	–
LU	LTV	0%	83%	1	YES	YES
SE	LTV	100%	100%	0	NO	NO

Source: ESRB, national macroprudential authorities

Note: The data are based primarily on information reported by national authorities to the ESRB. They may therefore not capture all measures implemented, particularly those taking the form of recommendations.

The Netherlands has an LTV limit of 100%; for the purposes of the analysis, this setting is regarded as inactive. The large number of changes to the DSTI limit reflects the annual recalibration of DSTI limits differentiated by household income group and interest rate.

Other conditions include, for example, stricter limits for foreign currency loans and loans for the purchase of investment property, as well as more lenient limits for first-time buyers and the introduction of volume-based exemptions. If such conditions were introduced at any point during 2015–2025, YES is indicated.

LIST OF COUNTRIES

Abbreviation	Name	Central bank sets CCyB and SyRB capital buffers	Central bank sets borrower-based limits
AT	Austria	NO	NO
BE	Belgium	NO	YES (recommendation), NO (legally binding)
BG	Bulgaria	YES	YES
CY	Cyprus	YES	YES
CZ	Czech Republic	YES	YES
DE	Germany	NO	NO
DK	Denmark	NO	NO
EE	Estonia	YES	YES
ES	Spain	YES	YES
FI	Finland	NO	NO
FR	France	NO	NO
GR	Greece	YES	YES
HR	Croatia	YES	YES
HU	Hungary	YES	YES
IE	Ireland	YES	YES
IT	Italy	YES	YES
LT	Lithuania	YES	YES
LU	Luxembourg	NO	NO
LV	Latvia	YES	YES
MT	Malta	YES	YES
NL	Netherlands	YES	NO
PL	Poland	NO	NO
PT	Portugal	YES	YES
RO	Romania	YES	YES
SE	Sweden	NO	NO
SI	Slovenia	YES	YES
SK	Slovakia	YES	YES
NO	Norway	YES CCyB, NO SyRB	NO
CH	Switzerland	NO	NO
IS	Iceland	YES	YES (from 2020)
UK	United Kingdom	YES	YES
EA	euro area	–	–

Note: For the purposes of this article, the position as of 31 December 2025 is taken into account; the Swedish central bank assumed responsibility for setting the CCyB (but not the SyRB) in April 2026.

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CZECH NATIONAL BANK

Na Příkopě 28

115 03 Praha 1

Czech Republic

Contact:

COMMUNICATIONS DIVISION
GENERAL SECRETARIAT

Tel.: 224 411 111

www.cnb.cz

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