

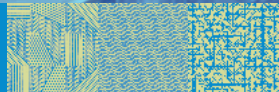


# Financial Stability

# 24

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Year XV · May 2023





CROATIAN NATIONAL BANK  
EUROSYSTEM

# Financial Stability

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# Introduction

The beginning of 2023 brought some sense of optimism in the context of an improved economic outlook on the back of the re-established global supply chains, China's reopening and lower energy prices. However, growth is still expected to be relatively weak, with persistently high uncertainty, particularly associated with the geopolitical sphere. Though slower, inflation remains elevated, so that central banks continue to tighten monetary policy, which makes financing conditions more stringent, dampens demand for new loans and increases the debt repayment burden for some debtors. Financing conditions in Croatia have started to tighten later than in the rest of the euro area, with no signs yet of a reversal in the upward phase of the financial cycle characterised by the surge in credit and real estate prices.

The recent turmoil in US and Swiss banks briefly destabilised European financial markets as well, but had no discernible impact on the Croatian financial system. Nevertheless, this episode illustrates financial system sensitivity to sudden negative news and shocks, the impact of which may rapidly spread and lead to a deterioration in market liquidity, higher risk premiums and a drop in the prices of financial and real assets. Last year's experience of sudden and large deposit outflows from a Russian-owned domestic bank, which severely undermined liquidity in just a few days and made the bank's resolution necessary<sup>1</sup>, illustrates the importance of public confidence for a smooth functioning of bank operations and the maintenance of financial stability.

The introduction of the euro has strengthened the integration of Croatia into European financial flows and almost completely eliminated currency risk from the domestic financial system. It has also mitigated the intensity of systemic risks and helped to keep stress in the domestic financial market at relatively low

levels. However, systemic risk exposure remains moderately elevated in view of the relatively bleak economic outlook against the backdrop of persistently high inflation and tighter financing conditions, significant structural weaknesses of the domestic economy, particularly the low activity in the labour market and labour shortages filled by foreign workers.

The drop in real income has weakened the purchasing power of households, which depleted their savings in efforts to maintain consumption. Lower-income households have been hardest hit because of the inflation structure, in which essential items account for a large share. However, as these households are relatively less indebted, the largest increase in non-performing loans might be recorded with respect to medium-income households. Corporations managed to offset the rising expenses by increasing the prices charged to their customers in 2022, so that their income grew faster than expenses, while their profitability increased. However, the dispersion of profit margins also increased, which points to higher operating uncertainty amid inflationary conditions and a possible growth in the number of corporations in financial distress. The increasingly fast growth in wages will raise operating expenses of corporations in 2023, while sluggish demand might limit their capacity to raise prices.

Against the backdrop of persistent inflation, financing conditions might stay unfavourable for some time. The drop in the value of financial instruments has adversely affected bank capital, while credit risk associated with a heavier debt servicing burden of corporations and households is also trending up. Credit risk materialisation in the non-financial sector has been mitigated by the widely-used practice of interest rate fixation, at least at the beginning of the loan period. Interest rate risk for households has also been lowered by the broad use of the national reference rate (NRR) as the parameter used for most variable interest rate loans or loans with initial interest rate fixation, because it reflects banks' funding costs, in particular, deposits, interest rates on which have been trending up slowly. Finally, the legal restriction on the maximum permitted interest rate also mitigates the potential increase in loan repayment

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<sup>1</sup> See Financial Stability No. 23 (May 22), Box 1 Effects of war in Ukraine on the financial stability in Croatia – failure of a Russian-owned bank prevented.

costs in the short run, which is, in view of benchmark interest rate limits and developments, particularly relevant for housing loans tied to the EURIBOR. The rise in loan repayment costs will be somewhat faster and steeper for corporations as their loans with variable interest rates are mostly tied to the EURIBOR and have a shorter average maturity, while interest rates on new loans have grown vigorously. The high public debt level in comparison with peer economies paired with favourable current fiscal indicators suggests that risks associated with public debt sustainability are moderately high. Also, the long average maturity of public debt further reduces the sensitivity of total funding costs to changes in market conditions.

The domestic banking system demonstrated a high level of stability and solid profitability amid the uncertainty that marked 2022. The already high liquidity level rose even further at the time of euro area accession due to adjustments in monetary policy instruments. The bulk of liquid funds is in the form of cash and deposits held with the central bank, which further upholds the banks' resilience to sudden shocks. The strong capital position has remained largely unaffected by the unfavourable impact of interest rate growth on financial asset valuations. Against the backdrop of rising interest rates and stabilisation of the economic outlook, robust lending activity and the growth in net interest margins might give an additional boost to profitability indicators.

The upward phase of the financial cycle continued in Croatia in 2022 because the monetary policy tightening affected the financing conditions only very mildly and slowly. The rise in residential property prices picked up on the back of historically low interest rates, another round of the government housing loan subsidy programme, the growth in housing loans and robust demand by non-residents. Nevertheless, market activity began to lose steam, while the number of purchase and sale transactions dropped sharply towards the end of the year. De-

spite this, the asking prices of real estate continued to rise in early 2023, spurred by the announcements of a new round of the subsidy programme. However, buyers showed slightly less interest, which may be attributed to higher interest rates and the deterioration in the macroeconomic outlook.

Lending to the private sector also accelerated in 2022, with lending to households picking up slightly and lending to corporations growing vigorously, particularly to energy companies. With the surge in loans amid elevated inflation, tighter financing conditions and heightened uncertainty contributing to the accumulation of systemic risks, the share of stage 2 loans has already started to rise.

In response to higher systemic risks, the CNB raised the capital buffers, thereby strengthening the resilience of credit institutions to potential losses in the event of risk materialisation. As a result, a further increase in the countercyclical buffer rate, from 0.5% to 1%, in proportion to the rise in systemic risks, was announced in the second half of 2022. In view of the mature phase of the financial cycle and the expected sharp growth in bank profitability this year, the CNB continues to adjust the level of capital buffers to the evolution of cyclical risks and conditions in which banks operate. To that end, it has put forward for public consultation a proposal to further raise the countercyclical buffer rate to 1.5% starting from June 2024.

In conditions of solid profitability and capital surpluses, the increase in that rate would expand room for a counter-cyclical macroprudential policy should there be a reversal in the financial cycle, thereby strengthening the system's resilience. This is also confirmed by the results of this year's stress testing of credit institutions, which show that in crisis conditions, including a strong increase in credit risk, the banking system would remain capable of withstanding potential shocks, largely thanks to the build-up of capital buffers and liquidity surpluses.



## Box 1 Financial stability concepts: systemic risks, resilience, macroprudential policy

Macroprudential policy is implemented in cycles in which it is necessary to make an assessment of the overall systemic risk level, financial system resilience and macroprudential measures and their effects.

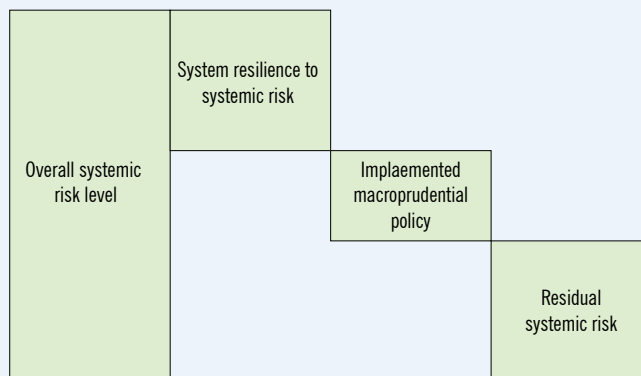
The ultimate objective of macroprudential policy is to contribute to the safeguarding of the stability of the financial system as a whole (ESRB, 2011). After the most recent global financial crisis (GFC), this has become one of the key tasks of central banks and/or other financial sector regulators, as the maintenance of price stability and supervision of individual financial institutions proved to be insufficient to safeguard the stability<sup>1</sup> of the whole financial system. Macroprudential policy seeks to support financial stability by building the capital and liquidity resilience of the financial system and alleviating the accumulation of systemic risks in the economy and the financial system.

The usual cycle of macroprudential policy implementation includes the following steps: identification and assessment of systemic risks and financial system vulnerabilities, selection and calibration of instruments to reduce identified risks and vulnerabilities and their implementation, and effectiveness assessment of the measures taken, which determines any possible recalibration or deactivation of instruments. The first step in the cycle focuses on an analysis of critical macroeconomic developments and evaluation of their impact on the evolution of systemic risks (see chapter I). In the second step, an analysis is made of the resilience of the system of credit institutions, that is, its capacity to cover potential losses in the event of the materialisation of systemic risks (see chapter II). Finally, this analysis may be used to determine the extent to which risks are covered by the macroprudential policy measures implemented and to assess whether there is any need to complement these or design other measures (see chapter III).

This concept may be simply illustrated, as in Figure 1. The left rectangle shows the level of overall systemic risks that characterise a financial system in a given period and include various cyclical risks (such as excessive lending, overvaluation of financial instruments and real estate) and structural risks (concentration risk, funding risk). System resilience to systemic risk is shown in the second column and implies the capacity of individual institutions to cover potential losses by the capital and liquidity surpluses they maintain at above legal requirements. The third column shows implemented macroprudential policy measures, which include microprudential and macroprudential capital requirements and their interaction with other requirements (see Box 6), as well as other measures (such as the Recommendation to mitigate interest rate and interest rate-induced credit risk in long-term consumer loans). It should be noted that this is a simplified illustration because the second and third columns often overlap and are intertwined in practice, and it is difficult to clearly identify their particular contributions to the overall macroprudential policy stance.

<sup>1</sup> Financial stability may be defined as the smooth functioning of all financial system segments in the resource allocation process, in risk assessment and management, payments execution, as well as the resilience of the system to sudden shocks.

Figure 1 Relationship between identification of risks, resilience and macroprudential policy



Source: adjusted according to ESRB (2019).

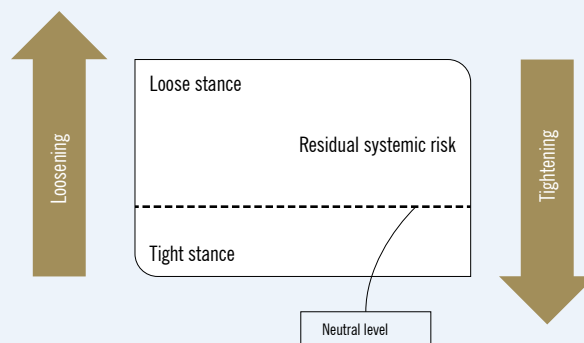
If the estimated level of systemic risks cannot be sufficiently covered by system resilience and implemented macroprudential policy, there is a residual risk level in the system, which may be expressed as follows:

$$\text{residual risk level} = \text{overall risk level} - \text{resilience} - \text{policy},$$

and is shown in the last column in Figure 1. The last step in the cycle of macroprudential policy implementation considers whether the level of residual risk is lower or higher than the benchmark level of risk, the so called neutral level. As systemic risk cannot be entirely avoided, a neutral level of systemic risk can be defined as the level at which the financial system will continue to function smoothly in the event of risk materialisation, that is, the level where no major difficulties arise in financial system functions.

If the residual risk level exceeds the neutral level, it implies that the current macroprudential stance is loose, as the level of residual risk is higher than the level considered to be neutral for the financial system. Conversely, if residual systemic risk is lower than the neutral level, the

Figure 2 Assessment of the macroprudential policy stance



Source: adjusted according to ESRB (2019).

stance is tight, as the residual systemic risk level is reduced to below the neutral level by means of the policy measures implemented (Figure 2).

**If policymakers assess that the policy stance diverges from the desired level, an additional analysis is made of residual risks in the financial system so as to adjust the currently implemented measures or to implement new ones.** More specifically, if policymakers assess that the policy stance is loose and that the residual risk level is too high relative to the neutral level, they may propose the introduction of additional or the tightening of current measures in order to bring the residual risk towards the neutral level. For example, after assessing the evolution of risks in 2022, the CNB implemented measures to reduce cyclical risks in the economy and raised the announced countercyclical buffer rate on two occasions (see chapter III).

Something similar obtains if the policy stance is assessed as (very) tight: if risks are reduced to very low levels as a result of implemented measures or if risks themselves become smaller over time, individual measures can be abolished or eased. For example, the Decision on a temporary restriction of distributions was rescinded in September 2021 in response to the identified reduction in systemic risks, as described in the CNB publication [Macroprudential Diagnostics No. 15](#).

**The described steps in a macroprudential policy cycle are repeated over time.** Therefore, in addition to analysing systemic risks, it is necessary to monitor the effects of macroprudential measures that have a stronger or weaker impact on particular systemic risks, as well as changes in the system-wide resilience of credit institutions. In this way, as the designated macroprudential authority, the CNB regularly monitors economic and financial developments and the further evolution of systemic risks, so as to be able to adjust on time appropriate instruments and achieve a “neutral” macroprudential policy stance.

**Finally, it should be noted that the theoretical concepts described here are still being developed in practice.** The analysed concepts of financial stability are not easily observable, and it is particularly difficult to measure macroprudential policy instruments and measures, as well as systemic risk levels. As we are still in the phase of developing and fine-tuning the approach and methods to be used for that purpose, the described concept provides a possible starting point to assess the macroprudential policy stance (the other possible concept is described in Box 7).

# I Risks to financial stability

# A Macroeconomic environment

Prolonged geopolitical tensions and their possible escalation paired with the expected slowdown of global economic activity are the main sources of risks to global financial stability stemming from the macroeconomic environment. Furthermore, even though overall inflation has been gradually decreasing, reflecting the cheaper prices of energy in global markets, it has remained elevated, while core inflation indicators have yet to show clear signs of a reversal. Monetary policy tightening has increasingly been spilling over to financing conditions. The stronger integration of the Croatian financial system into European financial flows and the almost complete elimination of currency risk following Croatia's accession to the euro area has mitigated the overall exposure of the domestic financial system to systemic risks. However, the relatively gloomy economic outlook and prolonged high inflation as well as pronounced structural weaknesses of the domestic economy have kept the system's exposure to systemic risks at a moderately elevated level.

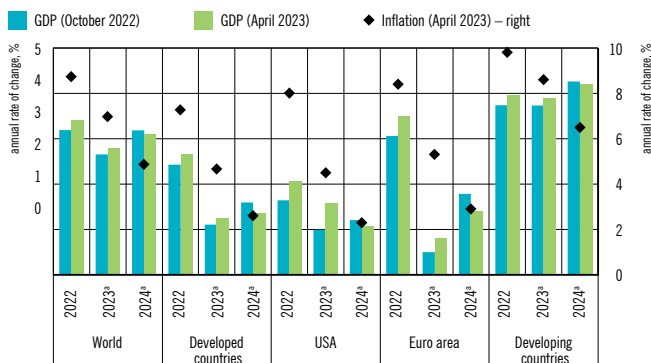
## A.1 Risks in the international environment

**Geopolitical tensions, in particular the duration and intensity of the war in Ukraine, and the strained relations between the US and China, are the main sources of risks to global financial stability.** Global economic growth slightly exceeded

pessimistic expectations in 2022, a year marked by the military conflict in Ukraine and the sharp tightening of many central banks' monetary policies in response to high inflation. However, growth prospects remain subdued and uncertain (Figure A.1). This is the outcome of shocks to the global economy, driven by the war in Ukraine and the gradual decline in purchasing power due to high inflation, which continue to adversely affect economic sentiment and short-term expectations across the world including Europe (Figure A.2). However, stabilisation and then the drop in the prices of key energy products in the second half of 2022 led to a mild recovery in consumer and business optimism. The improved global economic outlook will have a positive impact on the euro area as well, which might perform slightly better than pessimistically expected in late 2022. However, the economic outlook remains overcast by relatively high prices of some raw materials and energy, harsher financing conditions and increased costs of living.

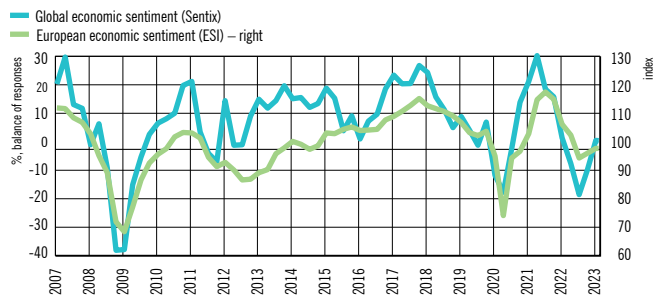
**Inflationary pressures remain strong despite the gradual decline in the overall inflation rate.** The growth in consumer prices that began in mid-2021, driven by supply chain bottlenecks and rising transport costs, escalated following the outbreak of the war in Ukraine and growing uncertainty regarding the prices and supply of energy and other important raw materials (Figure A.3). Against this background, central banks in many countries initiated a cycle of monetary policy tightening. At its meeting in May 2023, the Fed increased its benchmark rate for the tenth time in a row, to 5.25%, a record high since August 2007 (Figure A.4). The interest rate on the deposit facility of the ECB (currently the most important ECB interest rate, which in the present conditions of ample primary liquidity determines the interest rates on the money market) was raised to 3.25% in May 2023, with the ECB announcing that it would stop altogether reinvestments in the portfolio of Eurosystem securities purchased within the asset purchase programme (APP). Tightened financing conditions in combination

Figure A.1 Economic activity slows down, but expectations for 2023 go up



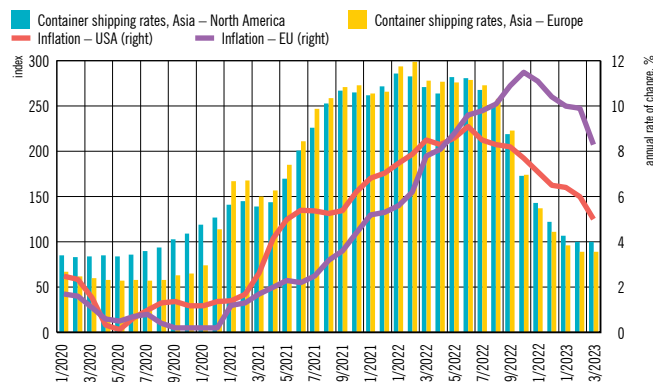
\* Forecast. Source: IMF (WEO, April 2023 / October 2022).

Figure A.2 Though improving, economic sentiment has not yet fully recovered



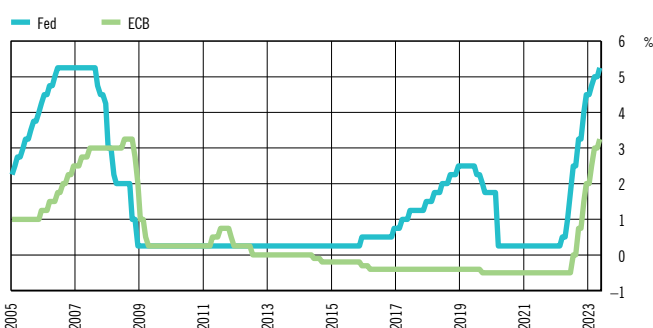
Notes: The sentiment indicator Sentix monitors investors' sentiment on a global level, their expectations and estimates of the current economic situation. It is based on a survey and its value may range between -100 and 100. Positive values point to a positive assessment of the economic situation and vice versa. ESI indicator monitors economic sentiment in the EU, where values above 100 point to economic sentiment better than the actual long-term average. Sources: Bloomberg and European Commission.

Figure A.3 Though decelerating, inflationary pressures remain high



Source: Bloomberg.

Figure A.4 Sharp tightening of monetary policy



Note: The figure shows the Fed's benchmark rate (upper bound) and the rate on the ECB's deposit facility. Source: Bloomberg.

with elevated inflation and weaker economic prospects could hit have a particularly hard impact on highly indebted countries with accumulated structural imbalances and significant financing needs, increasing the risk of debt refinancing for the non-financial corporate sector, with significant heterogeneity across countries and sectors.

**The tightening of financing conditions has raised the risks of a further decline in the prices of some types of financial assets.** The value of the main global equity indices decreased sharply in 2022, accompanied by amplified volatility and lower liquidity in the capital market, with a slight reversal of that trend seen only in early 2023 (Figure A.5 and Figure A.7). The drop in the prices of shares and the decrease in the price-to-earnings ratio point to increased caution and reduced investor confidence (Figure A.6). Long-term government bond yields rose to the levels last observed a decade ago, reflecting expectations that interest rates would stay elevated for an extended period of time (Figure A.8). Nevertheless, as these rates grew slightly less than short-term rates, the yield curve on US and German debt instruments remained inverted, while the spread between 10-year and 2-year government bonds widened further amid the recent deterioration in economic outlook (Figure A.9).

**The beginning of 2023 was marked by the materialisation of liquidity and solvency risks in several US banks, which affected investors' confidence worldwide.** A combination of excessive risk-taking and the volatile structure of funding sources paired with high interest-rate risk exposure without appropriate backstops led to the failure of Silicon Valley Bank and Signature Bank in the US in March 2023, followed by the failure of the First Republic Bank in late April. Faltering investor confidence spilled over to the European market, with problems escalating in March with the shaken stability of the Swiss Credit Suisse bank, which had had prior operating problems. While these risks were specific for banks in distress, their materialisation

Figure A.5 Leading global equity indices decreased sharply in 2022

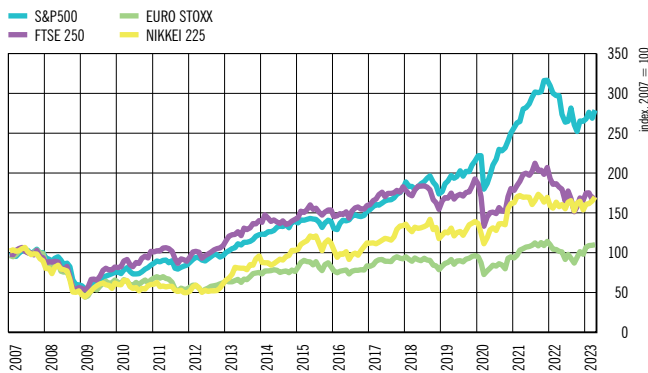


Figure A.6 Decrease in the price-to-earnings ratio signals reduced investor confidence

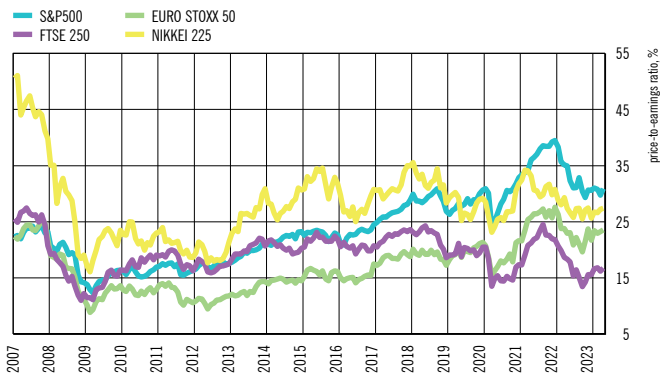


Figure A.7 Higher volatility on capital markets is usually followed by deteriorating liquidity

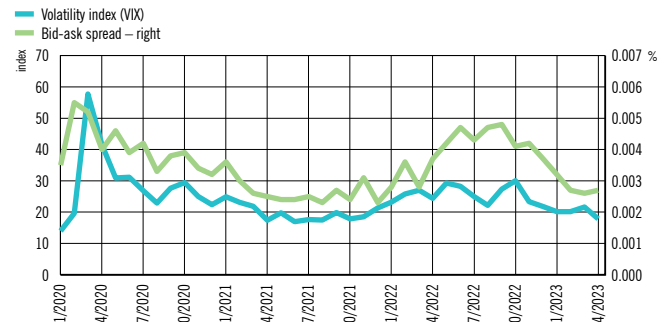


Figure A.8 Yields on long-term bonds continue to grow

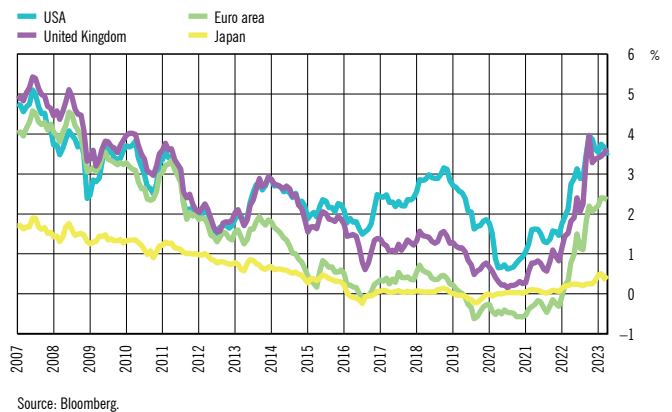
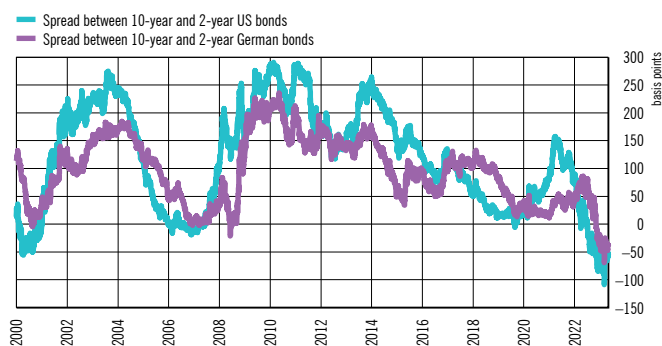


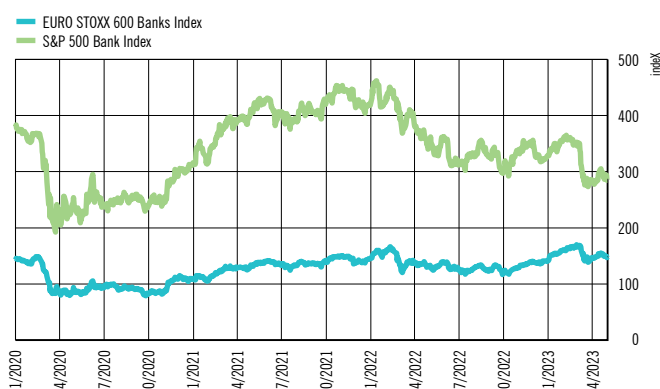
Figure A.9 Inverted yield curve points to deteriorated expectations



Note: The spread between 10-year and 2-year bonds points to investors' perception of recession risk (long-term yields lower than short-term yields point to potential recession in the short run).

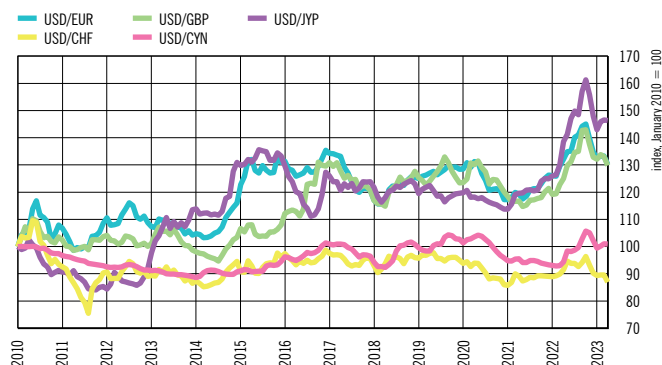
Source: Bloomberg.

Figure A.10 Shares of European banks withstood significant price pressures in March 2023



Source: Bloomberg

Figure A.11 US dollar appreciated noticeably versus most other currencies in 2022



Note: The rise in the index shows currency depreciation against the dollar.

Source: Bloomberg.

triggered the spread of stress, which was reflected in increased risk premium in financial markets and lower share prices of the banking sector. The rapid response of regulators helped to calm down investors and prevented further transmission of volatility, but the risk of disorderly market developments remained present. Shares of European banks weathered significant price pressures during these episodes thanks to their solid capital positions and stable business models (Figure A.10).

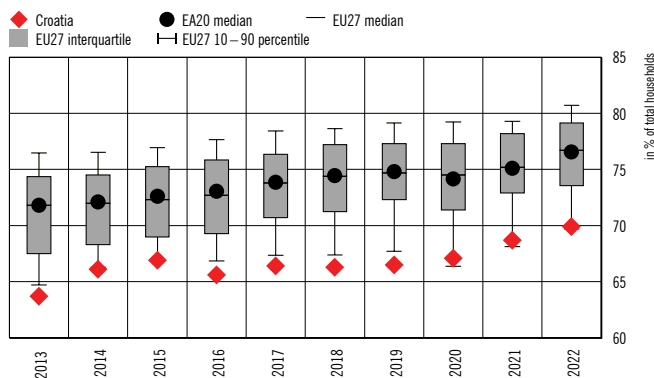
**The strengthening of the US dollar and the deterioration of global financing conditions raised the risk associated with debt servicing capacities in a number of emerging market economies that mostly borrow in a currency other than their own.** In parallel with the tightening of the Fed's monetary policy, the US dollar appreciated significantly and ended last year considerably stronger than the majority of other important global currencies. Notwithstanding a slight reversal of the trend in recent months, the US dollar exchange rate remained slightly higher in the first quarter of 2023 than in the previous year (Figure A.11). Mounting risk aversion might be the main driver of developments in the global foreign exchange market in the upcoming period, while the demand for the US dollar as safe haven could remain strong, particularly in view of any prolonged geopolitical uncertainty. By contrast, an opposite effect could be produced by an earlier turn in the cycle of the Fed's monetary policy tightening in response to the recent instability in the US banking system.

## A.2 Risks in the domestic environment

**Financial system exposure to risks in the domestic macroeconomic environment holds steady at a moderately elevated level.** This is mostly the result of existing structural weaknesses and prevailing uncertainty. More specifically, imbalances in the labour market in terms of the very low rate of labour force participation and unfavourable demographic and migration trends limit the potential for economic growth. Despite the rise in employment, of 2.4% in 2022 (CPII data on the number of insured persons), the population activity rate in Croatia still ranks among the lowest of all euro area countries and the entire EU (Figure A.12). Also, while the domestic fiscal position improved strongly in 2022 as a result of the general government surplus, the sharp fall in the public-debt-to-GDP ratio to 68.4% and its low sensitivity to interest rate hikes in the short run (see chapter 3.2 Government interest rate risk), the public debt level continues to be quite high in comparison to peer economies. The introduction of the euro stands out among the positive structural factors as it has further strengthened the integration of the Croatian financial system into European financial flows and almost completely eliminated currency risk.

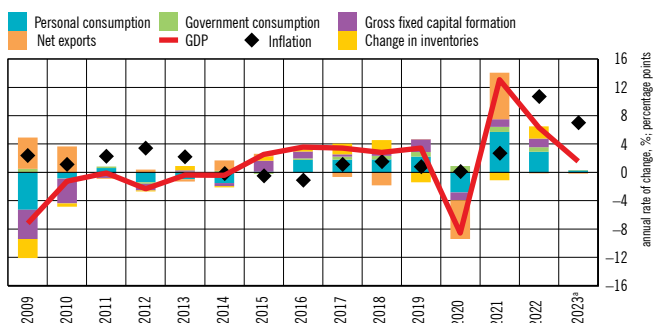
**The relatively weak outlook for the global and European economy is reflected in domestic economic developments.** The major contributors to the slowdown in Croatian GDP in 2022 were reduced personal consumption, because of the rising costs of living that diminished the purchasing power of income and a decline in consumer optimism, and the decrease in

Figure A.12 Activity rate in the domestic labour market remains very low



Source: Eurostat.

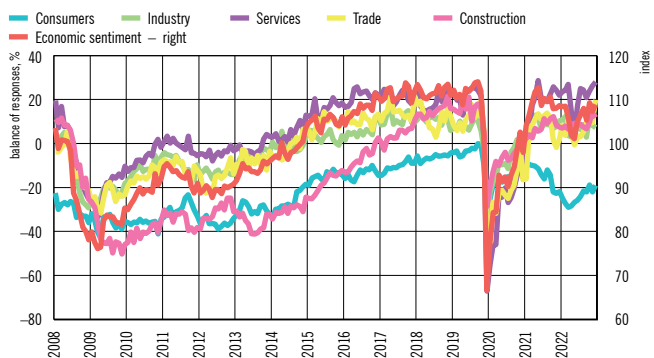
Figure A.13 Slowdown of Croatian economic growth characterised the year 2022



<sup>a</sup> CNB forecast of March 2023.

Note: The figure shows contributions to GDP growth, the annual rates of change in real GDP and the average annual rate of change in the consumer price index (CPI).  
Sources: CBS and CNB.

Figure A.14 Overall economic sentiment slightly above the long-term average, while consumer confidence is very subdued



Source: European Commission.

net exports triggered by a slump in foreign demand and higher prices of energy and raw materials. Economic growth is expected to be relatively weak in 2023, reflecting the sharp slowdown in personal consumption, while the strong uptake of EU funds should partly compensate for slower investments. Consumer confidence, which has edged up in recent months, remains much below pre-pandemic levels (Figure A.13), while business confidence is much above its long-term average, particularly in service activities (relying on tourism) and construction (Figure A.14).

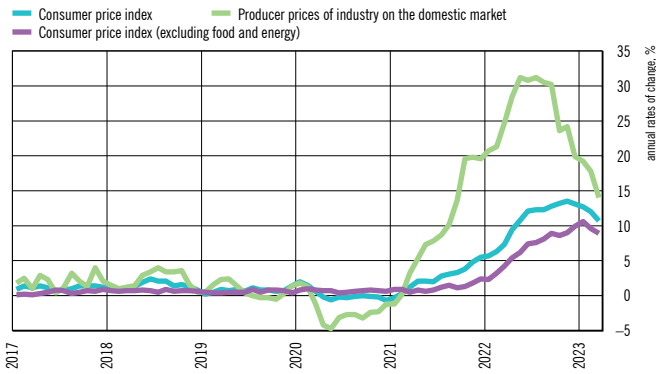
**Though consumer price inflation has been slowing down since end-2022, inflationary pressures are still strong.** The spillover of the high global prices of raw materials and other input costs to domestic prices and bottlenecks in production chains caused inflation to surge in mid-2022 to the highest level in the last 28 years. The abatement of inflationary pressures seen in the second half of 2022, which was the outcome of stabilisation of energy prices, in particular of gas and oil prices, and slower economic growth, resulted in lower annual inflation rates by the end of the year (Figure A.15). In the upcoming period, inflation might continue to slow down gradually, but inflationary pressures, though somewhat lower than a year ago, will still remain very pronounced, mostly due to persistent geopolitical uncertainty and its potential impact on the prices of raw materials and energy in the world market, as well as potential upward pressures on wages in response to the accumulated losses in purchasing power, particularly if companies make efforts to maintain or increase their profit levels. After falling by 3.4% last year, real net wages are expected to grow mildly in 2023 because of anticipated slower inflation and faster growth in nominal wages (Figure A.16). This is why personal consumption growth slowed down in 2022 despite the significant decrease in the household savings rate, to 3.3%, that is, much below both the high rates seen during the pandemic and the average levels in pre-pandemic years (Figure A.17).

**The performance of corporations was better last year than in the pre-pandemic 2019, improving their resilience in the event of risk materialisation that may arise as a consequence of dwindling demand and interest rate growth in the context of robust borrowing.** Corporate revenues were much larger in 2022 than in 2021 (Figure A.18). Estimates based on the segment of corporations listed on the Zagreb Stock Exchange show that revenues grew slightly faster than expenses in most activities, profitability edging up. The dispersion of profit margins also increased, which is associated with the asymmetric impact of the energy shock and differences in the extent to which corporations were able to transfer rising costs of raw materials and energy to their customers. The number of enterprises operating in Croatia also grew sharply despite the parallel rise in the number of bankruptcies (Figure A.19). In early 2023, the net entries of enterprises<sup>2</sup> edged down from the beginning of 2022, but remained above the pre-pandemic average. In view of the

<sup>2</sup> The net entries of enterprises are defined as the difference between entries (establishment) of enterprises and exits (bankruptcy, pre-bankruptcy, winding-up and voluntary exit) of enterprises from the market.

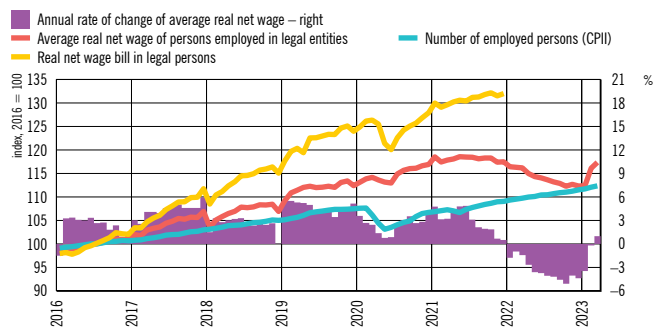


Figure A.15 Slower rise in consumer and producer price inflation



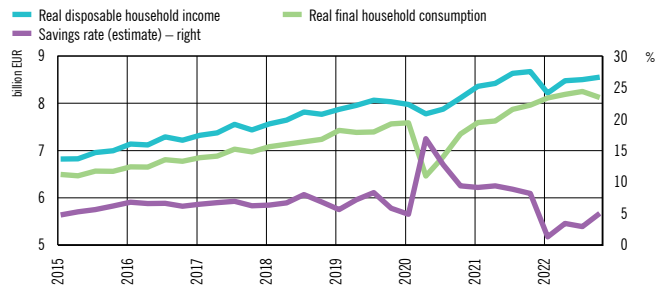
Source: CNB.

Figure A.16 High inflation caused a fall in real wages in 2022



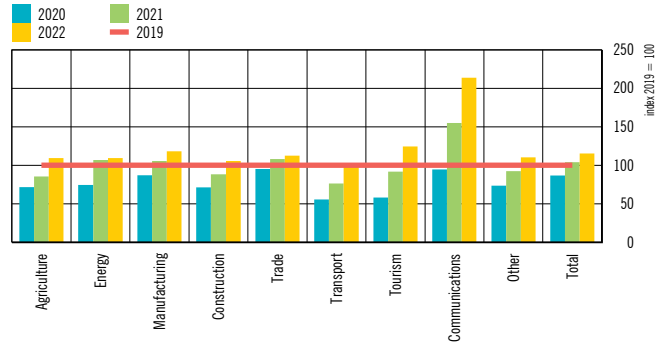
Notes: The shown data have been seasonally and calendar adjusted. The data series showing the real net wage bill of persons employed in legal entities shows data up to 2021 as the data on employed persons for 2022 are preliminary, which could affect the reliability of the wage bill data.  
Sources: CBS, CNB and CPII.

Figure A.17 Household savings rate on a downward path



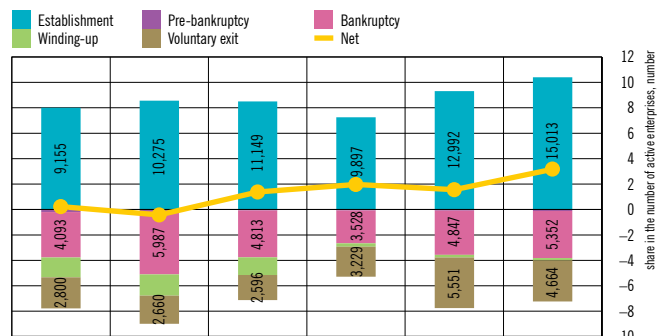
Notes: Quarterly disposable income values have been estimated using the Chow-Lin method and series of compensation of employees and gross operating surplus and mixed income as indicators. The savings rate has been calculated as the ratio of the estimated amount of savings to estimated disposable income and excludes adjustments for changes in pension rights; the series have been deflated by the GDP deflator for final household consumption; the values are expressed in the prices of the first quarter of 2015.  
Sources: Eurostat and CNB calculations.

Figure A.18 Fiscalised receipts point to real growth in sales in 2022



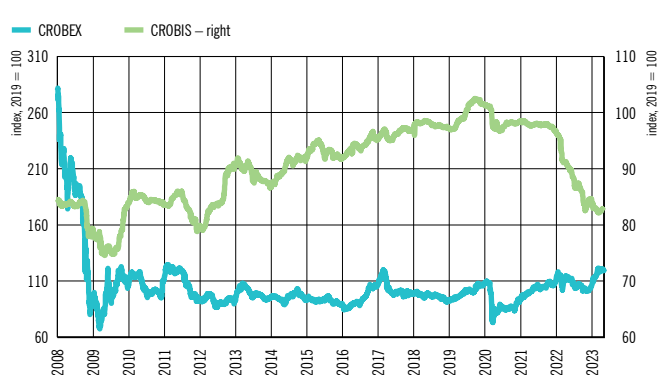
Note: The columns show a change in cumulative amounts of fiscalised receipts in a given year; amounts are expressed in the prices of the first quarter of 2015.  
Sources: Tax Administration and CNB.

Figure A.19 In 2022, the number of enterprises grew at the sharpest pace in the last five years



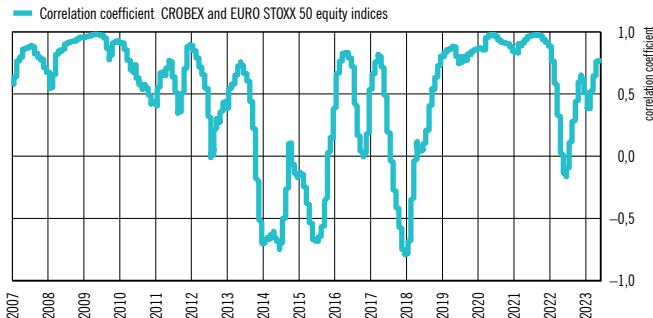
Sources: CNB and Commercial Court Registry.

Figure A.20 CROBIS index continued to go down, while the CROBEX exceeded pre-pandemic levels



Source: Zagreb Stock Exchange.

Figure A.21 Increased correlation between the CROBEX stock index and Euro Stoxx 50 in early 2023



Note: The coefficient of correlation between stock indices has been calculated on the basis of a moving window of data on the values of specific indices in the period of 250 working days.  
Sources: Bloomberg and CNB calculations.

solid business performance in 2022, companies entered 2023 on a relatively favourable footing. However, the surge in corporate debt (see chapter 1.B) and rising interest rates on debt servicing (see chapter 1.C) give rise to financial stability risks.

**Stress in the domestic financial market holds steady at relatively low levels, within the usual fluctuation range** (see Figures 2 and 3 in Box 2). The CROBIS index has been gradually decreasing since the last quarter of 2021 as a result of accelerated inflation and growing key interest rates, which may adversely impact the portfolios of domestic financial institutions whose strategies for portfolio immunisation and management of balance sheet maturity depend on developments in the prices of these instruments. On the other hand, the CROBEX rebounded noticeably in the first quarter of 2023 and slightly exceeded pre-pandemic levels, largely driven by the favourable performance of listed corporations (Figure A.20). Finally, money market interest rates rose perceptibly on the back of abundant liquidity of the domestic banking system and a relatively small trading volume.

## Box 2 Revision of the Croatian financial stress index following accession to the euro area

The introduction of the euro as the official currency in the Republic of Croatia has created the need to adjust the Croatian financial stress index (hereinafter 'the CFSI') to the new circumstances in order to continue with a systematic monitoring of movements in domestic financial markets and to identify stress events on time. In addition to the adjusted definition of the foreign exchange and money markets, equal weights will be used in the new index calculation as the structural break makes it inappropriate to use historical data to determine the significance of particular market segments.

**The new Croatian financial stress index, adjusted for use after the introduction of the euro as the official currency in the Republic of Croatia, has brought changes in the segment of foreign exchange and money markets and in the aggregation method.** The former CFSI combined developments in four financial markets – foreign exchange, money, equity and bond – in a single stress indicator. In this process, each market was observed by using an equal number and type of indicators associated with liquidity, volatility and accumulated losses (see [Box 1 in Financial Stability No. 20](#)).

**The former indicators in the segment of the foreign exchange market, derived from a bilateral exchange rate of the kuna against the euro, have been replaced by new indicators derived from the effective exchange rate of the euro against a basket of selected currencies.** The currencies included in the calculation of the effective exchange rate as well as their shares in the structure have been determined based on the currency structure of assets and liabilities in the balance sheets of credit institutions and investment funds<sup>1</sup>, excluding all balance sheet positions denominated in the kuna and the euro. The thus established shares of remaining currencies were averaged in three year periods. The currencies<sup>2</sup> that exceeded the threshold of 1% of the value of assets and liabilities on a three-year basis were identified as significant in the context of the effective exchange rate indicator for the purpose of CFSI calculation.

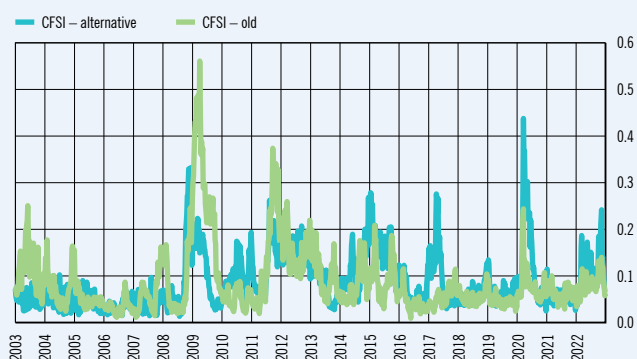
**Along with the foreign exchange market segment, significant changes have been made in the money market segment.** That is, the indicators derived from interest rates on bank trading in kuna deposits and interest rates on kuna T-bills of the Ministry of Finance (hereinafter 'MoF') have been replaced by indicators derived from interest rates on bank trading in euro deposits and interest rates on euro-denominated MoF T-bills and euro area benchmark interest rates. To ensure data availability and longer time series, the difference between three-month interest rates on bank trading in kuna deposits (which were included in the calculation after ZIBOR discontinuation) and interest rates on three-month MoF T-bills in kuna has been replaced by the difference between

the 12-month EURIBOR and interest rates on 12-month MoF T-bills, whereas the former money market volatility indicator derived from the overnight interest rate on bank trading in kuna deposits has been replaced by the indicator derived from the overnight interest rate on bank trading in euro deposits. Furthermore, the scope of turnover used in the calculation of money market liquidity indicators has been broadened to include all financial institutions with which banks carry out trading<sup>3</sup>.

**Four individual segments of the financial market (foreign exchange, money, equity and bond) have been aggregated into a new and revised CFSI by applying equal weights,** which is also a basis for aggregation used in the index variant published by the European Central Bank. To compute the final value of overall stress, equal weights are multiplied by the stress dynamics of the particular market and the correlation matrix that measures the strength of stress correlation, which means that, in addition to the dynamics and weight of the individual market, the overall stress value depends on correlations among markets. In the final run, equal weights are "corrected" taking into account the individual dynamics and interdependence of all markets. Equal initial weights have been selected as there were no grounds for using regression models to determine the weights of individual financial markets depending on the importance of particular market segments for economic developments, as was the case with the former index. The new CFSI also assumes a value between 0 and 1, where a higher value indicates an increase in financial stress in one or more markets.

**Proposed changes in the calculation of the index are not significant, as indicated by the comparison of the CFSI used up to the end of 2022 and its alternative variant,** which illustrates how the financial stress dynamics would have unfolded had the euro been the official currency

Figure 1 CFSI (old) and CFSI (alternative)



Note: CFSI (alternative) that includes changes in the segment of the foreign exchange and money markets and the aggregation method is for information purposes only and does not reflect actual stress in Croatian financial markets in the period up to 31 December 2022.  
Source: CNB.

1 The coverage is based only on balance sheets of credit institutions and investment funds as data for other financial institutions are not available on a granular level. Data are quarterly and cover the period from December 2012.

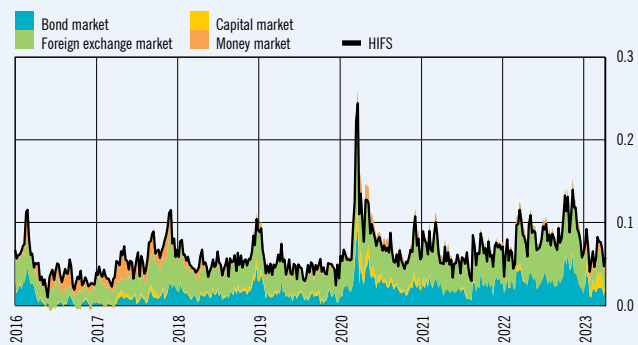
2 These are as follows: the US dollar, the Swiss franc, the Australian dollar, the Canadian dollar, the pound sterling and the Hungarian forint.

3 In addition to interbank trading, it covers trading between banks and money market and pension funds, insurance corporations, other financial intermediaries, financial auxiliaries and other money lenders.

of the Republic of Croatia at the beginning of the analysis (alternative CFSI is adjusted in the segment of the foreign exchange and money markets with revised aggregation with equal weights). However, as this was not the case in reality, the new version of the CFSI will in future analyses be used only for the period from the beginning of 2023. The dynamics of changes in the old and alternative CFSI over the historical period was very similar, with exceptions in the stress values recorded during the global financial crisis, in 2010-2011 and in 2017, as well as at the beginning of the COVID-19 pandemic in the first quarter of

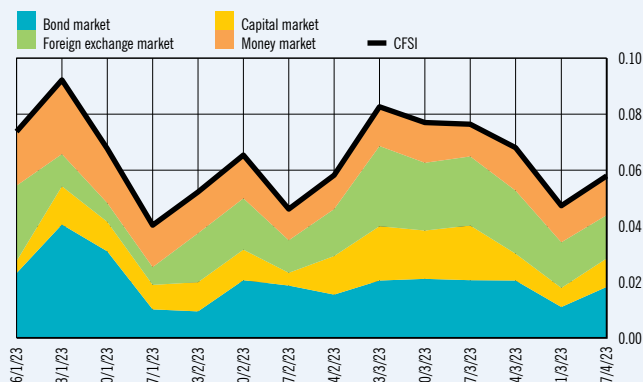
2020. With occasional stronger contributions from the foreign exchange market segment (measured in terms of the effective exchange rate of the euro against the basket of currencies in which the US dollar accounts for 72% in the last three-year period) to changes in the alternative CFSI, the mentioned exceptions largely reflect the application of the revised aggregation methodology with equal weights<sup>4</sup>. Contributions of individual markets to CFSI changes are shown in Figures 2 and 3, with Figure 3 showing in detail the contributions to changes in the new revised CFSI over 2023, which will be used in future analyses.

Figure 2 Contributions of individual markets to CFSI changes – longer time period



Notes: The old CFSI is shown for the period up to 31. December 2022. A new and revised CFSI (shaded area) is shown as of 1 January 2023.  
Source: CNB.

Figure 3 Contributions of individual markets to changes in the new CFSI in 2023



Source: CNB.

<sup>4</sup> The source of changes are methodological changes, which should be taken into account in future interpretations, bearing in mind that it is not possible to directly compare shocks after 1 January 2023 with those that occurred before that period.

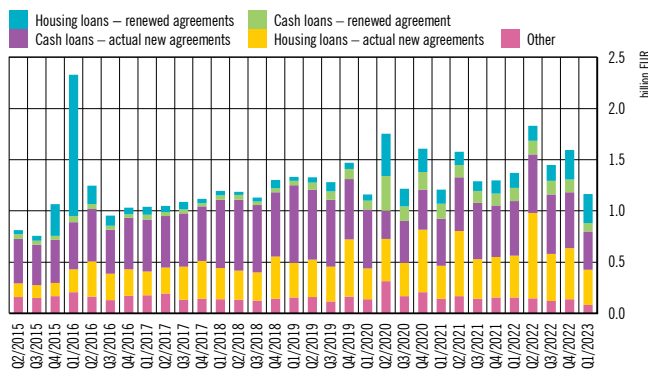
# B Private sector borrowing

Lending to the private sector intensified in 2022 and at the beginning of 2023, fuelling the accumulation of systemic risks. The sharpest acceleration was seen in corporate loans, which increased at an annual rate of 19% in spring 2023, while household loans grew at a more moderate pace. In the same period, the several-year long downward trend in interest rates on new loans came to a stop, with interest rates for corporations growing perceptibly and those for households rising gradually in 2022 and early 2023.

## B.1 Households

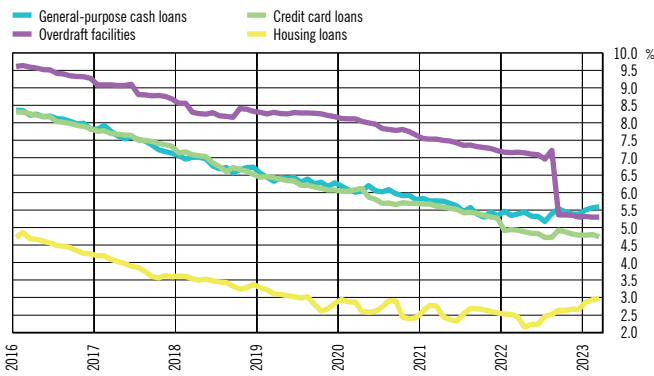
**The maintenance of favourable financing conditions, the government programme of subsidised housing loans and the dynamic market for residential real estate led to a mild acceleration in household lending in 2022.** With pronounced growth in newly-granted housing loans during the seventh round of the government subsidy programme (in the 2nd quarter), the total principal of new housing loans grew by around 25% from 2021 to 2022 (Figure B.1, see also chapter I.D). On the other hand, the volume of new general-purpose cash loans grew more moderately (by 10% from 2021), so that their amount remained much lower than before the pandemic amid low consumer confidence, which has been gradually recovering from the shocks triggered by the war in Ukraine and inflation acceleration in 2022. New lending decelerated slightly in early 2023, due in part to exceptionally intensive lending activity in late 2022 ahead of the prospective rise in lending interest rates that banks announced for early 2023. A new round of government housing loan subsidies will provide an additional boost to household lending in the second quarter.

Figure B.1 The amount of principal in newly-granted housing loans continued to rise in 2022



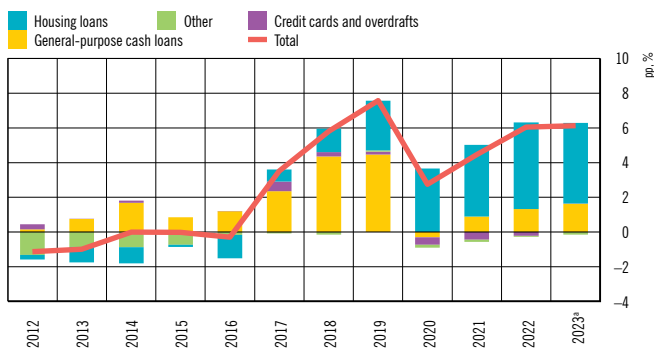
Note: The figure does not include credit card debt and overdraft facilities.  
Source: CNB.

Figure B.2 The several-year long downward trend in interest rates on new housing and cash loans came to a halt in 2022



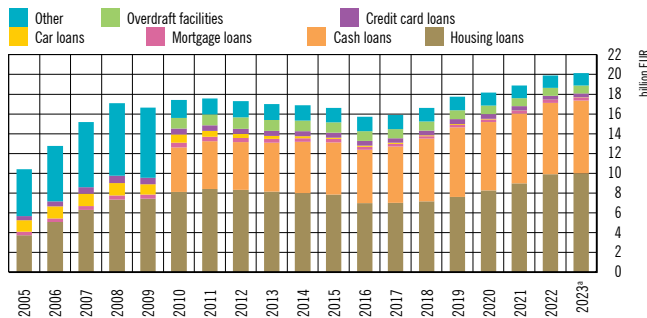
Source: CNB.

Figure B.3 Household loans picked up slightly in 2022



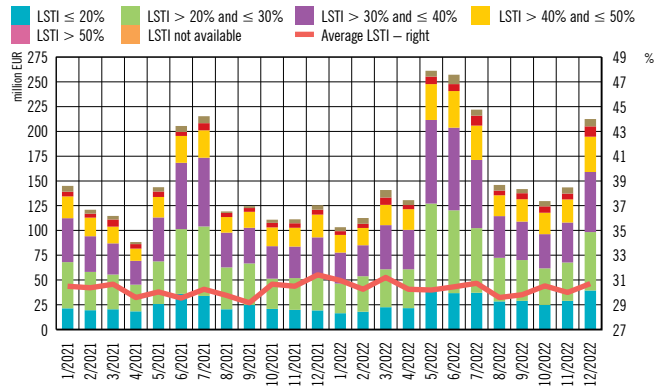
<sup>a</sup> Data for 2023 refer to the 12-month period up to 31 March 2023.  
Note: The figure shows the transaction-based change in debt, which excludes exchange rate, price and other changes.  
Source: CNB.

Figure B.4 Housing loans account for half of total loans to households



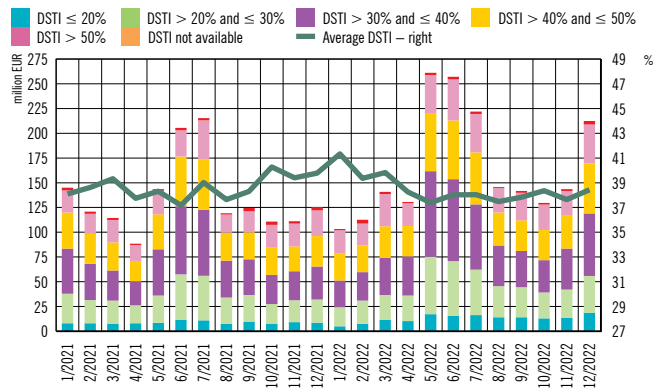
<sup>a</sup> Data for 2023 refer to the situation as at 31 March 2023.  
Note: Cash loans and overdraft facilities have been excluded from the category of other household loans since the end of 2010 because they have become new categories.  
Source: CNB.

Figure B.5 LSTI ratios of new housing loans remained unchanged in 2022



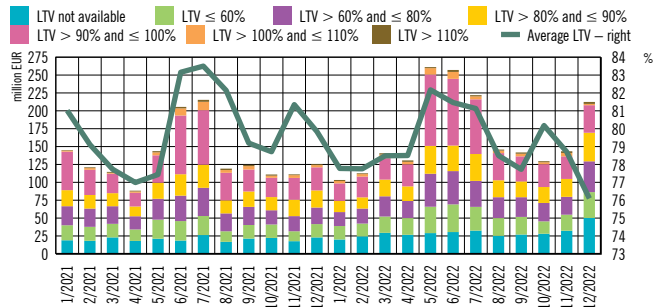
Source: CNB.

Figure B.6 Share of debtors that allocate a relatively large portion of income for debt servicing remained stable



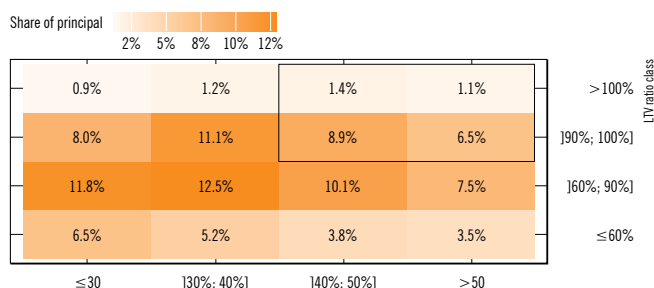
Source: CNB.

Figure B.7 LTV ratios grow in periods of subsidised housing loans disbursement



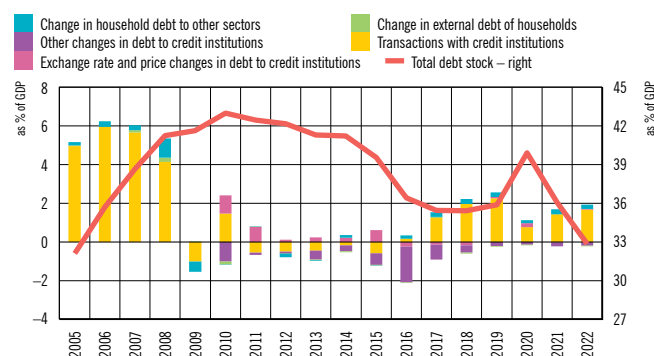
Notes: For loans collateralised by real estate under development, the LTV ratio has atypically high values as the value of collateral reported is the value of land and not the expected value of real estate after completion, so that such loans are included in the group "LTV not available". Also included in that group are housing loans without collateral.  
Source: CNB.

**Figure B.8 Share of high-risk new housing loans remained unchanged in 2022**



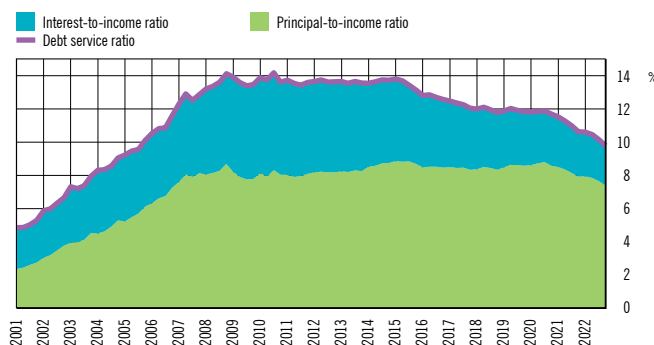
Notes: Data shown refer to housing loans collateralised by real estate and disbursed in 2022. The figure does not include loans with very high or missing LTV and DSTI ratio values and loans collateralised by real estate under development. Data on the LTV ratio do not include other exposures encumbering the collateral. DSTI ratios have not been reduced by the amount of subsidies.  
Source: CNB.

**Figure B.9 Household debt-to-GDP ratio continues to fall as a result of high inflation**



Note: Changes in debt to other sectors and the rest of the world are shown as the difference between the end of the previous year and relativised as a share in GDP.  
Source: CNB.

**Figure B.10 Inflationary pressures and growing maturity reduce the debt service ratio**



Note: Quarterly disposable income values have been estimated using the Chow-Lin method and series of compensation of employees and gross operating surplus and mixed income as indicators.  
Source: CNB.

The pick-up in lending was supported by continued historically low interest rates on new loans in 2022 (Figure B.2). Average interest rates on newly-granted cash and housing loans were slightly lower in 2022 (by 0.18 and 0.12 percentage points, respectively) than in 2021. However, in parallel to the tightening of the ECB’s monetary policy, the several-year-long downward trend in interest rates came to a stop in the second half of 2022 and interest rates started to go up gradually. In March 2023, interest rates on new housing loans were about a half percentage point higher than in the same period of 2022. Interest rates on subsidised housing loans also grew perceptibly, so that the average highest EIR agreed between the Republic of Croatia and credit institutions in 2023 is more than one percentage point above that agreed in 2022<sup>3</sup>. On the other hand, interest rates on overdraft facilities dropped sharply following the signing of the [Memorandum of Understanding in respect of current account overdrafts](#) between the Croatian government, the CNB and thirteen banks in July 2022. As a result, interest rates on overdraft facilities were almost 2 percentage points lower in December 2022 than in December 2021, while they remained almost unchanged in early 2023.

The bulk of the increase in household loans was accounted for by housing loans, which came to half of total household loans at the end of 2022 (Figures B.3 and B.4). The growth rate of household loans picked up from 4.6% in 2021 to 6% in 2022, where it held steady at the beginning of 2023. The loan growth was mostly driven by housing loans, which have been steadily picking up speed in recent years, recording an annual growth rate of 10.5% in late 2022 and slowing down marginally, to around 9.7%, by the end of March 2023. General-purpose cash loans continued to recover gradually, growing at an annual rate of 4.4% in March 2023. However, this was still slower than in the period from 2017 to 2019, when they grew by around 9%, on average. By contrast, overdraft facilities and credit card loans continued to decline for the third consecutive year.

Credit standards for housing loans did not change much over 2022. On average, beneficiaries of new housing loans had to allocate around 31% of income for loan repayment (LSTI ratio, Figure B.5), while around 39% of income went for debt servicing (DSTI ratio, Figure B.6). Loans granted to beneficiaries that allocate a relatively high share of their income for repayments are inherently more risky due to the lower capacity to withstand possible adverse economic shocks, such as rising costs of living or interest rates. More specifically, around 40% of loans with high DSTI ratios were granted with periods of interest rate fixation shorter than five years, which exposes consumers with such loans to interest rate risk that may materialise if interest rate increases continue to spill over to current loans after the expiry of the fixation period (see chapter I.C). The results of the bank lending survey indicate a tightening of credit

<sup>3</sup> See the lists of selected credit institutions in Croatia that were parties to the agreements on subsidised loans in 2022 and 2023, available at the website of the Ministry of Physical Planning, Construction and State Assets.

standards for housing and consumer loans in the second half of 2022. With respect to housing loans granted in the last quarter, along with the rise in interest margins, the banks reported the growth in collateral requirements, that is, the tightening of maximum LTV ratios.<sup>4</sup>

**The ratios of loan principal to the value of real estate (loan-to-value ratio, LTV) for subsidised loans were again higher in 2022 than for unsubsidised housing loans (Figure B.7).** In periods of subsidised housing loans disbursement, average LTV ratios reach around 82%, with almost half of loans disbursed having LTV ratios of over 90%. On the other hand, average LTV ratios in other periods are somewhat lower (at around 78%), while only slightly more than one third of housing loans are disbursed with LTV ratio values exceeding 90%. The beneficiaries of subsidised loans usually have lower initial savings (loan down payment) to finance the credit purchase of residential real estate. If DSTI and LTV ratios are analysed at the same time, the share of loans that can be deemed the most risky as they have DSTI and LTV ratios above 40% and 90%, respectively, has not changed much since last year and stands at around 18% (Figure B.8).

**Notwithstanding loan growth, total household debt and debt repayment burden decreased (Figures B.9 and B.10).** Total household debt increased by 5%. However, due to the high inflation rate, which generated a surge in nominal GDP growth, the debt-to-GDP ratio continued to decrease, falling to around 34% of GDP at the end of the year (Figure B.9). At the same time, the sharp increase in nominal disposable income paired with a slightly longer maturity and a steady fall in interest rates on loan balances in 2022 further reduced the debt servicing burden for households (Figure B.10). However, despite favourable trends in these indicators, rising costs of living are placing a growing burden on income and diminish the capacity for loan repayment (see Figures A.16 and A.17, chapter I.A) and the absorption of possible further negative economic shocks (see Box 3).

## B.2 Non-financial corporations

**The growth in placements of credit institutions to non-financial corporations gained momentum in 2022.** This was mostly due to the increase in working capital loans driven by the larger needs of enterprises to finance current operations against the backdrop of surging costs, as well as buoyant demand for investment loans (Figure 1). Broken down by activities, energy companies accounted for the bulk of the increase in placements (Figure B.1). Placements to companies engaged in construction and real estate activities and companies in the trading sector also grew, albeit at a slower pace. By contrast, companies dealing in tourism recorded a mild deleveraging trend in respect of investment loans throughout 2022, whereas companies in

<sup>4</sup> More information on the results of the bank lending survey can be found at the following link: <https://www.hnb.hr/statistika/statisticki-podaci/financijski-sektor/druga-monetarne-financijske-institucije/kreditne-institucije/rezultati-ankete-o-kreditnoj-aktivnosti-banaka>.

Figure B.11 Working capital loans give a strong boost to the growth in financial institutions' placements to non-financial corporations

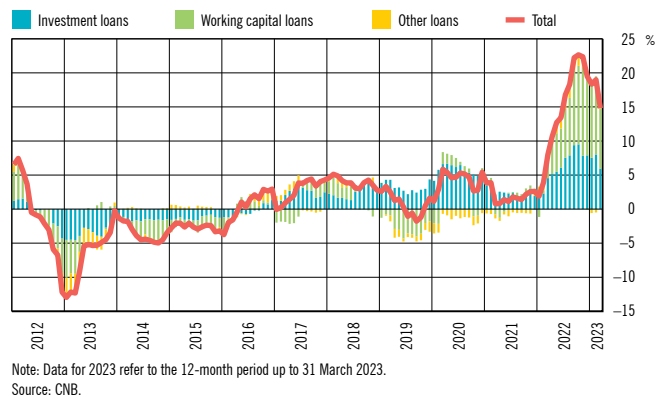
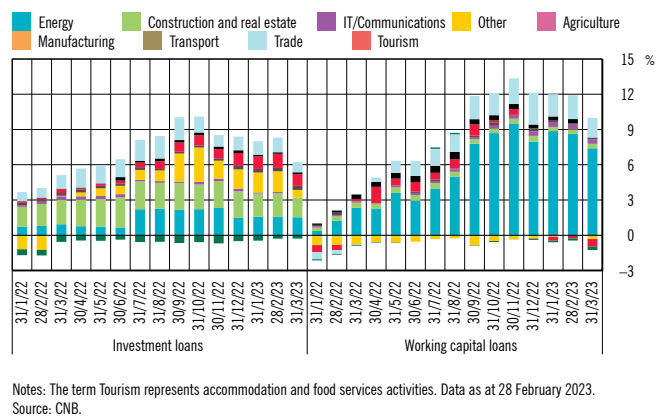


Figure B.12 Energy companies play a major role in loan growth



other service activities deleveraged based on working capital loans.

**Interest rates on corporate loans grew sharply, while banks tightened lending terms.** Interest rates on new loans to non-financial corporations began to rise steeply in mid-2022, growing by 2.5 percentage points by the end of the first quarter of 2023 (Figure B.13). Banks started to tighten lending terms for corporations in 2022 sharply, largely in response to the worsened risk perception, as suggested by the bank lending survey (Figure B.14). The survey results also indicate a slowdown in demand due to lower investment in long-term assets, whereas companies continued to need financing for inventories and working capital<sup>5</sup>.

<sup>5</sup> More information on demand and factors of corporate loan demand, as well as the overall results of the bank lending survey can be found at the following link: <https://www.hnb.hr/statistika/statisticki-podaci/financijski-sektor/druga-monetarne-financijske-institucije/kreditne-institucije/rezultati-ankete-o-kreditnoj-aktivnosti-banaka>.



Figure B.13 Interest rates on new loans to non-financial corporations started to rise in mid-2022

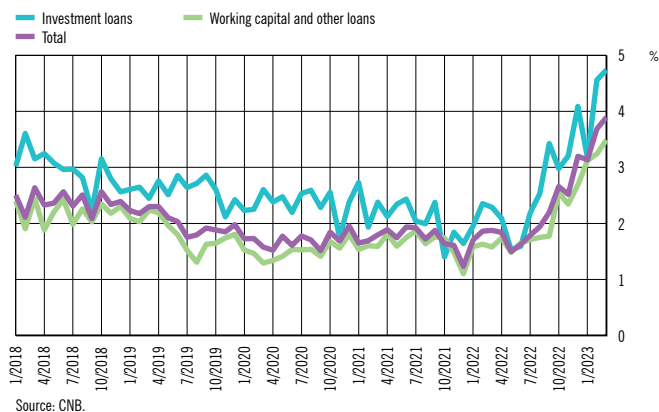


Figure B.14 Credit standards for non-financial corporations tightened due to the worsened risk perception

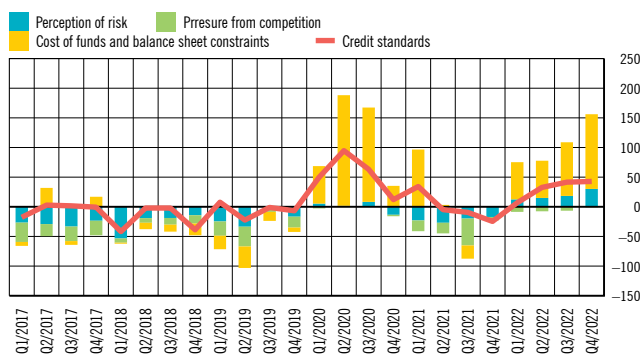


Figure B.15 Indebtedness continues to fall owing to the rise in nominal GDP

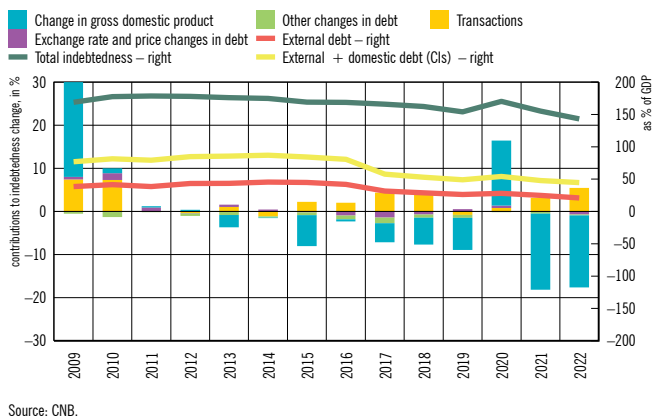
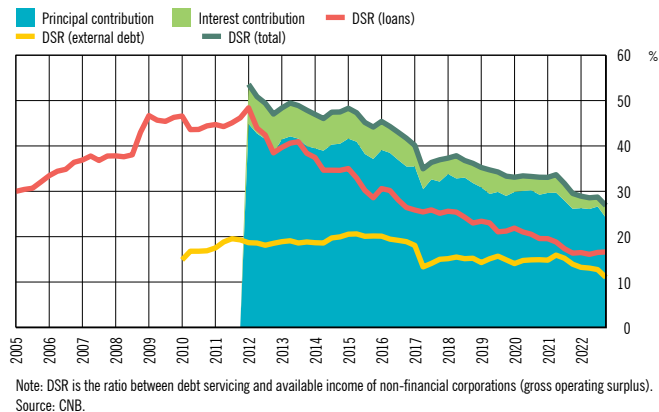


Figure B.16 Debt repayment burden steadily decreases amid recovery in gross operating surplus of corporations



Notwithstanding the considerable increase in liabilities of non-financial corporations to credit institutions in 2022, the steep rise in nominal GDP lowered the indicator of relative indebtedness of the non-financial corporate sector (Figure B.15). Owing to the sharp increase in nominal GDP, the ratio of non-consolidated debt of non-financial corporations to GDP dropped to 142% by the end of the year. The debt repayment burden also decreased steadily, with respect to both interest and principal payments, due to the growth in gross operating surplus of corporations (Figure B.16). Favourable developments in relative indebtedness of corporations were a result of inflation and an environment of robust demand, where corporations managed to offset the rising expenses by increasing the prices charged to their customers (see publication [Macprudential Diagnostics No. 18, Analytical annex](#)).

### B.3 Outlook

Relatively strong housing lending leads to further accumulation of risks in the household sector, primarily those associated with interest rate hikes and sustainability of elevated prices in the real estate market. The risks associated with lending to households may be assessed as high due to the ongoing relatively strong credit growth amid monetary policy tightening and rising risks to the debt servicing capacity; in phases of pronounced credit growth, it is often the case that the share of vulnerable debtors sensitive to potential unfavourable economic developments increases along with the widening of the debtors' base and the rise in their debt. Longer and stronger than anticipated increases in interest rates might create debt servicing difficulties, particularly for debtors that allocate a substantial portion of their income to debt repayment. Also, rising costs of living deplete household savings and leave a smaller share of income available for debt repayment (see Box 3 How inflation impacts households and their debt servicing capacity). In situations of unfavourable developments in the residential real estate market, poor liquidity and price decreases, loans with a very

high LTV ratio (>90%) might exceed the value of the property, which may create losses for credit institutions arising from delinquent loans secured by residential real estate.

**The risks arising from loans to non-financial corporations have so far been mitigated by good business performance. However, these risks are perceived to be high due to the rise in interest rates on new loans and uncertainty surrounding future economic developments.** On the one hand, the better debt servicing capacity of corporations makes it possible for credit institutions to absorb the initial shock of interest rate

hikes (see chapter I.C) and enables the servicing of a greater amount of debt undertaken by corporations in 2022, mitigating significant increases in risks in that sector. This is the outcome of good business results driven by the transfer of higher costs of raw materials to consumers and potential increases in profit margins. On the other hand, rising costs of production process financing paired with difficulties in the refinancing of due liabilities may give rise to credit risk in the non-financial corporate sector and have an adverse effect on the quality of the banks' credit portfolios. In the event of unfavourable developments in the non-financial corporate sector, such as a slump in demand and undermined profitability, systemic risks of excessive debt growth might materialise and generate losses for the banking sector.

## Box 3 How inflation impacts households and their debt servicing capacity

The rise in the cost of living last year diminished real disposable income of households, with utility costs growing moderately and food costs growing significantly. Lower-income and pensioner households were hit hardest by the inflationary shock, with a mild increase in the share of vulnerable households, which are assumed to spend more than 70% of their income on food, utilities and debt repayment. Following the inflationary shock, some households might face difficulties in loan repayment, whereas the rise in vulnerable indebted households in the upper middle part of the income distribution has slightly increased risks to financial stability.

**For the first time in several decades, households are facing a major inflationary shock.** Even though the COVID-19 pandemic caused a dramatic economic downturn, it did not severely affect a large share of households thanks to support measures to alleviate the pandemic effects. However, the combination of high inflation and economic uncertainty that followed might cause serious financial problems for many households. This Box attempts to assess the impact of elevated inflation on household vulnerability as well as its potential impact on financial stability.

**The analysis is based on data on the structure of household consumption according to the Household Finance and Consumption Survey (HFCS<sup>1</sup>)** carried out in late 2020. The rise in spending on food and utilities from the end of 2020 to the end of 2022 was simulated at the level of individual households in the sample, using the growth rate of the index of food and utility prices.<sup>2</sup> Furthermore, for each quintile of the income distribution income growth was simulated using the rate of wage growth specific for that quintile in Croatia in the period from 2020 to 2022<sup>3</sup>. It was also assumed that the ratio of the annual total debt repayment cost to total annual disposable income (DSTI) remained unchanged over the period observed.

**The increase in the share of food and energy costs in disposable income, triggered by the rising costs of living, was most evident for households in lower income brackets.** The average household in the first quintile of the income distribution spent, on average, around 35%

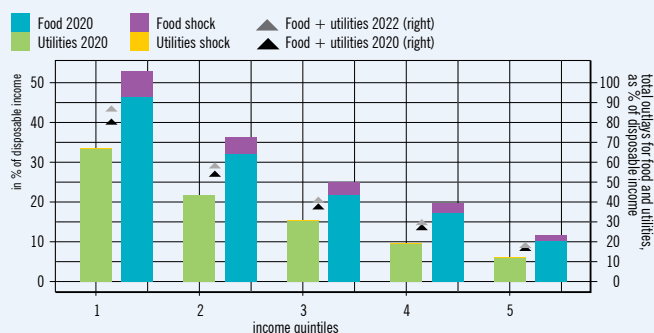
1 For more information on the survey, see: <https://www.hnb.hr/statistika/anketna-istrzivanja/anketa-o-financijama-i-potrosnji-kucanstava>.

2 Utility prices are weighted by the shares of individual products (e.g. gas, electricity, other utility services) in the consumer basket at 5-digit COICOP level to ensure that the rise in utility costs is methodologically aligned with the HFCS data on consumption.

3 Similar results were obtained by use of data on wage movements at aggregate level (all employed persons) because departures from the central distribution are very small. As the analysis is made by use of a statistical sample, the use of wage developments to estimate the 2022 income was deemed to be an appropriate approach because it provides a conservative estimate of income growth as well as a conservative estimate (upper bound) of the impact of inflation on households. More precisely, cyclical developments in the period reviewed might have given a stronger boost to disposable income (e.g. employment growth, other sources of income, such as pensions and rent income, displaying different dynamics to wages, but they have not been covered by the survey and cannot be simulated in a consistent manner.

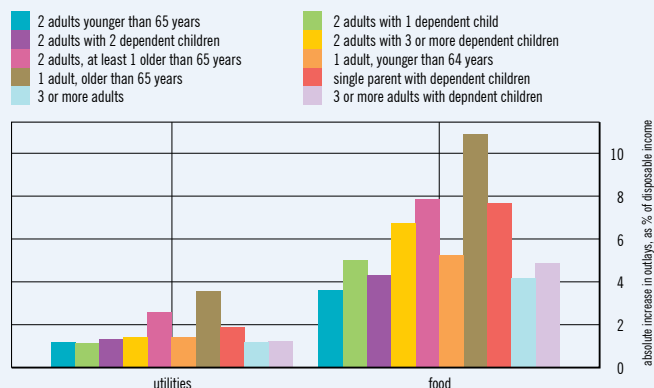
of disposable income on utility charges, while slightly more than 45% went on food (Figure 1). At the same time, the highest-income households spent on average around 5% of disposable income on utility charges and around 10% of their income for food. However, the inflationary shock considerably raised food costs, while outlays for utilities rose marginally for all households due to caps on the retail prices of energy. The rise in living costs mostly affected households in the lower part of the income distribution; their outlays for food as a share of income rose by around 8 percentage points, while the increase for households in the highest income groups was around 2 percentage points. More specifically, households with at least one person over 65, which are also the ones with the lowest income, were hit the hardest by rising living costs (Figure 2). By contrast, the disposable income of younger people was much less affected by the shock of living costs. Among other things, the education level of a household head was directly linked with the impact of rising costs of living.

Figure 1 Share of spending on food and utilities (after price growth) in household income, by income distribution



Notes: Food 2020 (Utilities 2020) shows the share of spending on food (utilities) in disposable income in terms of income and prices in 2020; Food shock (Utilities shock) shows the share of increased spending on food (utilities) in disposable income estimated by the increase in the price index of food (utilities) and growth in nominal wages from 2020 to 2022. Sources: CNB (HFCS) and authors' calculations.

Figure 2 Growth in food and utility costs relative to income, by household type



Sources: CNB (HFCS) and authors' calculations.

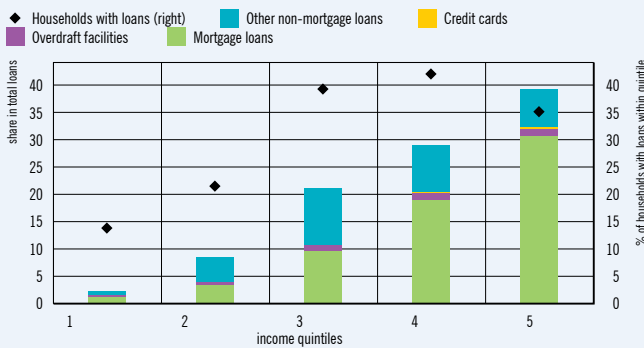
From a financial stability perspective, it is important specifically to examine indebted households to see how much they have been affected by higher costs. As a rule, the lowest-income households lack creditworthiness or may raise very little debt, with indebtedness growing in stride with income, but decreasing towards the peak of the income distribution. As a result, there are slightly less than 15% of households with debt in the first income quintile, while there are around 40% of indebted households in the third and fourth quintiles (Figure 3)<sup>4</sup>. Also, as households in lower income groups raise smaller amounts of loans, households in the first two income quintiles account for only one tenth of total household loans (Figure 3). At the same time, the largest amount of loans is concentrated in highest-income households, although that group does not account for the biggest number of indebted households (only 35% are in the fifth quintile).

Indebted households in any income bracket have higher essential expenses. Estimates show that indebted households with the highest

income spend only 25% of their income on costs of living and loan repayment, while those without debt spend 20% of their income on living expenses. The ratio of total outlays to income becomes increasingly high moving down the income ladder. As regards the lowest-income households, essential expenses for households without debt came up to a high 85% of income in 2022, while indebted households spent their entire income on food, utilities and debt servicing (Figure 4). Therefore, each further decrease in income might jeopardise their capacity to repay debt.

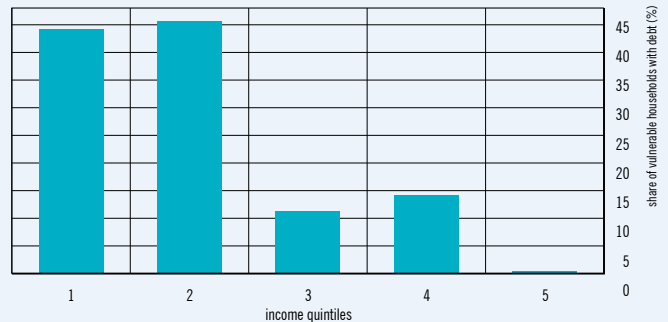
Around 18% of indebted households were identified as vulnerable in 2022, only 2 percentage points more than in 2020. Applying the methodology used in Valderrama et al. (2023)<sup>5</sup>, a household is defined as vulnerable if it spends more than 70% of disposable income on food at home, utilities and debt servicing. The largest share of vulnerable households is in the first and second quintiles, accounting for around 45% of households in the given quintiles, while a much smaller share

Figure 3 Frequency of indebtedness and participation in total loans, by income distribution



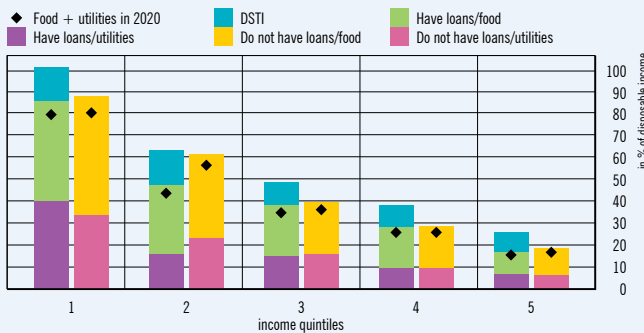
Note: "Households with loans" represents the share of households that have loans in a particular income distribution quintile. Sources: CNB (HFCS) and authors' calculations.

Figure 5 Share of households with debt in each quintile that spend more than 70% of income on food, utilities and debt servicing



Note: The figure shows the share of vulnerable households in the total number of households with debt in a particular income quintile. Sources: CNB (HFCS) and authors' calculations.

Figure 4 Differences in shock effects on households' living costs depending on their indebtedness



Notes: For each income quintile, the first column shows indebted households and the second column shows households without debt. DSTI is the ratio of annual debt servicing costs to total annual disposable income; it is assumed that DSTI remains unchanged. Sources: CNB (HFCS) and authors' calculations.

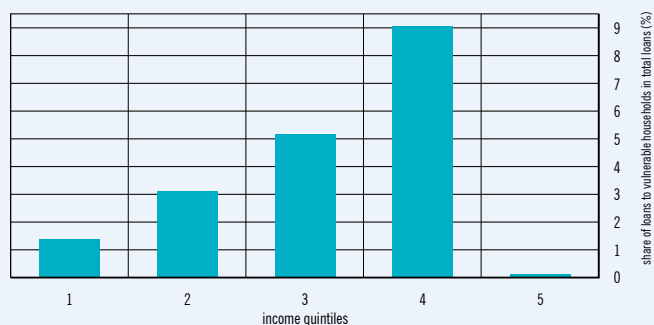
of households in the upper part of the income distribution was assessed as vulnerable (there are almost no vulnerable households in the fifth income quintile) (Figure 5).

While the most vulnerable indebted households are most often those with lower income, the largest share of debt held by indebted vulnerable households is in the upper middle income group. The share of loans of all vulnerable households in total loans is slightly below 20%, which is comparable to the share of loans that banks perceive as risky (sum of stage 2 and 3 loans, see chapter I.E, Figure E.14). The largest share of loans to vulnerable households is found in the fourth income quintile, accounting for around 9% of total household loans, i.e. half of all loans to vulnerable households (Figure 6).

5 Vulnerable households are defined in line with the methodology presented in Valderrama, L., Gorse, P., Marinkov, M. and Topalova, P. (2023): European Housing Markets at a Turning Point – Risks, Household and Bank Vulnerabilities, and Policy Options. IMF WORKING PAPERS, 2023(076). Available at: <https://www.imf.org/en/Publications/WP/Issues/2023/03/24/European-Housing-Markets-at-a-Turning-Point-Risks-Household-and-Bank-Vulnerabilities-and-531349>.

4 HFCS data suggest that around 30% of households have some type of loan, while around 7% have a housing loan.

Figure 6 Share of loans to vulnerable households in total loans, by income distribution



Note: A vulnerable household is one that spends more than 70% of income on food, utilities and debt servicing; the figure shows the share of loans to vulnerable households in total household loans.

Sources: CNB (HFCS) and authors' calculations.

**In conclusion, the share of vulnerable households has slightly increased due to higher costs of living, while risks to financial stability are associated with households in the upper middle income group because of their large indebtedness.** When viewed in more detail, the lower part of the income distribution includes most households that spend the largest portion of their income on essential expenses; however, such households rarely have debts or borrow only small amounts, which means that only a few will face potential problems in loan repayment. On the other hand, as the upper part of the income distribution includes a much smaller number of vulnerable households but with larger loan amounts, potential difficulties they may face in debt repayment might have the strongest impact on the growth of credit risk in banks.

## Box 4 Companies in bankruptcy

The bankruptcy framework that governs the settlement of creditors of companies that become incapable of meeting their obligations or are over-indebted is a very important prerequisite for an effective market mechanism and the orderly functioning of the credit market. This Box provides an analysis of companies that are undergoing bankruptcy or facing a high risk of insolvency in order to gain an insight into the characteristics of actions used in dealing with insolvent companies and trends in financial system exposure to such companies. It is established that banks recognise potentially risky clients even before the initiation of bankruptcy proceedings; in this context, appropriate institutional arrangements may provide additional support.

**Market entries and exits are normal processes where old and non-competitive companies are replaced by new and innovative companies, rejuvenating the sector of non-financial corporations in an economy<sup>1</sup>.** Assuming that market exits are efficient, such dynamics enables a transfer of resources towards innovative projects as well as productivity growth. The number of companies that were insolvent and non-viable in the long run grew sharply in the aftermath of the global financial crisis, but they continued to “live” for some time owing to slow and ineffective bankruptcy proceedings. In such a setting, bankruptcy proceedings lead to higher costs of claims settlement and larger creditor losses, as well as potentially higher risk perception of investors and financial institutions, with negative consequences on the financing costs for all companies.

**A new Bankruptcy Act, which came into force in late 2015, aimed at expediting and facilitating the market “clean-up” of inefficient companies in the Republic of Croatia<sup>2</sup>.** Its positive effects are mentioned in the Doing Business Report of the World Bank (Figure 1), which assesses that the recoverability of claims of secured creditors in bankruptcy proceedings improved significantly following the bankruptcy reform and that the position of Croatia in terms of the quality of the bankruptcy framework improved in the international context. However, there is also room for improvement in view of the quality gap compared to the insolvency resolution in OECD countries<sup>3</sup>. To provide an even more efficient solution to the insolvency problem, amendments to the Bankruptcy Act<sup>4</sup> were adopted in March 2022 in response to the need to ensure faster and more efficient bankruptcy proceedings, in part due to the delays accumulated during the pandemic.

1 The idea about the effect of replacing old and unproductive companies in unpromising industries by new and innovative companies goes back to the concept of “creative destruction” coined by the famous economist Joseph A. Schumpeter, who mentioned it first in his work *Capitalism, Socialism, and Democracy*.

2 Official Gazette 71/2015.

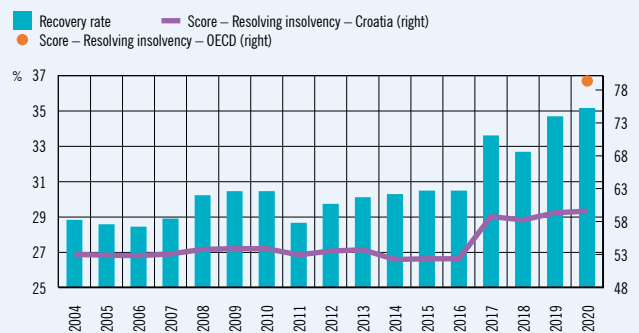
3 The median of the overall resolving insolvency indicator for all high-income OECD countries stands at 79.4, while it is 59.6 for Croatia. The gap is even wider as regards the recovery rate: the median rate is at 84.5% for all OECD countries and at 35.2% for Croatia.

4 The amendments were made in accordance with Directive (EU) 2019/1023 (Directive (EU) 2017/1132 on restructuring and insolvency) on preventive restructuring frameworks, on discharge of debt and disqualifications, and on measures to increase the efficiency of procedures concerning restructuring, insolvency and discharge of debt. The Act was published in Official Gazette 36/2022.

**The reform of the bankruptcy framework has simplified the initiation of bankruptcy proceedings, increased their number and contributed to faster dissolution of bankrupt companies** (Figure 2). The implementation of concrete reforms facilitated easier initiation of bankruptcy proceedings by creditors and automated initiation of bankruptcies, leading to a jump in the number of proceedings initiated. Furthermore, a much larger number of bankruptcies has been opened with respect, on average, to younger companies, which may be a direct outcome of the earlier initiation of proceedings, but it may also reflect the fact that younger companies are less capable of surviving in the market<sup>5</sup>.

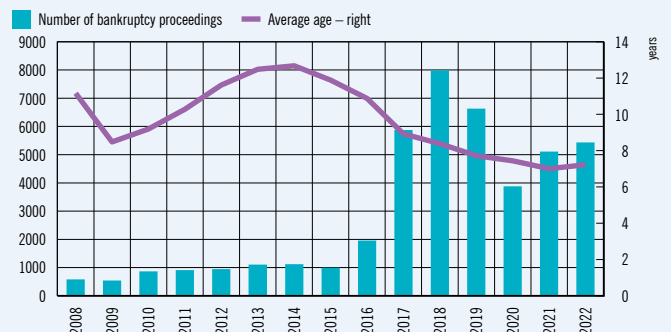
**The indicator of increased default risk suggests that the average time needed to initiate bankruptcy proceedings against risky companies became slightly shorter following the enforcement of the new Bankruptcy**

Figure 1 World Bank recognizes that efficiency of the bankruptcy framework has improved since 2015



Notes: The recovery rate for creditors shows the percentage of their original investment they recover in bankruptcy proceedings. Score - Resolving insolvency refers to the overall score for the quality of the bankruptcy regime. Source: World Bank.

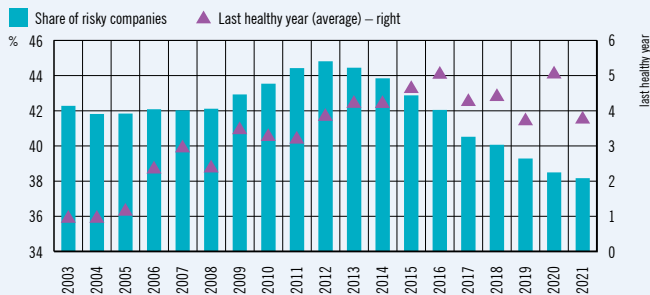
Figure 2 Sharp increase in the number of bankruptcy proceedings after 2015, particularly for younger companies



Notes: The term “bankruptcy proceedings” refers to bankruptcies, pre-bankruptcies and windings-ups in one year. The average age refers to the age of a company at the time of the opening of bankruptcy proceedings. Source: Commercial Court Register (processed by the CNB).

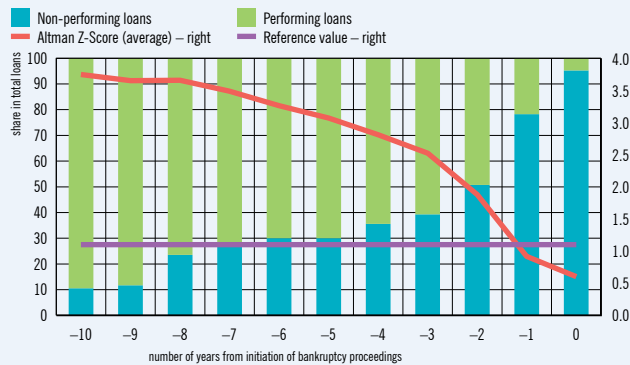
5 Knaup, A. E. and Piazza, M. C. (2007): Business Employment Dynamics Data: Survival and Longevity, Monthly Labor Review, 3-10. examine the survival rates for young companies using US data and show that new companies, which have not yet established their market positions, are weaker and have more difficulties in securing business continuity.

**Figure 3 Number of risky companies decreases together with the time preceding their bankruptcy**



Notes: The share of risky companies refers to the share of companies having an Altman Z-Score below the reference value in the total number of companies in a given year. The last healthy year is defined as the number of years before the initiation of bankruptcy, when a company last recorded an Altman Z-Score higher than the reference value, which is used to signal increased insolvency risk.  
Sources: FINA, Commercial Court Registry and CNB.

**Figure 4 Companies' risk increases sharply one year before their bankruptcy and banks classify most of their loans as non-performing**



Sources: FINA and CNB.

**Act.** Companies with increased operating risk are defined according to the methodology in Altman (2005)<sup>6</sup> as those having an Altman Z-Score below the reference value. This is used as a basis for constructing an indicator of the last healthy year, which measures how many years have passed between the last year when a company recorded good performance (i.e. had an Altman Z-Score above the reference value) and the year of initiation of bankruptcy proceedings. During a several-year period of economic downturn, that is, after 2008 and up to 2016, the number of companies defined as risky in terms of the Altman Z-Score started to grow (Figure 3) and increasingly more time passed between the initial signal of potential riskiness and the opening of bankruptcy

6 An Altman Z-Score is calculated by using the following formula:  $z = 6.56 \cdot WC/A + 3.26 \cdot RE/A + 6.72 \cdot EBIT/1 + 1.05 \cdot C/L$ , where "WC" refers to working capital, "A" to assets, "RE" to retained earnings, "C" to capital and "L" to liabilities. The reference value used to define insolvency risk is 1.1. More information on the Altman Z-Score model applied may be found in: Altman, E. (2005): An emerging market credit scoring system for corporate bonds, *Emerging Markets Review* (6), 311-323.

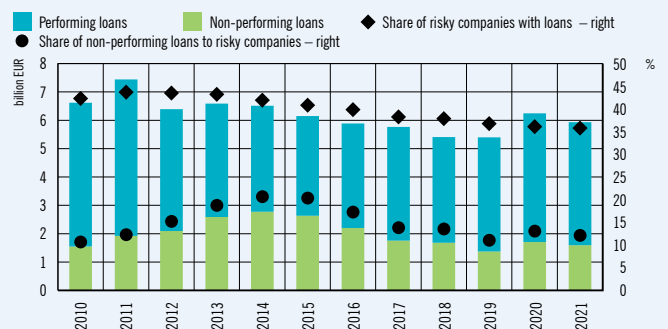
proceedings. By contrast, the improved macroeconomic environment after 2016 supported a reduction in the share of risky companies<sup>7</sup>, simultaneously reducing the time needed to initiate bankruptcy proceedings against a company with deteriorating performance, which may be associated with the Bankruptcy Act amendments. The exception was 2020, when the initiation of bankruptcy proceedings was temporarily suspended after the outbreak of the COVID-19 pandemic, so that the time between the first signs of risk and the initiation of bankruptcy proceedings became longer. However, the share of companies deemed as risky did not increase in that period, which is probably attributable to ample government support during the pandemic (see Analytical annex in Macroeconomic Diagnostics No. 12 and Box 4 in Financial Stability No. 22).

**Banks begin to recognise signs of deteriorating performance of their debtors much earlier than the initiation of bankruptcy proceedings.**

Looking at a ten-year time frame before the initiation of bankruptcy proceedings, it is evident that the share of loans banks classify as non-performing increases as the moment of initiation comes closer, which on average reaches 50% two years before the initiation of the proceedings (Figure 4). The Altman indicator for companies with bank loans also deteriorates during that period, falling below the reference value in the year before the initiation of the proceedings, which is a sign of insolvency risk.

**The exposure of banks to companies with elevated insolvency risk decreased steadily until the beginning of the COVID-19 pandemic (Figure 5).** Parallel to the decline in the total exposure amount, the share of risky companies with loans was decreasing up to 2020<sup>8</sup>, as did the share of non-performing loans granted to risky companies. However, the

**Figure 5 Banks' exposure to risky companies increased during the pandemic**



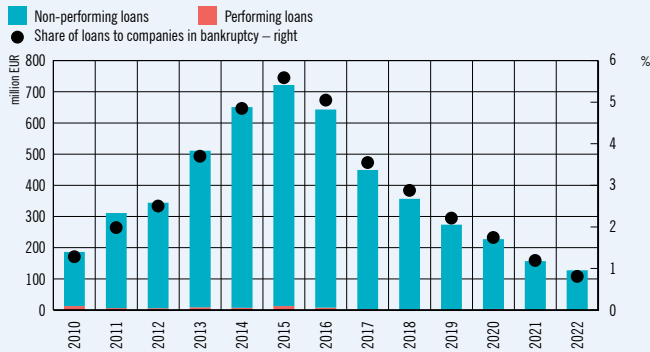
Notes: The figure shows banks' exposures to risky companies with an Altman Z-Score below the reference value. The share of non-performing loans to risky companies refers to their share in total loans to non-financial corporations. The share of risky companies with loans refers to their share in the total number of companies with loans.  
Sources: FINA and CNB

7 Caballero, R. J. and Hammour M. L. (2000): Creative Destruction and Development: Institutions, Crises, and Restructuring, NBER Working Paper No. w7849 shows that a favourable macroeconomic environment contributes to a decrease in the share of risky companies.

8 The share of risky companies with loans refers to the share of companies having an Altman Z-Score below the reference value in the total number of companies with loans.

year 2020 saw an increase in bank exposure to “unhealthy” companies, notwithstanding the continued fall in their share in the total number of companies with loans, which may be the outcome of loans granted to companies whose operations were constrained by the pandemic.

Figure 6 Banks’ exposure to companies undergoing bankruptcy has been decreasing since 2016



Note: Banks’ exposure to risky companies refers only to banks’ exposures to companies in active bankruptcy proceedings. Sources: Commercial Court Registry and CNB

**Almost all banks’ exposures to companies undergoing bankruptcy are classified as non-performing.** Banks’ exposure to companies in bankruptcy grew in the first half of the 2010s (Figure 6) and then started to decrease after 2015, when economic activity began to recover. In 2022, non-performing loans to companies in bankruptcy accounted for less than 1% of total bank loans to non-financial corporations (vs more than 5% in 2015). This may also be attributed to a more active resolution of insolvent companies by means of bankruptcy proceedings, leading to a fall in the number of active proceedings and their shorter duration, as well as intensive sale of non-performing claims and their removal from banks’ balance sheets.

**Performance and dynamics among companies affect credit institutions** and are reflected in the financial stability of the entire system. Uncertainty regarding performance of companies, their solvency and the outcome of bankruptcy proceedings hampers the resolution of credit risk in banks’ balance sheets, which may adversely affect competitiveness across the entire economy. Higher bank exposure to unhealthy companies may result in a diminished supply of bank loans to the economy because of the balance sheet constraints faced by banks<sup>9</sup>. Therefore, from a financial stability perspective, it is necessary to ensure an adequate institutional framework that can rapidly and efficiently address the issue of insolvency and actively monitor banks’ exposure to risky companies.

<sup>9</sup> More information on the impact of non-performing loans on bank lending may be found in Huljak I., Martin R., Moccero D. and Pancaro C. (2020): *Do non-performing loans matter for bank lending and the business cycle in euro area countries?*, ECB Working Paper Series No. 2411.



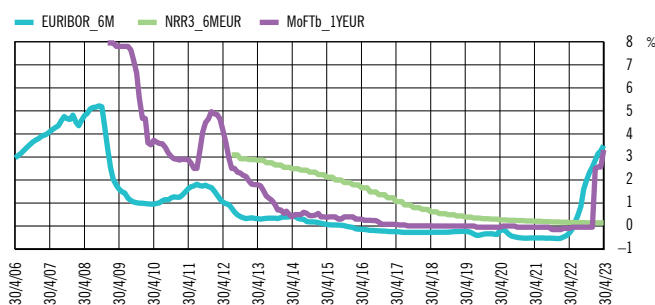
# C Interest rate risk of the non-financial sector

Against the backdrop of interest rate increases, prolonged geopolitical instabilities and volatility of prices of energy and raw materials could have an unfavourable effect on the debt repayment capacity of the non-financial sector. The non-financial sector is moderately vulnerable to interest rate increases. Highly indebted debtors with long principal maturities, whose loans are linked to variable reference parameters, such as the EURIBOR, are particularly exposed to interest rate risk.

## C.1 Interest rate trends

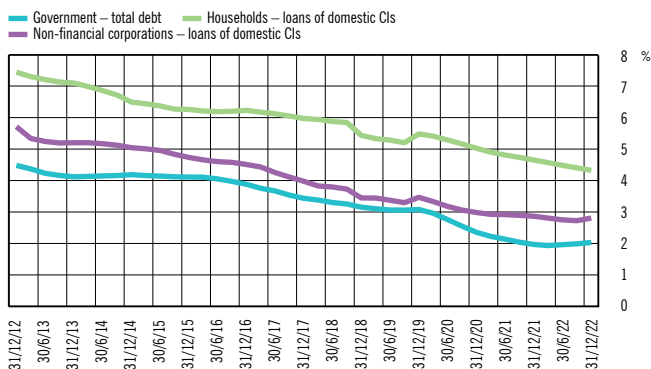
**Increases in the ECB’s key interest rates aimed at curbing inflation have been increasing market interest rates since mid-2022, and thus also debt repayment costs for loans granted at a variable interest rate.** Despite the noticeable increase in reference interest rates seen from the second quarter of 2022 (Figure C.1), interest expenses still did not react significantly to the rise in interest rates (Figure C.2). Since the rise in reference interest rates is reflected in average interest rates on new bank loans with a time lag, which, historically, hovered around three months for government debt and debt of non-financial corporations and six months for household debt, it is not until 2023 that interest expenses are expected to rise more considerably. The exposure of individual sectors to interest rate risk also depends on the share of their debt arising from loans granted at a variable interest rate, the average debt maturity, legal regulations and other factors. The government is the least exposed in the non-financial sector, with less than 15% of long-term public debt entered into at a variable interest rate. At the same time, some 30% of household loans are linked to variable interest rates, with a smaller share of such loans linked to the EURIBOR, and the majority linked to the national reference

Figure C.1 Main reference interest rates soared from historical trends in 2022



Note: MoFTb\_1\_YEUR indicates the interest rate on one-year T-bills in euro, NRR3\_6MEUR indicates the six-month national reference rate of the average banking sector financing cost in euro for all natural and legal persons (6M NRR3 EUR), EURIBOR\_6M indicates the six-month EURIBOR.  
Sources: ECB, MoF, HUB and CNB.

Figure C.2 Implicit interest rates in 2022 still did not react to reference rate increases



Source: CNB.

rate (NRR), which has been very stable over the past year. In addition, legal regulations lay down interest rate ceilings and the rules for the periodic adjustment of such ceilings, so that the possibility of interest rate increase in household loans is limited in the short term, i.e. legal provisions protect households from sudden interest rate changes. In the non-financial corporate sector, slightly less than a half of loans of domestic credit institutions were granted at a variable interest rate, with the majority of debtors with such loans linked to the EURIBOR and the interest rate on MoF T-bills, which also grew noticeably from 31 January 2023.

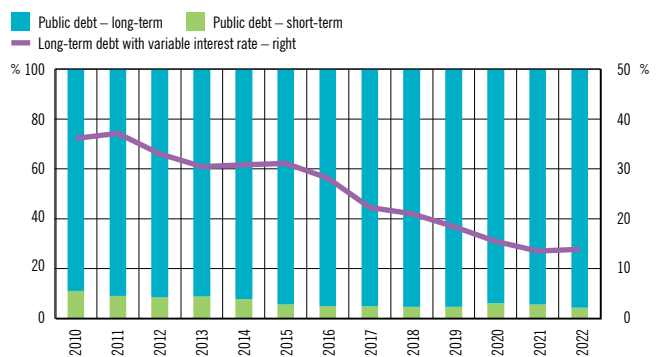
## C.2 Government interest rate risk

**Despite the tightening of financing conditions, expenditures on interest in the government sector saw only a slight increase in 2022, with a stable ratio to public debt and nominal GDP.**

This is attributable to the heavy reliance of Croatia on financing from long-term sources at fixed interest rates, with a noticeable extension of the average maturity of government debt which, in late 2022, amounted to some six years. On the other hand, short-term financing, which requires a more frequent access to financial markets so that changed market conditions are fed through to it faster, is very poorly represented with short-term debt accounting for less than 5% in total public debt (Figure C.3). Furthermore, the share of long-term public debt with a variable interest rate in the total public debt has been declining for many years now and is relatively low, accounting for less than 15% (Figure C.3), which has mitigated the effect of interest-rate risk on public debt sustainability.

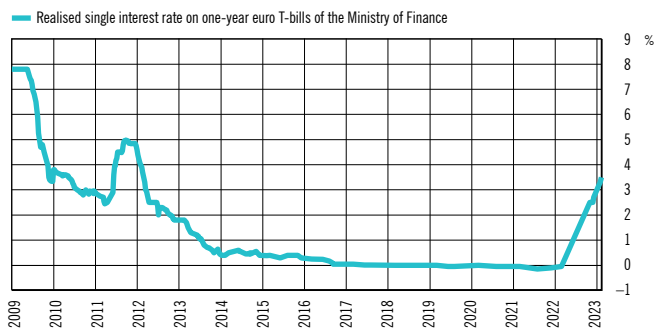
**Interest rates on new government debt remain relatively low in historical terms.** Yields on the long-term bonds of the Republic of Croatia exceeded 4% in March 2023, i.e. increased from 1.2%, the level they stood at the beginning of 2022, reflecting the rise in market interest rates. The increase was still significantly lower than that seen in non-euro area EU member states such as Hungary, Poland and Romania and very close to

Figure C.3 The share of public debt with a variable interest rate in total debt has been declining for many years now



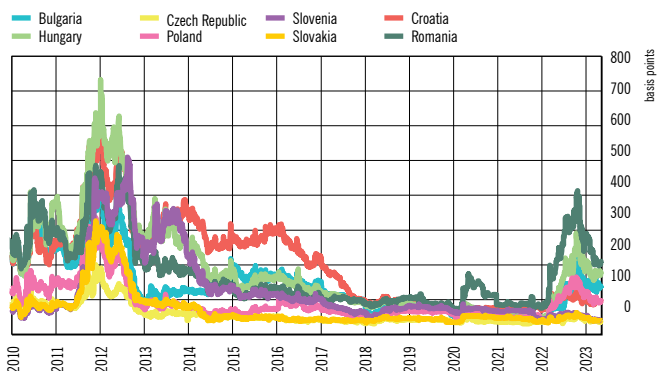
Source: CNB.

Figure C.4 Noticeable increase in interest rates on one-year T-bills over the past months



Source: Ministry of Finance.

Figure C.5 Croatia's CDS spread grew only slightly



Source: Bloomberg.

Table C.1 Matured and issued bonds in 2022 and the first months of 2023

Year	Matured bonds						Issued bonds					
	Amount	Currency	Interest rate	Date of issue	Date of maturity	Maturity in years	Amount	Currency	Interest rate	Date of issue	Due date	Maturity in years
Domestic												
2022	3,000,000,000	HRK	2.250	7/2/2017	7/2/2022	5	1,000,000,000	EUR	1.250	4/2/2022	4/2/2030	8
	1,000,000,000	EUR	6.500	22/7/2011	22/7/2022	11	800,000,000	EUR	3.375	15/7/2022	15/7/2023	10
International												
2022	1,250,000,000	EUR	3.875	29/5/2014	30/5/2022	8	1,250,000,000	EUR	2.875	22/4/2022	22/4/2032	10
2023	1,500,000,000	USD	5.500	4/4/2013	4/4/2023	10						

Note: The table shows bonds with a maturity of five years and more.  
Source: Ministry of Finance

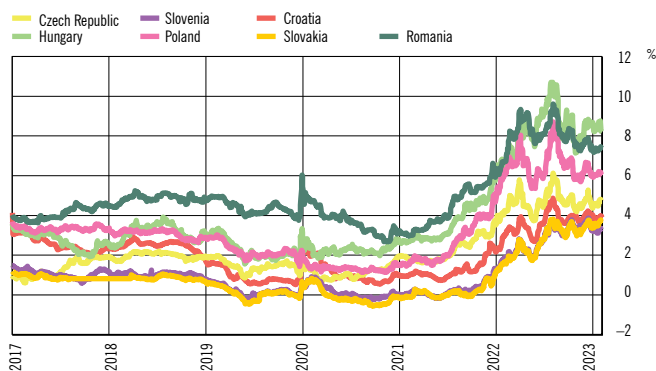
the yields on long-term government bonds in euro area peer countries such as Slovakia and Slovenia (Figure C.6). On the other hand, in the several-year-long period following the global financial crisis, new borrowing costs of the Republic of Croatia were elevated, so that, despite the sharp increase over the past year, interest expenses remained significantly lower than in previous years. Long-term government bonds that matured in 2022 were refinanced by new bonds at a still relatively favourable cost of borrowing (Table C.1). The increase in expenditures was particularly evident in short-term borrowing, where the interest rate on one-year MoF T-bills, which stood at less than 1% in the period from 2013 to 2022, and was even occasionally negative after 2019, increased sharply to 3.5% in early May 2023. Although it is still considerably lower than in the period from 2008 to 2009, the interest rate agreed for this form of short-term financing was at its highest level in the past ten years (Figure C.4).

**Croatia’s interest rate expense in the upcoming period will largely depend on the financing conditions on the market and the country’s sovereign risk premium.** In the preceding year, Croatia’s sovereign risk premium measured against the

CDS increased only slightly (Figure C.5), remaining at historical lows. This reflects the fact that in January 2023, Croatia became a member of the euro area, the very announcement of the date of entry into the euro area having had positive effects on the mitigation of borrowing costs (Zrnc, 2022). However, in addition to that, macroeconomic developments and the condition of public finance will have the most significant effect on the risk rating in the future.

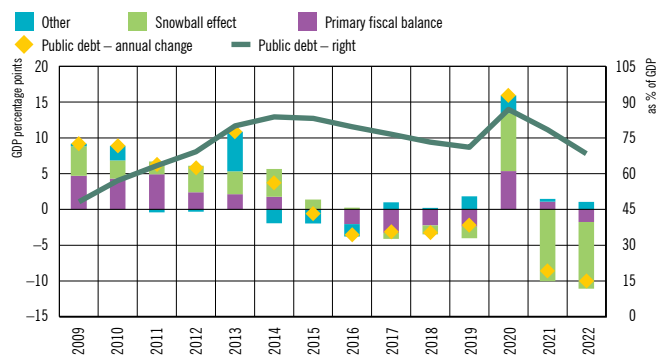
**The analysis of the sensitivity of public debt to interest rate increase shows that interest rate risk to public debt sustainability is not pronounced in the short term** (Figure C.10). This is a result of the aforementioned favourable maturity structure and the relatively low share of public debt with a variable interest rate, the relatively stable risk premium and favourable fiscal results over the past two years. The snowball effect stemming from the difference between the implicit interest rate on public debt and the rate of economic growth on public debt developments was extremely favourable over the past two years (Figures C.7 and C.8), contributing strongly to the reduction of the public debt-to-GDP ratio. Interest expenditures have been declining since 2016 (Figure C.11), and measured by their ra-

Figure C.6 Yields on the long-term bonds of the Republic of Croatia also increased



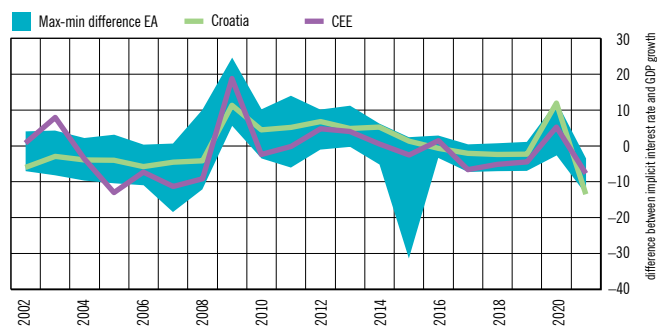
Source: Bloomberg.

Figure C.7 The strong contribution of the snowball effect to public debt decrease



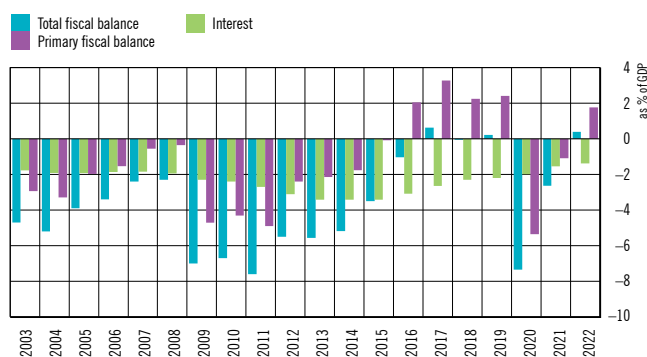
Source: CNB.

Figure C.8 GDP growth rate higher than the rate of growth of interest rate on public debt points to a more favourable snowball effect



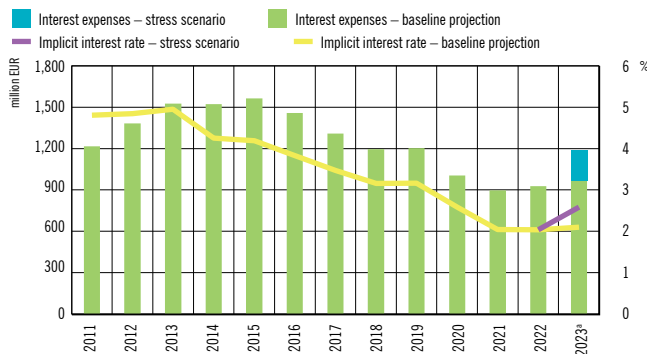
Note: EA indicates the euro area and excludes the data for Estonia, Latvia, Luxembourg and Malta; black horizontal lines show maximum and/or minimum; CEE represents Central and Eastern Europe. Sources: Eurostat and CNB calculations.

Figure C.9 General government balance and interest expenditures



Source: CNB.

Figure C.10 Interest rate risk is not pronounced in the long term



<sup>a</sup> The stress scenario assumes the effect of an interest rate increase in the amount of two percentage points on interest expenditures relative to the baseline projection taken from the Stability Programme of the Republic of Croatia from April 2023. Source: CNB.

to GDP, they are at their historical lows. In addition, needs for financing in the upcoming year will be lower than in the preceding years, and maturing long-term bonds are likely to be refinanced under still relatively favourable conditions, which should not significantly increase the debt repayment burden in the short term. Furthermore, the strong absorption of EU funds is also very important, and although it is neutral budget-wise, it indirectly reduces the pressure for government borrowing and enables the financing of necessary structural projects.

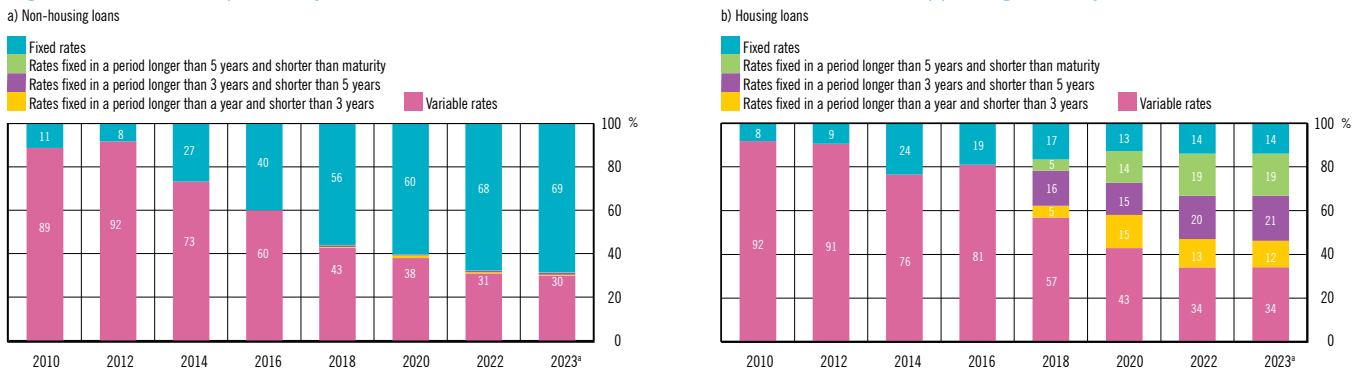
### C.3 Household sector interest rate risk

**In the household sector, interest rate risk was also mitigated by interest rate fixation: most housing loans to households are linked to interest rates variable in a period shorter than maturity, while non-housing loans are predominantly linked to fixed interest rates.** As much as 70% of non-housing loans have interest rates that are fixed to maturity, while the share of such loans is much smaller in housing loans, amounting to a modest 14% (Figure C.11). A further 40% housing loans is accounted for by loans with interest rates fixed for a period longer than three years, 13% of housing loans have interest rates fixed for a period from one to three years, and about one third of such loans have variable interest rates. Since the majority of loans have interest rates that are fixed for at least a specific period, debtors are protected from the effect of market interest rate increase in the short term. Furthermore, the loan structure according to interest rate variability is significantly different from the loan structure ten years ago, when 90% of loans had variable interest rates, which indicates that credit institutions have acted in accordance with the [Recommendation to mitigate interest rate and interest rate-induced credit risk in long-term consumer loans](#), adopted by the CNB in 2017.

**In addition to the remaining period of interest rate fixation, the possibility and the intensity of a change in interest rates on existing loans also depends on the agreed upon reference parameter** to which the change in the interest rate is linked in loans with variable interest rates, i.e. to which the change in interest rates will be linked after the expiry of the initial period of interest rate fixation. The most frequently applied reference parameter is the national reference rate (NRR), to which some three quarters of loans with variable interest rates and initial period of interest rate fixation are linked, while EURIBOR is applied in 18% of such loans and at the end of 2022, it was mostly applied to loans with variable interest rates without the initial fixation (Figure C.12). Since from 1 January 2023, due to Croatia’s joining the euro area, EURIBOR has been applied as the reference parameter for newly granted loans with variable interest rates, its share will grow gradually.

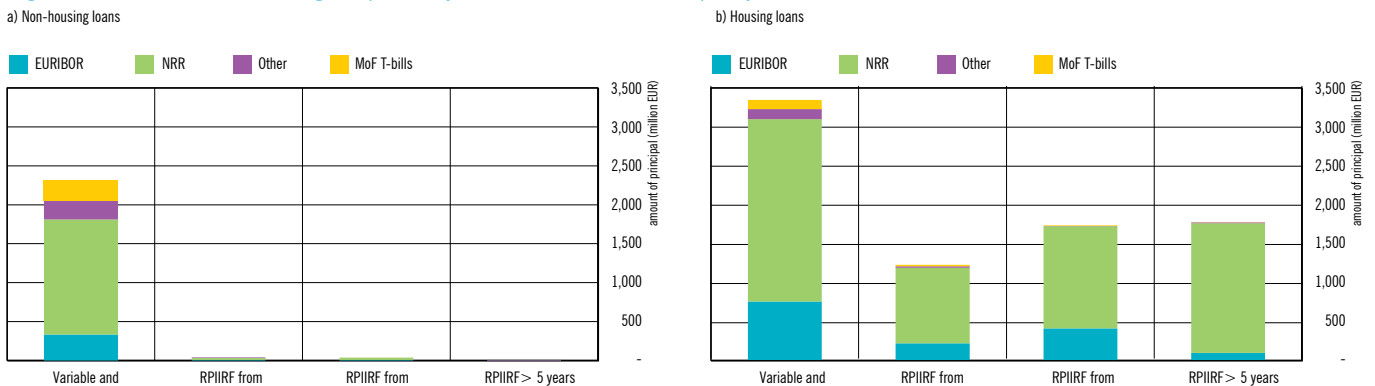
**In addition to the structure of interest rates according to variability and the reference parameter, the possibility of interest rate change is also significantly affected by legal regulations.**

Figure C.11 Over the past ten years, the share of loans with a variable interest rate has dropped significantly



\* The data refer to the stock of loans as at 31 December, except for 2023, where they refer to 31 March.  
 Notes: The figure does not include credit card debt and overdraft facilities. Since 2017, three additional categories have been excluded from the category of loans with variable interest rates, depending on the remaining period of interest rate fixation, i.e. those up to three years, those over three years and shorter than five years and those over five years.  
 Source: CNB.

Figure C.12 Interest rate change is primarily linked to the NRR and partly to the EURIBOR



Notes: Loan stock as at 31 December 2022. The figure does not include credit card debt and overdraft facilities.  
 Source: CNB.

NRR trends primarily depend on the developments in interest rates on deposits with credit institutions that have been decreasing over the past years, which was also reflected in the decline in interest rates on loans linked to the NRR (Figure C.13). The NRR could increase with a time lag relative to the change in monetary conditions, following the increase in interest rates on deposits. In contrast, the EURIBOR is the interest rate currently applied when banks borrow in the European money market, so that an increase in it rapidly led to a strong growth in interest rates on non-housing loans in which the EURIBOR is applied as the reference parameter. However, in housing loans, interest rates linked to the EURIBOR continued to decline due to the

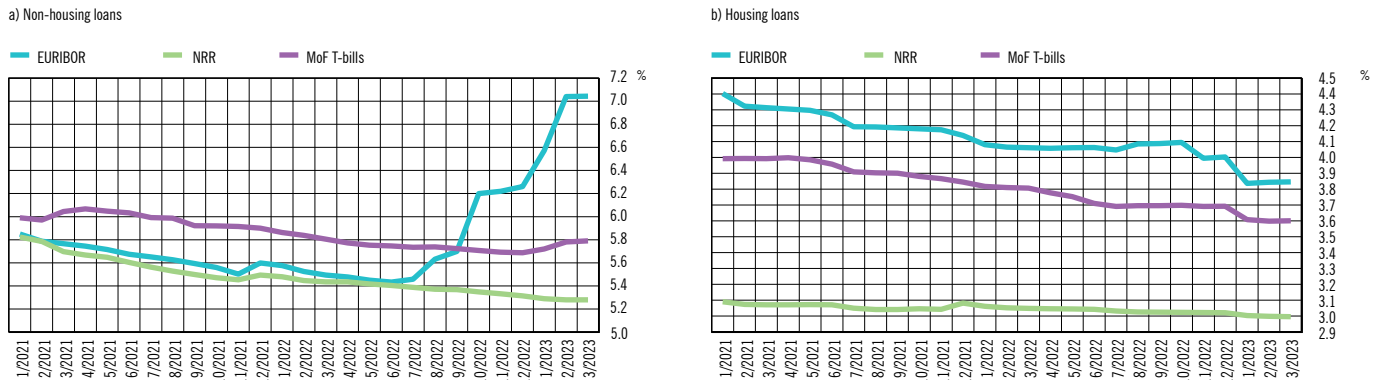
decrease in the legally prescribed maximum interest rate<sup>6</sup>, while the higher ceiling in non-housing loans also enabled a sharper rise in interest rates. By the end of the year, applicable interest rates of banks were either very close to the maximum or had reached it. As at 31 December 2022, the maximum allowed variable interest rate on housing loans with a variable interest rate was 4.05% for euro loans and 4.09% for kuna loans, while in other consumer loans, it was significantly higher and stood at 8.22% for euro loans and 9.11% for kuna loans<sup>7</sup>.

**Sensitivity analysis of an interest rate increase of three percentage points in loans with variable interest rates shows**

6 OG 75/2009, 112/2012, 143/2013, 147/2013, 9/2015, 78/2015, 102/2015, 52/2016 and 128/2022 and OG 101/2017 and 128/2022.

7 The maximum allowed interest rate on housing loans with a variable interest rate may not be higher than the average weighted interest rate on the stock of housing loans in a particular currency (separately for HRK, EUR and CHF), increased by one third. In contrast, the interest rate on non-housing loans with a variable interest rate may not be higher than the average weighted interest rate on the stock of consumer loans in a particular currency (separately for HRK, EUR and CHF), increased by one half. For the cap applicable as of 1 January, the average weighted interest rates are calculated based on the data available on 31 October of the previous year, while for the cap applicable as of 1 July they are calculated based on the data available on 30 April of the current year.

Figure C.13 Legal cap on interest rates prevents interest rate increase in housing loans linked to the EURIBOR



Notes: The figure shows average interest rates on loans with variable interest rates which, in addition to the nominal interest rate, also include default interest rate on loans in relation to which default interest rate is calculated. The figure does not include credit card debt and overdraft facilities.  
Source: CNB.

that the largest burden would fall on debtors with non-housing loans. For each loan, the assumed interest rate increase is possible only up to the level of the legal cap on the maximum interest rate applied to the relevant group of loans. Observed by the classes of a repayment cost increase (Table C.2), in about 18% of non-housing loans and 13% of housing loans, the increase in repayment costs would exceed 10%, with a very small share accounted for by loans with an increase above 20%: 1% for non-housing loans and 2% for housing loans. Furthermore, since the legal interest rate ceiling is significantly higher than

the average interest rate on non-housing loans, in the event of an increase in interest rates of three percentage points, debtors with such loans would be exposed to a higher repayment cost increase than the users of housing loans, where as much as 25% of users would not even be exposed to any repayment cost increase.

**The difference in the possible repayment cost increase is particularly pronounced if loans whose interest rate change is linked to the EURIBOR are observed (Table C.3).** Specifi-

Table C.2 Distribution of loans according to the class of repayment cost growth in the event of an interest rate increase of three percentage points

Amount of the relative increase in the repayment cost for the increase in i.r. of 3 p.p.	Amount of principal (million EUR)	Number of loan accounts	Share of the principal	Share of the number of loan accounts	Average annual repayment (EUR)	Average annual increase (EUR)	Average loan principal amount (EUR)	Average amount of the remaining loan maturity in years
<b>Non-housing loans</b>	<b>2,132</b>	<b>230,996</b>			<b>2,195</b>	<b>141</b>	<b>9,229</b>	<b>7.5</b>
1. No increase	20	6,233	1%	3%	924	-	3,221	5.2
2. <= 5%	503	121,363	24%	53%	1,964	45	4,143	3.5
3. ]5%; 10%]	698	61,542	33%	27%	2,362	171	11,340	6.0
4. ]10%; 20%]	748	39,629	35%	17%	2,646	334	18,872	9.1
5. > 20%	163	2,229	8%	1%	5,745	1,448	73,197	18.4
<b>Housing loans</b>	<b>3,224</b>	<b>95,065</b>			<b>3,892</b>	<b>163</b>	<b>33,915</b>	<b>15.1</b>
1. No increase	588	23,796	18%	25%	3,723	-	24,724	12.2
2. <= 5%	1,096	43,333	34%	46%	3,817	80	25,287	11.5
3. ]5%; 10%]	784	16,234	24%	17%	4,124	294	48,309	16.4
4. ]10%; 20%]	648	10,089	20%	11%	4,260	578	64,189	20.8
5. > 20%	108	1,613	3%	2%	3,742	896	67,072	22.6
<b>Sum/average</b>	<b>5,356</b>	<b>326,061</b>			<b>2,690</b>	<b>147</b>	<b>16,426</b>	<b>12.0</b>

Notes: Interest rates are assumed to grow up to the legal interest rate ceiling applicable as at 31 December 2022. The calculation uses individual data on loans with a variable interest rate or interest rate that will become variable in 2023. Loans classified into risk category C and loans without principal have been excluded. The calculation also excluded credit card debt and overdrafts. Average remaining maturity has been weighted by the amount of the principal.  
Source: CNB.

Table C.3 Distribution of loans whose interest rate change is linked to the EURIBOR according to the class of repayment cost growth in the event of an interest rate increase of three percentage points

Amount of the relative increase in the repayment cost for the increase in i.r. of 3 p.p.	Amount of principal (million EUR)	Number of loan accounts	Share of the principal	Share of the number of loan accounts	Average annual repayment (EUR)	Average annual increase (EUR)	Average loan principal amount (EUR)	Average amount of the remaining loan maturity in years
<b>Non-housing loans</b>	<b>328</b>	<b>26,497</b>			<b>2,814</b>	<b>110</b>	<b>12,386</b>	<b>8.3</b>
1. No increase	19	2,429	6%	9%	2,203	-	7,640	5.3
2. <= 5%	141	16,478	43%	62%	2,802	35	8,551	5.9
3. ]5%; 10%]	99	5,567	30%	21%	2,754	199	17,761	9.0
4. ]10%; 20%]	51	1,804	16%	7%	3,426	481	28,434	11.2
5. > 20%	19	219	6%	1%	6,980	1,668	84,697	17.4
<b>Housing loans</b>	<b>747</b>	<b>25,565</b>			<b>3,978</b>	<b>51</b>	<b>29,219</b>	<b>13.5</b>
1. No increase	459	18,175	62%	71%	3,825	-	25,281	12.3
2. <= 5%	148	5,016	20%	20%	4,286	51	29,470	12.5
3. ]5%; 10%]	74	1,327	10%	5%	4,775	337	55,962	16.6
4. ]10%; 20%]	62	979	8%	4%	4,212	558	62,916	20.3
5. > 20%	4	68	1%	0%	3,420	750	56,425	20.4
<b>Sum/average</b>	<b>1,075</b>	<b>52,062</b>			<b>3,386</b>	<b>81</b>	<b>20,652</b>	<b>11.9</b>

Notes: Interest rates are assumed to grow up to the legal interest rate ceiling applicable as at 31 December 2022. The calculation uses individual data on loans with a variable interest rate or interest rate that will become variable in 2023 and the interest rate change of which is linked to the EURIBOR. Loans classified into risk category C and loans without principal have been excluded. The calculation also excluded credit card debt and overdrafts. Average remaining maturity has been weighted by the amount of the principal.

Source: CNB.

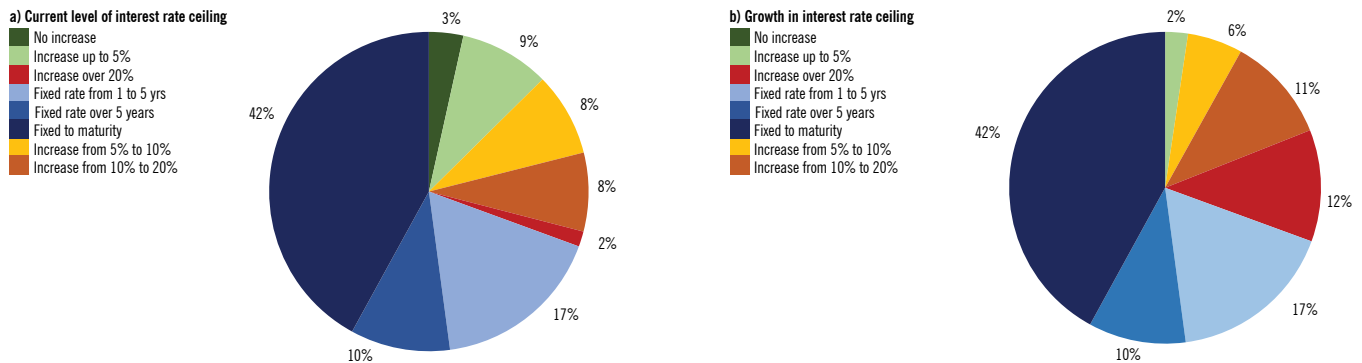
Figure C.14 Debtors with loans having longer maturities and loans with low initial interest rate levels are more exposed to the risk of repayment cost increase



Notes: The figure shows the average relative repayment cost according to reference parameters (columns) and the classes of the initial interest rate level (rows) in the case of an increase in the interest rate of three percentage points, relative to the situation at the end of 2022. Interest rates are assumed to grow up to the legal interest rate ceiling applicable as at 31 December 2022. The calculation includes loans with a variable interest rate or interest rate that will become variable in 2023. Loans classified into risk category C and loans without principal have been excluded. The calculation also excluded credit card debt and overdrafts.

Source: CNB.

Figure C.15 Loans under the risk of high repayment cost increase account for a smaller share of total household loans, but their share increases several times in the case of ceiling increase



Notes: Shares of the principal are shown according to the simulated repayment cost increase in the case of interest rate growth of 3 percentage points with the current interest rate ceiling level on loans with variable rates and in the case of ceiling increase that would enable interest rate increase by 3 percentage points. The figure does not include credit card debt and overdraft facilities. Source: CNB.

cally, housing loans linked to the EURIBOR are mostly repaid by applying the maximum interest rate allowed, so that in as much as 71% of such loans the interest rate cannot increase currently as it has already reached the legally prescribed interest rate ceiling. In non-housing loans where interest rate change is linked to the EURIBOR, the possible repayment cost increase is higher than in housing loans. However, the distribution of non-housing loans linked to the EURIBOR according to class of repayment cost increase is still lower than the distribution of all non-housing loans with a variable interest rate, with a somewhat higher share of the number of loan accounts in the class of increase up to 5% and a somewhat lower share of loan accounts in the class of increase between 10% and 20%.

**The exposure of debtors to the risk of interest rate change depends on the remaining maturity and the initial interest rate level**, with the latter affecting the exposure via two channels. On the one hand, where the initial interest rate level is low, the set interest rate increase (of three percentage points in the case at hand) leads to a higher relative growth in the repayment cost than in the case of a high initial interest rate level. Furthermore, a low initial interest rate level also implies a larger difference between the interest rate ceiling and the initial interest rate, which leaves more room for a repayment cost increase. Figure C.14 shows that those debtors holding loans with longer maturities and loans with interest rates significantly lower than the legally prescribed ceiling are more exposed to the risk of exposed to the risk of repayment cost increase.

**The analysis of the sensitivity of repayment costs to interest rate growth points to a moderate risk of the increase in the repayment cost of household loans**, where for housing loan beneficiaries this risk is currently primarily limited to a proportionally low level of the legally prescribed ceiling of the interest rate on housing loans with variable rates. On the other hand, a very high (> 20%) repayment cost increase is absent in most of the non-housing loans, primarily due to the short maturity and higher initial interest rate levels. However, the interest rate ceiling level itself depends on the movement of average interest

rates on the stock of loans, which could accelerate if interest rates on new loans or deposits increase, which would be reflected in the NRR movement to which most consumer loans at a variable interest rate are linked.

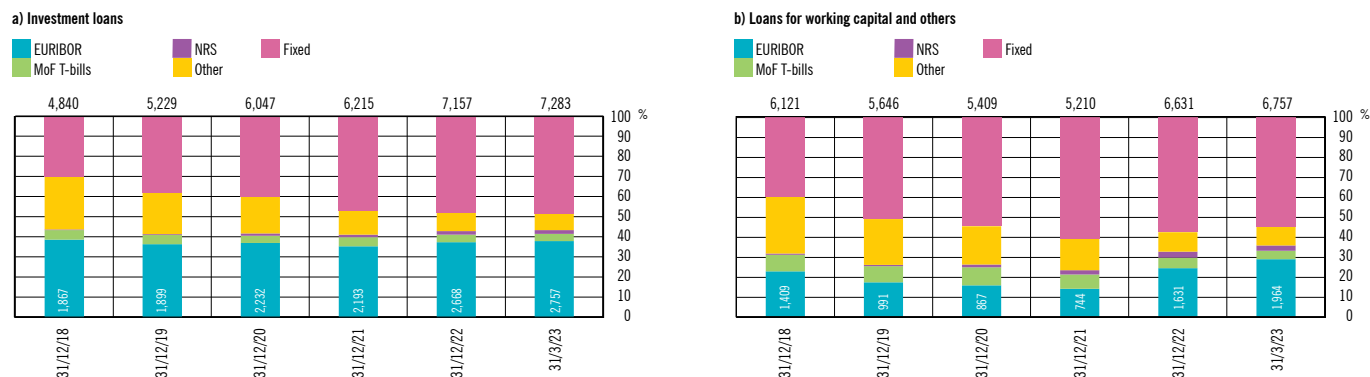
**The significance of the legal restriction on housing loan repayment costs is shown by a simulation in which ceiling effects are excluded (i.e. assumes its higher level).** In its previous analyses (see publications [Financial Stability, No. 23, Box 2](#) and [Macroprudential Diagnostics No. 18, Box 1](#)) the CNB published repayment cost sensitivity analyses of the effects of a considerable increase in the ceiling level, up to the level that would not restrict the interest rate increase. Although loans exposed to the risk of a considerable increase in repayment costs (> 20%) account for a smaller portion of total loans to households, their share increases several times in the event of an increase in the interest rate ceiling up to the level that would allow interest rates to grow by 3 p.p. for all loans. Thus, the share of the loan principal with an increase in the repayment cost by more than 20% would grow from 2% to as high as 12% of all loans to households (Figure C.15). In such a case, the repayment cost for about 30% of the number of housing loans linked to EURIBOR would increase by more than 20%, which is much higher than in the situation that assumes the ceiling will be kept at the current level or close to it. In contrast to housing loans, in non-housing loans sensitivity analysis results without the legal ceiling are mostly unchanged (see Table 1 in [Macroprudential Diagnostics No. 18, Box 1](#)).

## C.4 Interest rate risk in the non-financial corporate sector

**As with the government and household sectors, the sensitivity of non-financial corporations to repayment cost increase depends on the variability of the interest rate and the remaining maturity of the principal.** Although most corporate loans are agreed at a fixed interest rate, a significant portion



Figure C.16 More than a half of loans granted by banks to non-financial corporations are at fixed interest rate



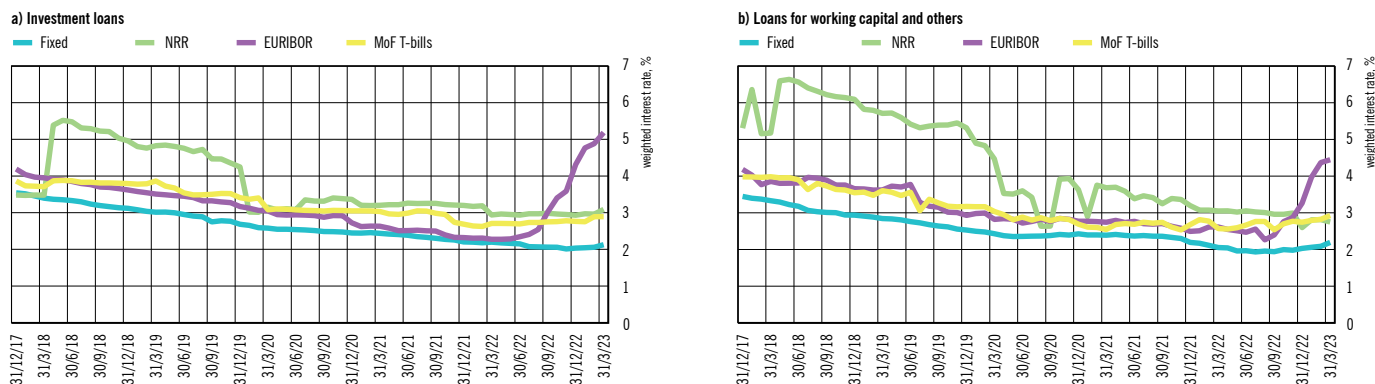
Note: The amounts above the columns represent the stock of aggregate investment loans of domestic credit institutions to the non-financial corporate sector in million EUR, while the amounts at the bottom of the chart represent the stock of EURIBOR-linked loans. Source: CNB.

of corporate loans is granted at a variable interest rate linked to EURIBOR (Figure C.16) accounting for more than 30% of total loans, or almost two thirds of all loans granted at a variable interest rate, while a smaller share is linked to T-bills of the Ministry of Finance, and only a small share to the NRR. In addition, the share of loans with a variable interest rate in total loans started to increase moderately in 2022 under the impact of new loans. With regard to maturity, loans for working capital mostly have the remaining maturity of less than a year as they are granted for the purpose of meeting short-term needs for the financing of operating corporate activities so that the need for their refinancing, recently at increasingly higher interest rates, makes them very sensitive to interest rate volatility due to rising borrowing costs. Investment loans are also sensitive to interest rate changes due to the slightly smaller representativeness of the fixed interest rate because banks try to protect themselves from interest rate risk in the longer period by transferring it to

the debtor. Consequently, corporations are more sensitive to interest rate changes than households or the government.

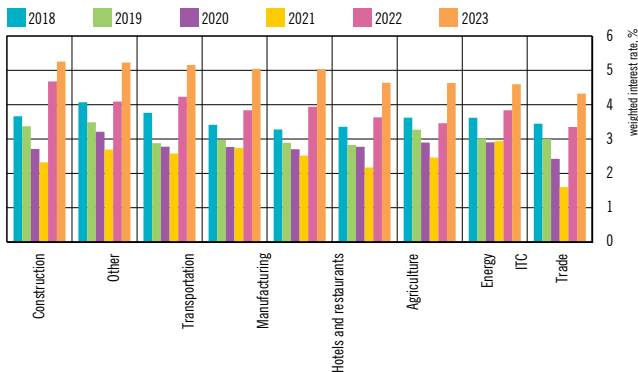
**The price of debt started to grow significantly in mid-2022, however, primarily for loans agreed with the EURIBOR reference parameter.** Weighted interest rates on the stock of loans with a variable interest rate linked to EURIBOR for investment loans rose by more than 3.5 p.p. (until 31 March 2023 from the beginning of 2022), while weighted rates of loans for working capital increased by about 2 p.p. in the same period, which was the consequence of their shorter maturity and a relatively short period of interest rate change (in addition to the current expectations of the continuation of an increase in key interest rates). The highest average interest rate of about 5% on loans linked to EURIBOR is paid by enterprises in construction activity, other service activities and transport, and the most pronounced growth was recorded in trade (Figure C.18). The rise in weight-

Figure C.17 Weighted interest rates on the stock of loans linked to EURIBOR rose considerably in the second half of 2022 and continued to rise in 2023



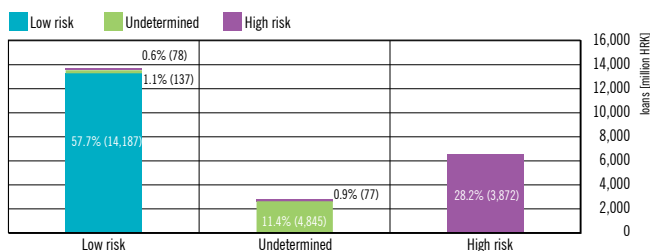
Source: CNB.

Figure C.18 The highest weighted interest rate on loans linked to EURIBOR is paid by construction and other service activities



Source: CNB.

Figure C.20 Increase in the principal risk due to the rise in interest rates

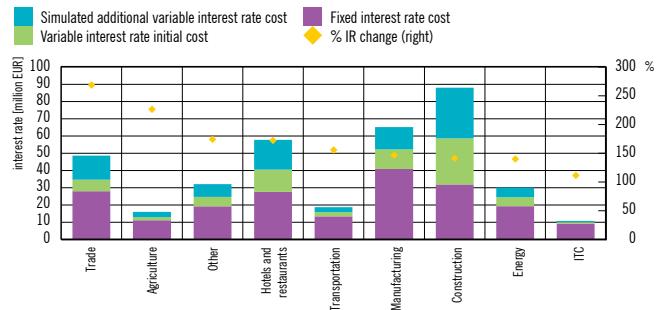


Notes: The percentages represent the share in performing loans granted to enterprises (domestic and external debt) and the numbers in brackets show the number of enterprises included in the simulation. The static balance and the PLA were assumed, i.e. the level of operating revenues was maintained at the level from 2021. Enterprises with a gross profit margin above 2% are low-risk enterprises, those with a gross profit margin below -2% are high-risk enterprises, while for enterprises with a gross profit margin from 2% and above -2% it is impossible to determine to which category they belong because in that distribution area performing and non-performing loans overlap.  
Source: CNB.

ed interest rates implies a proportional increase in interest expenses of corporations upon the expiry of the recalculation period of interest payments, which in the case of enterprises may be quarterly, semi-annual or annual, so that the increase in interest expense in the profit and loss account of corporations may be expected only in the course of 2023. The rates linked to other reference interest rates as well as the weighted fixed interest rate on the stock of loans did not change significantly from the levels from the beginning of 2022 (Figure C.17).

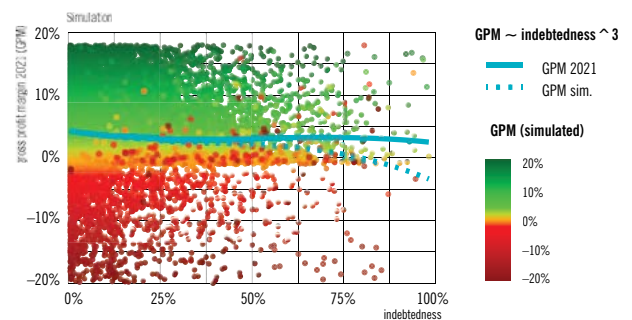
**A fast and relatively strong growth of interest rates may represent a considerable burden on enterprises that have loans granted at a variable interest rate, in particular linked to EURIBOR and potentially jeopardise their ability to repay debt.** In order to assess the sensitivity of enterprises to the rise in interest rates and their ability to absorb the increased interest expense, a sensitivity analysis of the profitability of enterprises according to the scenario simulating the increase in variable interest rates by 3.5 p.p. for loans granted with the EURIBOR

Figure C.19 Additional interest expenses according to the scenario of an increase in EURIBOR by 350 b.p.



Notes: The percentage of changes in interest expenses indicates the percentage amount of the additional interest expense relative to the original expense of the variable portion of interests paid in 2021: simulated additional interest expense/original expense of the variable interest \* 100%. The analysis includes loans with domestic credit institutions and external debt of enterprises (loans and debt securities).  
Source: CNB.

Figure C.21 Decrease in gross profit margin is stronger in more indebted enterprises



Notes: The vertical axis represents the gross profit margin of enterprises from 2021 and the colour scale shows the simulated gross profit margin after an increase in EURIBOR by 3.5 p.p. The lines in the chart indicate the dependence of the gross profit margin on indebtedness (simple polynomial regression of the 3rd row), where the dotted line refers to the simulated gross profit margin and the full line to the original one.  
Source: CNB.

reference rate (of which in 2022 an increase of 3 p.p. was already achieved, and during the first two months of 2023 an additional 0.5 p.p.) (Figure B.3). The increase in the interest expense of enterprises from the expense in 2021 and its impact on the gross profit margin from the same year were simulated. The simulation shows that enterprises in the activity of trade will have the largest relative increase in interest expense (over 250%), accompanied by agriculture. Enterprises in ICT, energy and construction activities will have the smallest relative increase in interest expense (between 110% and 140% increase in the annual interest expenses relative to the level from 2021), among which the latter will have the largest increase in the interest expense in absolute terms (Figure C.18).

**Changes in the interest expense burden are manifested differently in individual business entities depending on their profit margins, which can hedge them in the event of unplanned additional expenses.** For the purposes of this analysis, enterprises are classified in three risk categories depending on the

amount of the gross profit margin<sup>8</sup>, in order to estimate what share of enterprises is capable of withstanding the pressure of the interest expense increase and for which enterprises the increase in interest expense will lead to operations with losses. For some enterprises it is impossible to determine the risk profile based on a single performance indicator (gross profit margin) since the riskiness of enterprises is also determined by other risk factors that are not included in this analysis, so that they are classified in the middle category of an undetermined risk degree. Although the number of such enterprises is larger than the enterprises classified in the high risk category, their debt is on average smaller than that of high-risk enterprises, as well as those classified in the low risk category.

**According to the simulation carried out, an increase in EU-RIBOR by 3.5 p.p. might seriously undermine the profitability of a very small number of enterprises.** However, it is estimated that the riskiness of about 30% of currently performing loans could increase (EUR 6.8bn in loans, about EUR 2.3bn of which with domestic credit institutions) due to the undermined profitability of a portion of low-risk and marginally profitable enterprises (about 1.3% of enterprises with performing loans) as well as the possible materialisation of credit risk of the majority of loans granted to high-risk enterprises (Figure C.20).

**Increase in interest repayment costs might mostly jeopardise highly indebted enterprises,** whose simulated gross profit margin declines more strongly with the amount of debt (Figure C.21, illustrated by yellow and red shaded dots in the upper quadrant) than less indebted enterprises. However, the majority of non-financial corporations are capable of withstanding an increased interest expense burden without a significant undermining of their profitability. Also, due to the high share of loans with a fixed interest rate in the debt of non-financial corporations to domestic credit institutions, the non-financial corporate sector is moderately vulnerable to the shocks of interest rate changes. It should be kept in mind that data from 2021 were used for the simulation, a year still marked by the impact of the pandemic, so that it is possible that the improvement strengthened their resilience to the increase in the cost of financing.

## C.5 Outlook

**Despite the sharp rise in reference interest rates, which increases the loan repayment burden, credit risk materialisation should not be expected to be very significant for the non-financial sector induced by the increase in interest expenses for debtors.** The government part of the non-financial sector are moderately vulnerable to growing interest rate risk. The increased loan repayment burden for the government and non-financial corporations will be partially offset by higher revenues due to price increases. However, in more indebted enterprises, the interest expense might increase considerably, profitability might fall and the riskiness of placements of financial institutions might potentially increase. Debtors' interest rate risk hedging instruments include the extension of interest rate fixation, the refinancing of liabilities in addition to interest rate fixation or, depending on the possibilities of access, the hedging of liabilities by some of the interest-bearing instruments that would partially or fully annul the growth in interest expenses generated by interest income.

**The several-year long downward trend seen in the share of loans with variable interest rates strengthened the overall resilience of households to interest rate risk.** Housing loan beneficiaries are also protected to a considerable extent by the legally prescribed ceiling of the interest rate on housing loans with variable rates, while in non-housing loans the rise in the repayment cost is limited due to the relatively short maturity of those loans, as compared with housing loans, and a higher initial interest rate level that reduces the relative increase in the repayment cost. However, the effect of the rise in interest rates might be felt by debtors holding loans with a relatively long maturity and those with loans at interest rates much lower than the legal ceiling, whose ability to repay their loans regularly is reduced due to the decline in real income.

<sup>8</sup> Gross profit margin is defined by the equation

$$PM = \frac{\text{Total revenue} - \text{Total expenditure}}{\text{Total revenue}}$$

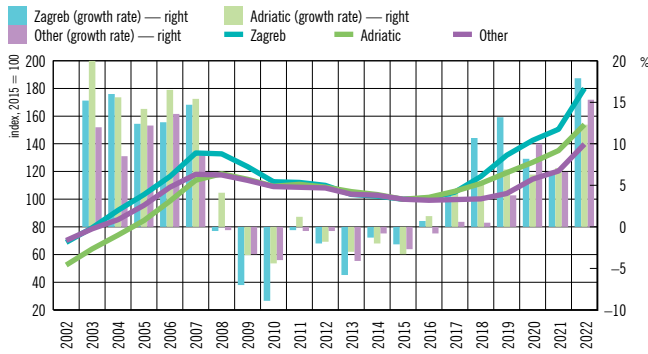
# D Risks in the real estate market

The increase in the prices of residential real estate accelerated strongly in 2022, putting Croatia close to the top of EU member states according to the residential real estate price increase. In addition to domestic demand, prices were also affected by strong demand by non-residents as well as by the seventh round of the government housing loan subsidy programme. Despite the sharp increase in the prices in the real estate market, the number of purchase and sale transactions began to fall on an annual level and the intensity of the fall itself was much more amplified at the end of the year. Although at present the asking prices of real estate continued to rise in early 2023, further dynamics of the real estate market will depend on the spillover from economic developments in the euro area and the volume of the new round of subsidies, which will push prices upwards. On the other hand, an increase in interest rates on new housing loans might have a negative impact on the rise in the real estate prices.

## D.1 Residential real estate market

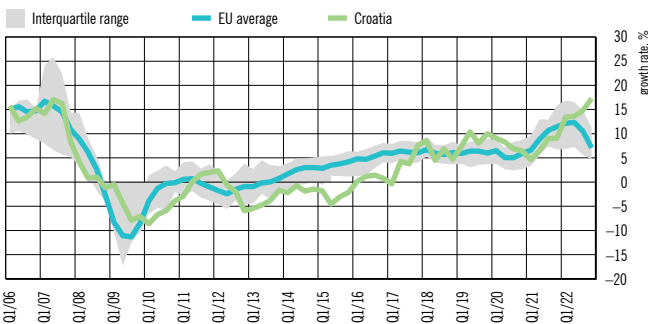
**The increase in the prices of residential real estate accelerated in 2022, as a result of which Croatia is close to the top among the EU member states in terms of the increase in residential real estate prices.** The annual rate of increase in residential real estate prices was 14.8%, pointing to a considerable acceleration from the 7.3% growth seen in 2021. Growth is the strongest in the City of Zagreb, followed by the Adriatic

Figure D.1 Growth of residential real estate prices in Croatia accelerated strongly



Note: For details on the construction of the nominal index, see Kunovac and Kotarac (2019): Residential Property Prices in Croatia.  
Source: CBS.

Figure D.2 Croatia is among the top EU member states in terms of the increase in residential real estate prices



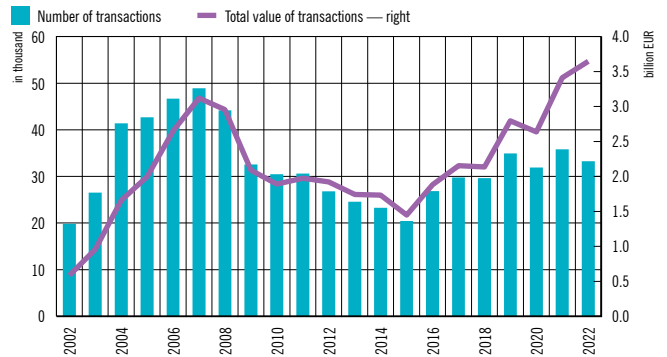
Note: The interquartile range in the figure shows the upper and the lower quartile of the distribution of the annual rates of change in the real state price changes in the EU in each period.  
Source: Eurostat.

region and the rest of Croatia (Figure D.1). In 2022, real estate prices grew stronger than in Croatia in only four EU member states (Estonia, Lithuania, Czech Republic and Hungary) and in the last quarter the intensity of Croatia's divergence from the EU average strengthened considerably. The increase in residential real estate asking prices also continued in the beginning of 2023<sup>9</sup> and could also be realised in actual prices.

**Despite a sharp increase in residential real estate prices, the number of purchases and sales in the market started to decline.** Thus, in 2022 the number of transactions in the residential real estate market in Croatia fell on an annual level by 7.1%, while the total value of transactions grew by 6.9% in the same period (Figure D.3). The largest fall in the number of transac-

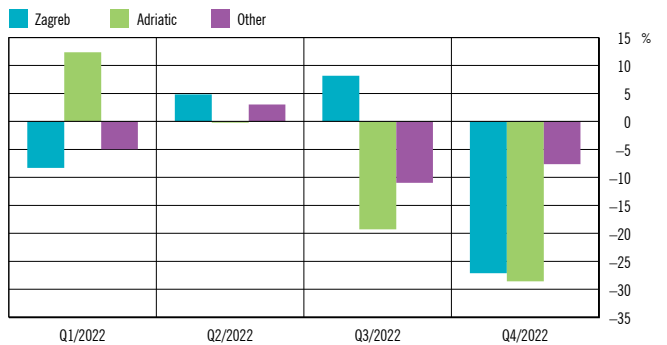
9 The above data on residential real estate asking prices are based on CNB's internal assessments based on data obtained from the website njuškalo.hr.

Figure D.3 Despite the growth in the total value, the stagnation in the number of transactions continued on an annual level



Source: Tax Administration database.

Figure D.4 The second half of 2022 was marked by a strong drop in the number of transactions

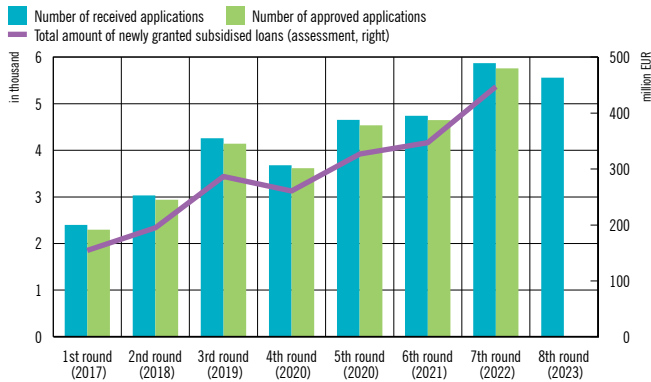


Source: Tax Administration database.

tions on an annual level was in the Adriatic region, while in the City of Zagreb and the rest of Croatia the intensity of the fall was somewhat weaker. In the last quarter of 2022, in the whole territory of Croatia, the decline in the number of transactions was particularly intensive, which might indicate that activities in the real estate market were cooling off (Figure D.4).

**The robust domestic demand was driven by non-credit demand and the government subsidy programme.** It is estimated that about a half of the purchases and sales in the market were not financed by loans, which points to a strong non-credit demand component. Also, the seventh round of the government housing loan subsidy programme, which took place in 2022, continued to support the increase in residential real estate prices (Figure D.5). About 15% of the total number of transactions in 2022 were finalised within this wave of the subsidy programme and market activity increased considerably in the months in which the programme was implemented. Although a somewhat weaker response was noticed in the new round of

Figure D.5 The amount of approved applications in the seventh round of housing loan subsidies is the highest so far



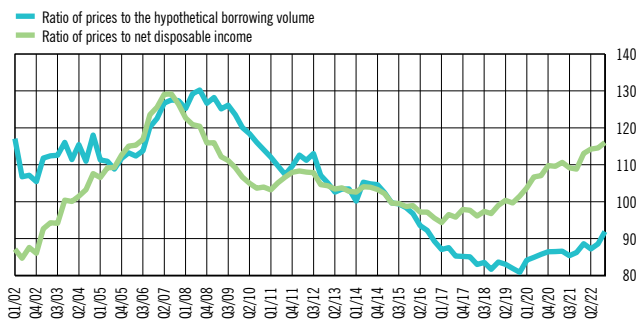
Source: APN and CNB calculations.

subsidies, partly due to the rise in interest rates on new loans, it could continue to contribute to the activities in the real estate market in 2023.

**The share of purchases and sales of residential real estate with non-resident participants is still at a high level compared to the pre-pandemic period.** The share of the number of transactions made up around 11.4% and the share of the value of purchases and sales by non-residents in the total value of purchases and sales made up around 19% in 2022 (Figure D.6). Most non-resident investors come from the euro area and they mostly buy real estate in the Adriatic region. Thus in certain counties on the coast the share of the value of transactions of non-residents reaches around 40%.

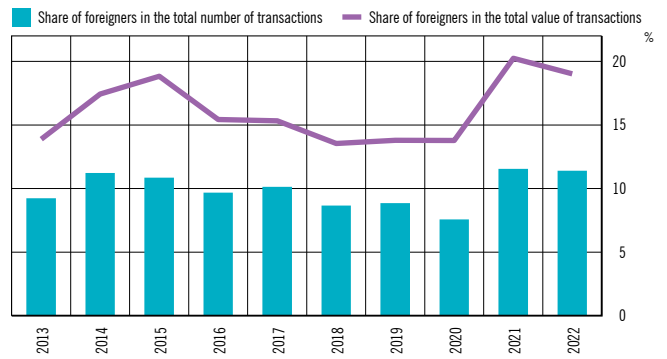
**Residential real estate affordability in Croatia continues to decline under the pressure of the increase in real estate prices**

Figure D.7 Affordability of the purchase of residential real estate is increasingly more difficult for households



Note: Ratio of real estate price to the hypothetical borrowing volume has been calculated in line with Hertich, M. (2019): <https://www.bundesbank.de/en/publications/research/discussion-papers/a-novel-housing-price-misalignment-indicator-for-germany-806946>. Sources: CBS, Eurostat and CNB.

Figure D.6 The share of non-residents in purchases and sales in the residential real estate market is elevated compared to the pre-pandemic levels

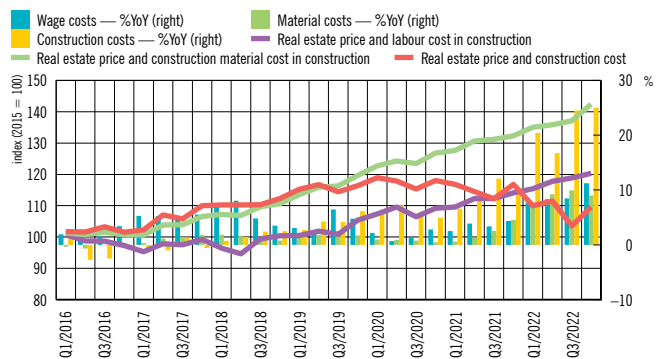


Source: Tax Administration database.

**and the cost of borrowing.** Although nominal income in 2022 grew strongly, the prices of residential real estate increased faster, thus reducing their affordability (Figure D.7). Also, during the long period of easing of financing conditions in the form of falling interest rates, the potential maximum loan amount households can get under the given conditions in the financial market (hypothetical borrowing volume) grew faster than the prices, increasing the housing affordability financed by loans from 2019, after which credit affordability started to decline, governed by the sharp rise in residential real estate prices. The recent increase in interest rates on new loans additionally contributes to the continued decline in the ability to purchase real estate by credit financing.

**The costs of construction of new residential buildings increased sharply throughout 2022, due to the increase in the costs of labour, construction material as well as other costs.**

Figure D.8 Due to the sharp rise in energy prices, construction costs grow faster than residential real estate prices



Note: The construction cost index includes the demolition of existing structures, site cleaning, excavations, assembly of constructions, assembly of roofs and frames, installation and finishing works and contractor's profit margins. Sources: Eurostat, CBS and CNB calculations.

Labour costs rose faster than construction material costs, despite the recent increase in construction material prices in the global market. Also, the ratio of real estate prices to construction cost declined in the first three quarters of 2022, governed by the increase in other costs and constructors' margins (Figure D.8). In the fourth quarter the rise in prices exceeded the increase in construction costs, indicating a further divergence of real estate prices from their fundamentals. Apart from the fact that the increase in the above costs exerts pressure on the prices of new residential buildings, it indirectly also impacts the prices of existing real estate.

**The number of building permits issued in 2022 was the highest since 2008, despite the stagnation of business optimism in construction.** Activity in the construction sector grew in 2022, as seen in the increase in the issued building permits from the previous year, although their number was still lower than in the period before the global financial crisis (Figure D.9). On the other hand, economic uncertainty and rising construction costs tended to produce stagnation in optimism in the construction sector.

**There is still a divergence of prices in the residential real estate market from most of the macroeconomic determinants.** After a long period, the ratio of real estate prices to the cost of construction fell below its long-term trend, while other divergence indicators are still higher than their long-term trends, which points to house price overvaluation in the market (Figure D.10). Thus, despite the strong growth in household nominal income, the ratio of real estate prices and household disposable income remained at a high level above its historical trends. Also, the ratio of real estate prices to rental costs continued to grow strongly, which indicates that the increase in demand due to the economic recovery had a stronger impact on the segment of purchase than rent in the real estate market<sup>10</sup>.

## D.2 Commercial real estate market

**The commercial real estate market recovery slowed down, except in the segment of office space where market activity intensified.** The rate of available office space capacities declined from 2021 levels, while the availability of retail and logistics space remained the same. Despite the currently established work-from-home practice, due to the limited offer of office space, availability at prime locations fell to its lowest level over the last ten years.

**Office space rental prices grew moderately driven by a dynamic demand.** In 2022, the moderate increase in rental prices in the segment of office space was also noticeable in prime location spaces as well as at other locations. Rental prices in

<sup>10</sup> The above data on the prices of rentals for housing were taken over from the official price statistics (COICOP code "041"). CNB's internal assessments point to a higher rise in rental prices.

Figure D.9 Despite the stagnation in optimism in construction, the largest number of building permits was issued since 2008

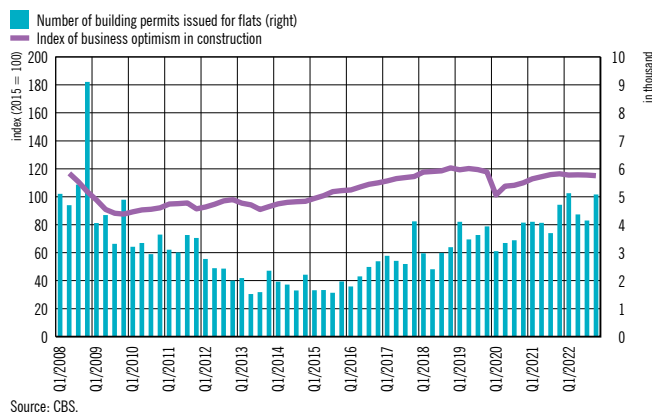
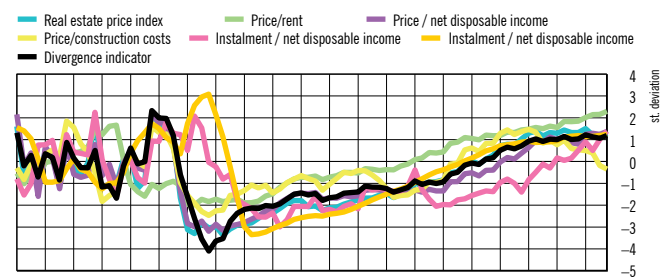
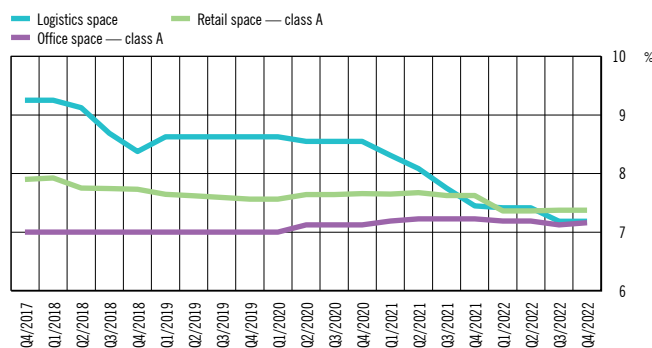


Figure D.10 Residential real estate prices are above the level determined by fundamentals



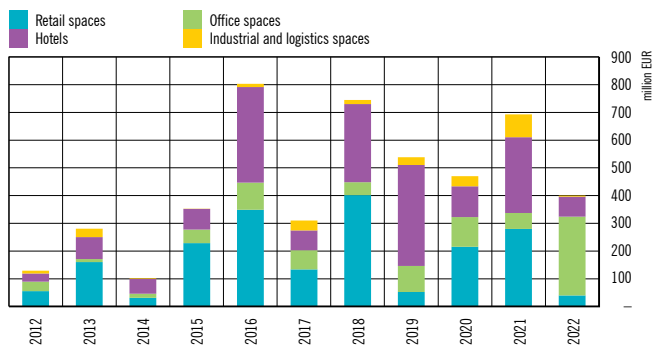
Notes: The data for 2022 are available up to the third quarter. The figure shows standardised cyclical components of various indicators relevant for the developments in real estate prices obtained using a one-sided recursive Hodrick-Prescott filter ( $\lambda = 400\,400,000$ ) included in the composite divergence indicator. The construction work volume index refers to buildings.  
Source: CBS, Tax Administration, Eurostat and CNB.

Figure D.11 Yields in the segment of logistics spaces continued to decline



Notes: Data refer to the City of Zagreb and its surroundings. Yield is defined as the ratio of annual income from rent and the price paid for the real estate.  
Sources: CBRE, Colliers, CW CBS International and Spiller Farmer.

Figure D.12 Decrease in the number of transactions in the commercial real estate market relative to the previous year



Notes: The assessment does not cover total transactions but only investment deals recorded in the market. It also does not include investments in construction.  
Source: Colliers.

the segment of logistics space increased primarily as a result of the increase in demand due to the recent supply chain developments, so that currently their average stands at EUR 5.8/m<sup>2</sup>. Rental prices of prime retail spaces increased very moderately as did the prices of other locations of the same segment.

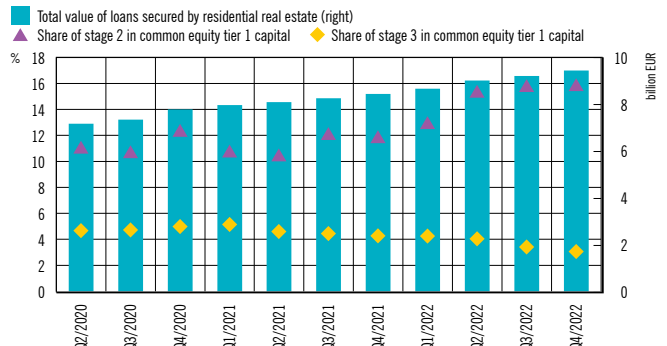
**Yields on investment in the commercial real estate market declined moderately in the segment of logistics and office spaces, while stagnation was noticeable in the segment of retail spaces.** The sharpest decline from the previous year was recorded in the segment of logistics spaces, where in 2022 the average yield stood at 7.3%. On the other hand, in office and retail spaces, the yield of prime locations mostly stagnated, and in 2022 stood at about 7.2% for retail and 7.4% for office spaces (Figure D.11).

**Growth in demand for office space in 2022 resulted in the increase in purchase and sale transactions of that segment, while the total amount of transactions in the commercial real estate market declined.** According to the available assessments of one of the private agencies, the total commercial real estate turnover in 2022 fell by about 42% from the previous year. At the same time demand for office space grew strongly, increasing several times in 2022, accounting for more than 70% of the total volume of transactions (Figure D.12). It is worth noting that due to the very small commercial real estate market in Croatia, the decline in the volume of purchase and sale transactions of other market segments does not necessarily point to a fall in demand but to the limited offer of the mentioned market segments.

### D.3 Exposures of credit institutions to the real estate market

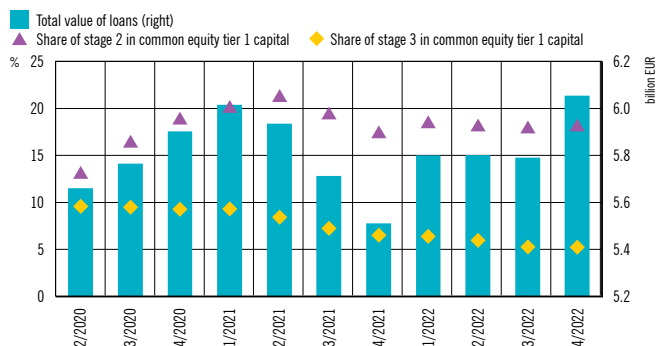
**The limited exposure of banks to the real estate market considerably contributes to preserving financial stability in Croatia.** Although the total values of loans secured by residen-

Figure D.13 Limited exposure of banks to changes in the residential real estate market



Note: Loans in stage 2 refer to performing loans witnessing a considerable increase in credit risk and loans in stage 3 refer to non-performing loans witnessing a loss.  
Source: CNB.

Figure D.14 Limited exposure of banks to changes in the commercial real estate market



Note: Loans in stage 2 refer to performing loans witnessing a considerable increase in credit risk and loans in stage 3 refer to non-performing loans witnessing a loss.  
Source: CNB.

tial real estate and loans secured by commercial real estate increased by around 10% in 2022, those loans still do not prevail in credit institutions' balance sheets. The share of loans secured by residential real estate of stage 2 in banks' common equity tier 1 capital, i.e. the loans in which credit risk increased considerably, did not change significantly from the same period of the previous year. On the other hand, the share of non-performing loans (stage 3) decreased moderately (Figure D.13). In loans secured by commercial real estate, the share of stage 2 increased only slightly, while the share of stage 3 did not change significantly (Figure D.14).

### D.4 Outlook

**The continuation of divergence in real estate prices from own fundamentals might lead to a deceleration in the real estate market.** Although the deceleration in market activity is noticeable in the number of transactions, the new round of housing



loan subsidies this year and a strong demand might continue to support a further growth in the prices of residential real estate. On the other hand, any spillover of the weaker non-resident demand due to negative economic developments in their respective countries presents the possibility of cooling of foreign demand in the real estate market in Croatia. It is worth noting that the continuation of a strong divergence in the movement of real estate prices from their own macroeconomic determinants increases the likelihood of risk materialisation in the form of price correction as well as the intensity of the correction itself.

**The spillover effects of the gradual monetary policy tightening in the euro area to the domestic market make new borrowing more expensive and could also increase the existing debt repayment burden.** The growth in interest rates could reduce the creditworthiness of market participants intending to purchase real estate. Such a situation could adversely impact

market liquidity and in the event of a significant materialisation of the risk of housing loans portfolio deterioration it would have a considerable impact on real estate value. In addition, the period of subsidy expired in the early months of this year for some users, increasing repayment costs and, consequently, their vulnerability. Housing loans are relatively well-hedged against excessive growth in the repayment cost within a short period, primarily due to legal restrictions (see Chapter 1.C).

**A possible slowdown in the real estate market would result in a moderate materialisation of risks for the financial stability of the Republic of Croatia.** A slowdown in real estate market activities in addition to an increase in interest rates and higher costs of living in the forthcoming period could result in the growth of non-performing loans, which would have a negative impact on credit institutions' profitability. However, the current profitability and capitalisation rates are rather high, which makes credit institutions resilient to the forementioned shocks.

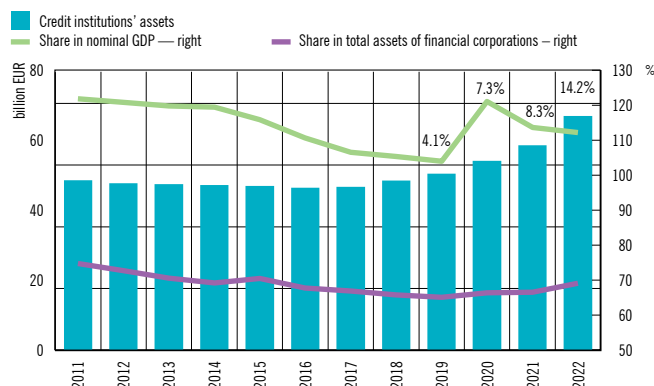
# E Risks to bank operations

Systemic risks for credit institutions stem from operations in an environment of high inflation and low economic growth. Growth in deposits and liquidity strengthened banks' lending potential. Measures aimed at assisting the economy reduced banks' credit risk within a short period, but their expiry, accompanied by the increase in interest rates, could lead to an increase, which is already shown by the growth in the share of stage 2 loans. The profitability of credit institutions remained at a high level, despite the moderate decrease in 2022 and with prospects for growth in an environment of rising interest rates, as long as credit risk remains low.

## E.1 Bank asset movement

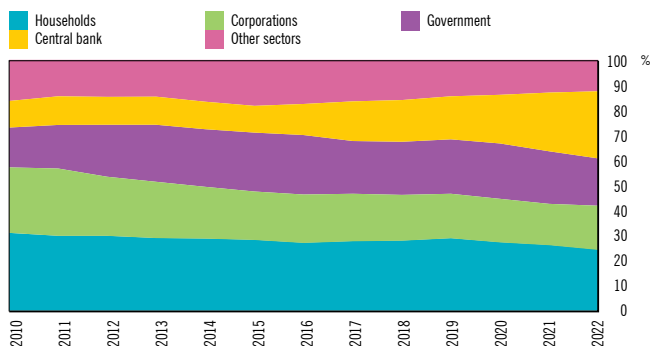
**A strong inflow of deposits had an impact on the record increase in credit institutions' assets, which in 2022 increased by 14.2%** (Figure E.1). Despite the growth in the banking sector's assets, its share in GDP continued to decline. The largest contribution to the growth in assets came from the most liquid types of assets, where assets with the central bank increased almost by a third and with the share of 26% became the largest banks' asset component at the end of 2022 (Figure E.2). At the same time, banks also strongly increased their exposure to corporations and households (see Chapter I.B), while exposure to the government grew moderately. The growth in exposure to the private non-financial sector in the previous year was followed by a slightly moderate increase in interest rates. In the Bank lending survey from the first quarter of 2023, banks announced a further tightening of lending conditions, which might slow down the lending dynamics in the forthcoming period.

Figure E.1 Credit institutions' assets in 2022 increased by 14.2%



Source: CNB.

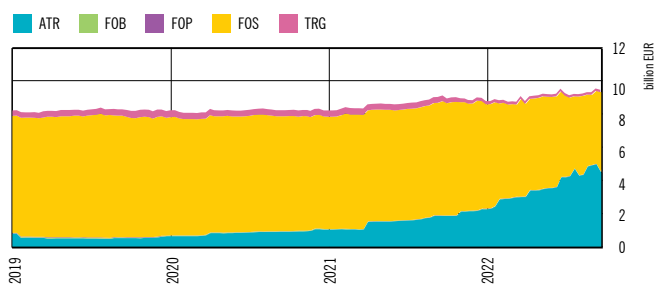
Figure E.2 The central bank's share in total assets continued to increase



Source: CNB.

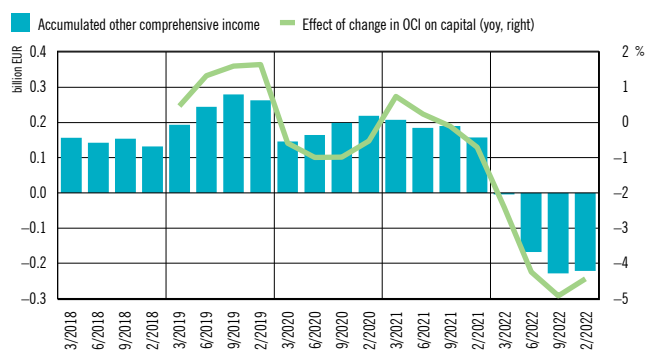
In the part of financial assets consisting of debt securities, the share of the instruments measured at amortised cost increased and reached 6% of the total assets at the end of 2022 (Figure E.3). The increase in interest rates and the accompanying decrease in the prices of debt securities prompted banks to value new exposures to a larger extent through the portfolio at amortised cost (ATR). In that portfolio, securities are held to maturity without recognising unrealised gains/losses, and any gain/loss is only recorded at the time of sale (that potentially may occur even before maturity, if necessary). On the other hand, in the portfolio carried at fair value through other comprehensive income (FOS), the repricing of securities is recognised continually and has a direct impact on banks' capital through unrealised gains/losses (Figure E.4, see Chapter II, Figure II.5). Apart from the increase in new investments in the ATR portfolio, individual banks also decided to change the business models for financial instrument management, so

Figure E.3 Share of debt securities measured at amortised cost increased significantly in the course of 2022



Note: ATR is the portfolio of financial instruments measured at amortised cost, FOB is the portfolio of financial assets mandatorily at fair value through profit or loss, FOP is the portfolio of financial instruments measured at fair value through profit or loss, OCI is the portfolio of financial assets at fair value through other comprehensive income, TRG is the portfolio of financial instruments held for trading.  
Source: CNB.

Figure E.4 Accumulated comprehensive income had an impact on the decrease in bank capital



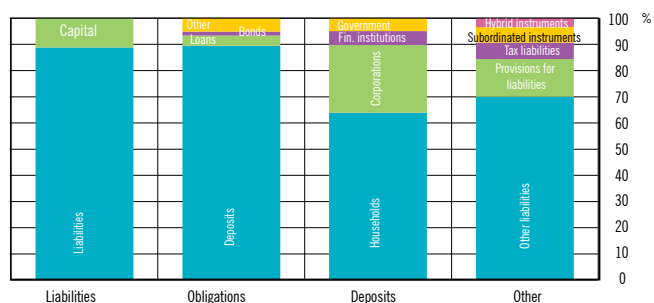
Source: CNB.

that they also transferred some instruments from FOS to this portfolio.

## E.2 Funding risk

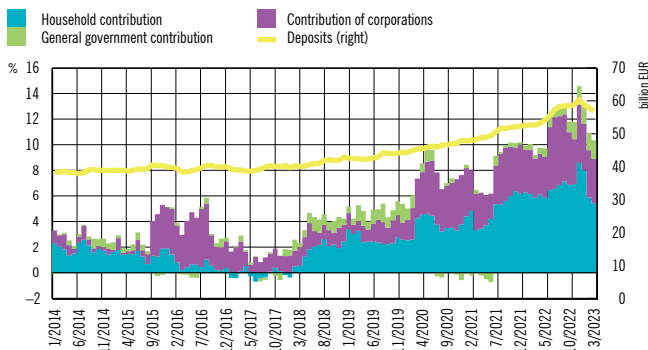
In funding sources credit institutions still mostly rely on deposits, which in 2022 increased by 15.3% (Figure E.5). The strong growth was largely brought about by household deposit inflows (mostly transactional) in the amount of EUR 4.5bn, spurred by the decline in cash in circulation before the conversion of the kuna to the euro at the end of the year. Corporate deposits attributed to improved business performance and growth in lending also increased, albeit at a weaker intensity (EUR 2.4bn, Figure E.6). The smaller portion of liabilities referred to loans received and bonds issued, which also grew in 2022.

Figure E.5 Banking system liabilities rely on private non-financial sector deposits



Source: CNB.

Figure E.6 The strong growth in total deposits in 2022 was under the impact of increasing household deposits



Source: CNB.

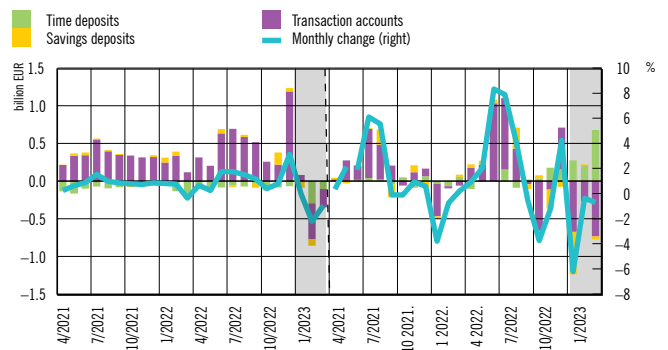
In early 2023, when the process of the introduction of the euro ended, deposits dropped to the levels from mid-2022 (Figure E.7). The outflow of deposits is mostly noticeable in households, which, apart from the withdrawal of funds deposited at the end of the year to facilitate the conversion, can also be attributed to the “national bond” purchase programme<sup>11</sup>, which, because the return they offered was greater than that on interest rates on deposits, attracted almost EUR 1.4bn from retail investors in the first round of subscription. A slightly more moderate decrease in deposits is noticeable in corporations. Some corporate transaction deposits were converted to short-term time deposits that had become more attractive due to the increase in interest rates (Figure E.9).

Considerable liquidity surplus, additionally strengthened by the adjustment of monetary policy instruments as a result of Croatia’s joining the euro area, postponed a significant increase in interest rates on deposits (Figure E.8). The reduction in the reserve requirement to 1% and the abolishing of the minimum required amount of foreign currency claims to banks released about EUR 10bn of additional liquidity, which reduced the pressure on the cost of the source of financing so that Croatia, at the end of 2022, was one of the euro area countries with the lowest interest rates on time deposits. However, it is expected that the spillover of the rise in key interest rates on deposits with Croatian banks could intensify. In March 2023, interest rates on time deposits to the private sector increased by 1.3 p.p. in households and 1.9 p.p. in corporations, when compared to the same month of the previous year. Higher interest rates make savings deposits more attractive, which could boost the inflow of deposits with longer maturity, as well as put pressure on the costs of financing of credit institutions.

Alternative sources of financing also grew significantly, although they only account for a smaller share of banks’ li-

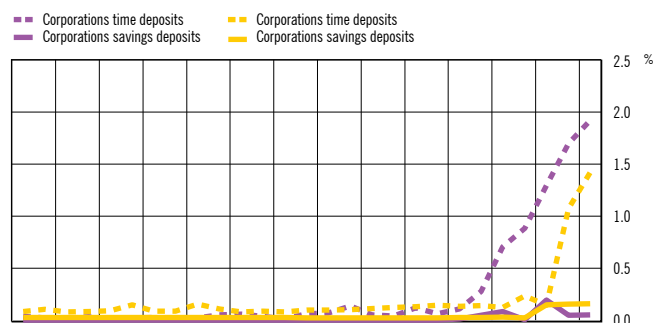
11 See: <https://mfin.gov.hr/vijesti/inauguralno-izdanje-obveznica-republike-hrvatske-dospijeca-2025-godine-u-nominalnom-iznosu-od-eur-1-85-mlrd-namijenjenih-fizickim-osobama-i-institucionalnim-ulagateljima/3426>.

Figure E.7 Moderate outflow of private sector deposits is noticeable in early 2023



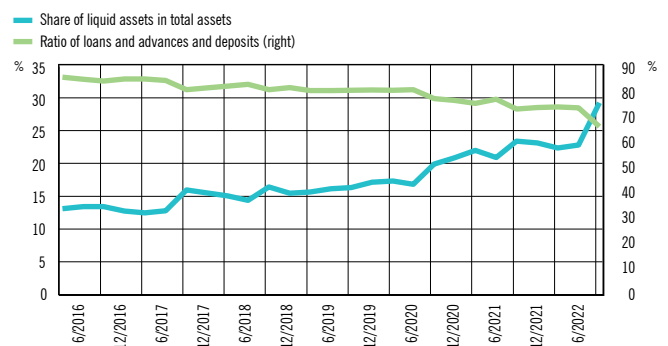
Note: The shaded area indicates the period in which the euro serves as the means of payment. Source: CNB.

Figure E.8 At the start of the year interest rates on time deposits grew



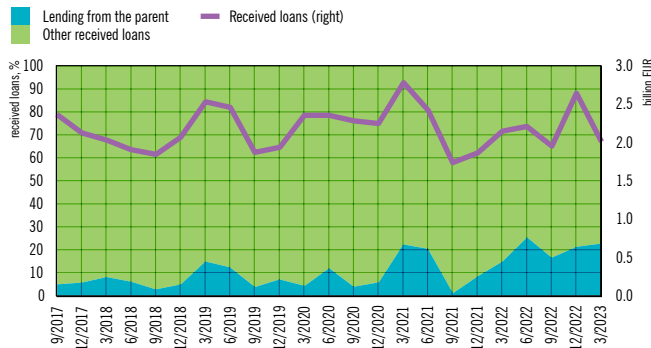
Note: Interest rates refer to deposits in euro. Source: CNB.

Figure E.9 Harmonisation of monetary policy instruments increased the share of liquid assets



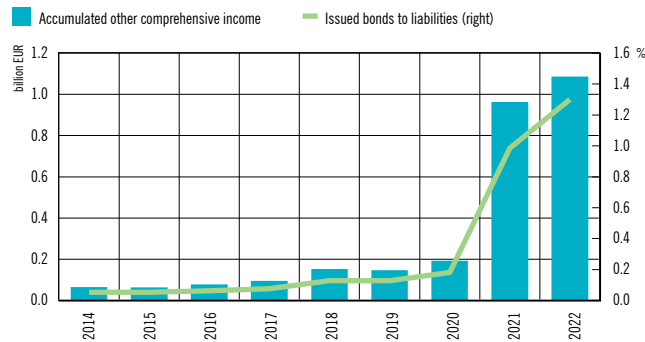
Source: CNB.

Figure E.10 Parent banks increased their share in received loans of Croatian banks



Source: CNB.

Figure E.11 Due to the maintenance of the requirements from the resolution regulatory framework, banks issued debt securities



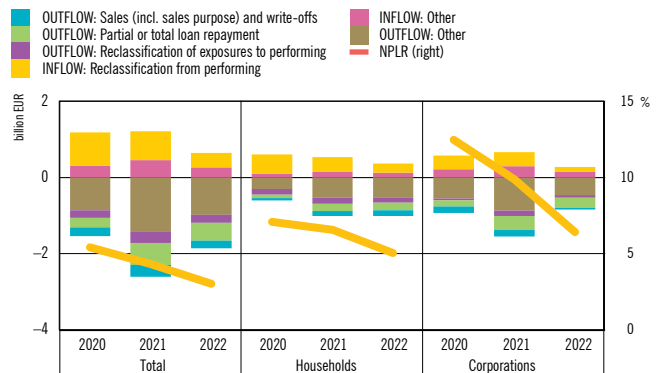
Source: CNB.

**abilities.** Bank loans received thus increased by EUR 780m, the main contribution coming from their parent banks (20%) (Figure E.10). In 2022, banks issued debt instruments in the amount of EUR 235m for the purpose of meeting resolution capital requirements (Figure E.11). The amount of issued debt instruments was a third higher than in the previous year, and an additional increase in the mentioned source of financing is expected because of the completion of the transitional period of the adoption of resolution requirements in which from 1 January 2024, the final MREL requirements will be obligatory (see Box 7 Assessment of the macroprudential policy stance by applying the growth-at-risk approach).

## E.3 Credit risk

**The trend of increasing loan quality continued.** The reduction in the non-performing loan ratio in total loans, in addition to the growth of new lending was also attributable to the reduction

Figure E.12 Repayments significantly contributed to the reduction in non-performing loans



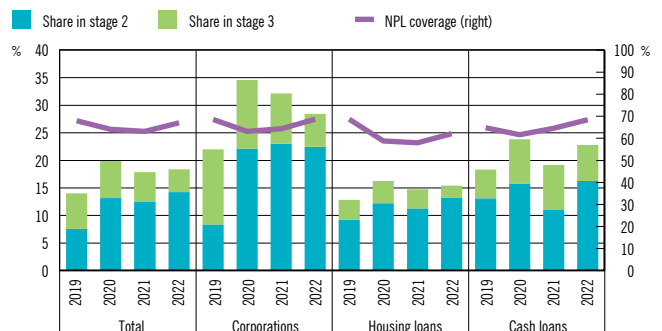
Source: CNB.

Figure E.13 Worsening of credit risk is mostly contributed to by entries in stage 2



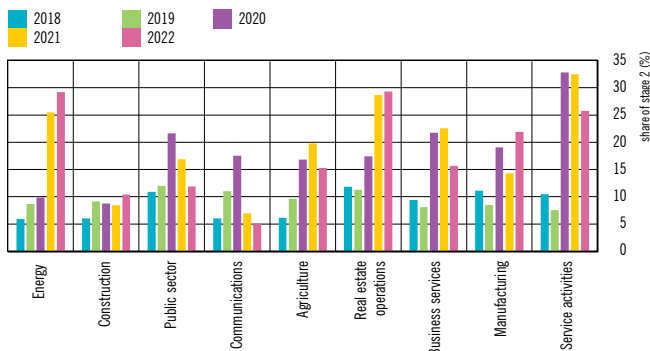
Note: Loans in stage 1 (F1) relate to performing loans, loans in stage 2 (F2) relate to performing loans witnessing a considerable increase in credit risk and loans in stage 3 relate to non-performing loans witnessing a loss.  
Source: CNB.

Figure E.14 Increase in the share of stage 2 is mostly the result of the deterioration of the quality of loans to households



Note: Loans in stage 2 (F2) relate to performing loans witnessing a considerable increase in credit risk and loans in stage 3 (F3) relate to non-performing loans witnessing a loss.  
Source: CNB.

Figure E.15 The largest worsening in the share of corporate loans in stage 2 in energy activity and manufacturing



Note: Loans in stage 2 (F2) relate to performing loans witnessing a considerable increase in credit risk. Source: CNB.

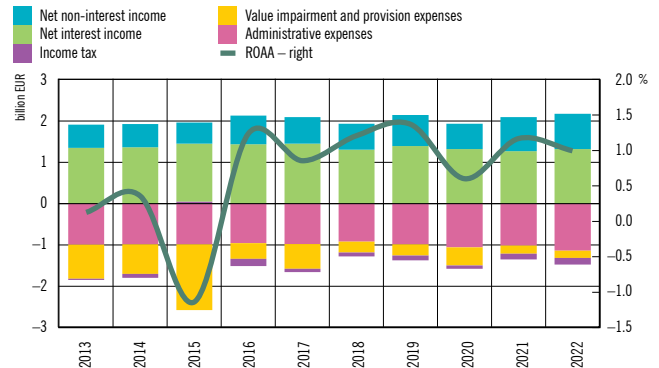
in non-performing loans as a result of early or complete loan repayments as well as the reclassification to performing loans (Figure E.12). At the end of 2022, the total NPLR stood at 3%. The decrease in the amount of non-performing loans was more pronounced in the portfolio of non-financial corporations than in households, although by the year-end this trend reversed because of the moderate growth in non-performing loans in energy-intensive activities.

**The possible risk of deterioration in loan quality is indicated by the increase in the share of stage 2 loans.** Following a temporary recovery in the previous year, the share of loans in addition to a significant worsening of credit risk from the initial recognition (loans in stage 2) increased moderately at the end of 2022 and was higher than before the beginning of the pandemic (by 6.7 percentage points): In addition to a significant transfer of individual exposures from stage 1 (Figure E.13), the increase in stage 2 loans was to a lesser extent also due to the reclassification of loans from stage 3, which suggests an improvement of loan quality. The growth of loans in stage 2 was mostly the consequence of the increase in credit risk of households in both cash and housing loans (Figure E.14). In non-financial corporations, the share of total loans in stage 2 decreased slightly due to increased lending (dilution effect), although in individual activities (manufacturing and energy supply activity) it increased (Figure E.15). The deterioration in quality can also be linked to the sensitivity of performance of enterprises, on energy prices and other input costs in the previous year, so that with the continuation of the geopolitical crisis and elevated inflation, as well as in addition to the worsening of the economic outlook, the quality of loans to the private sector could continue to deteriorate as well as prompt an increase in the share of loans in stage 3.

## E.4 Profitability

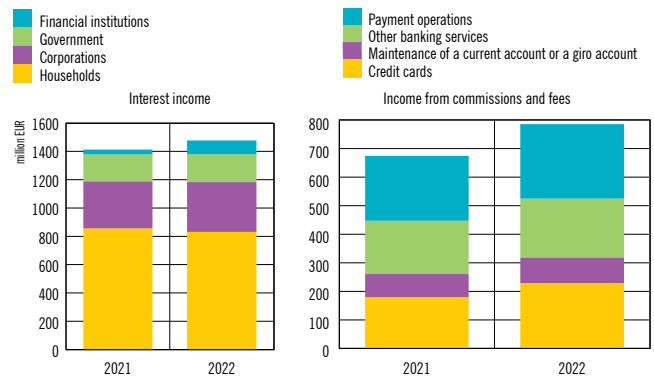
In 2022, the profitability of Croatian banks, even though slightly reduced, remained at a high level with a return on av-

Figure E.16 Higher administrative expenses had an impact on the decrease in gross profit



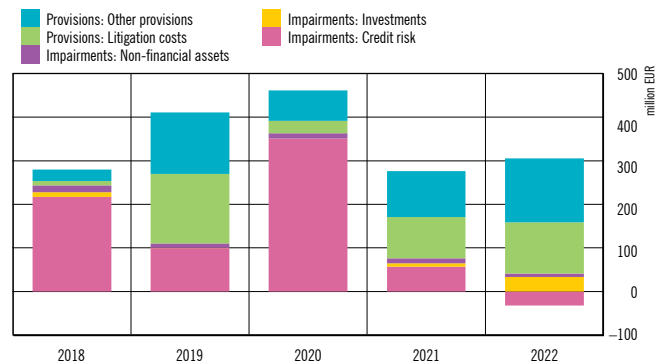
Source: CNB.

Figure E.17 Deposits with foreign financial institutions increased interest income



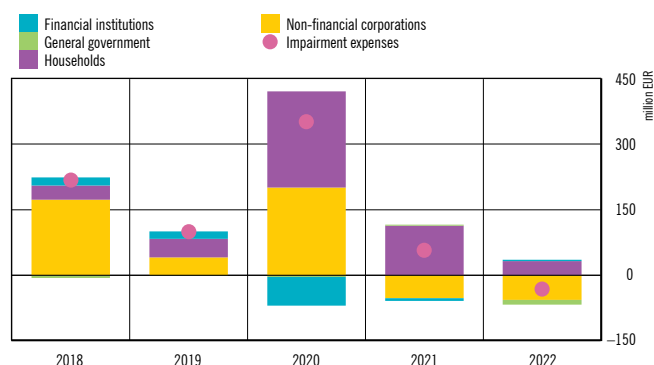
Source: CNB.

Figure E.18 Banks reduced impairments for credit risk in addition to the increase in litigation provisions



Source: CNB.

Figure E.19 Provisions for credit risk arising from corporations have dropped the most significantly



Source: CNB.

verage equity (ROAE) of 8.2% and a return on average assets (ROAA) of 1.0% (Figure E.16). The fall in profits from the previous year reflects much larger administrative costs (12%), largely offset by the increase in revenues from commissions and fees (16.5%), mostly in the segment of card operations and to a certain extent by fees in the payment operations (Figure E.17). Despite the decline in profits on an aggregate level, several banks qualified for the payment of excess profit tax due to the considerable increase in profits, which additionally reduced the aggregate ROAE by 0.2 percentage points. Banks' preliminary data for the first quarter of 2023 point to a significant increase in profits in an environment of rising interest rates.

**Interest revenues also increased moderately in 2022, in particular by the year-end when the interest rate growth cycle began, which will mark the operations of banks in 2023 to an even larger extent.** Interest income from foreign assets, i.e. reverse repo operations and deposits given to foreign financial institutions (largely to parent banks) recorded the largest growth (Figure E.17). Despite the decline in 2022, interest income from households continued to be the amplest source of earnings of the domestic banking system and income related to the implementation of monetary operations will also increase in 2023. On the other hand, interest income from household loans decreased in 2022, although it is still the amplest source of earnings of the domestic banking system. Interest expenses increased only moderately in 2022 under the impact of higher costs of derivatives, while the costs of deposits continued to decline. However, given the increase in interest-rate bearing assets, net interest margin continued to decline (from 2.1% in 2021 to 1.9% in 2022).

**The rising costs of credit institutions' operations, despite the growth of operating income, reduced their gross profit and cost effectiveness.** The largest contribution to the increase in costs came from administrative expenses, within which the cost of the information system due to the adjustment to the introduction of the euro accounted for the most significant component (see Box 5). Since most of these costs were one-off,

in 2023, banks will have the opportunity to reduce unit cost, which will be reflected in larger net earnings. In addition, employee costs and deposit insurance costs also increased, which further reduced cost effectiveness as measured by the cost-to-income ratio (CIR), from 48.7% in 2021 to 52.5% in 2022.

**Banks made additional profit by reversing the impairment for credit risks** (Figure E.18). The reversal of impairment mostly related to non-performing exposures with corporations and the government, while in households, due to the increase in the share of loans in stage 2, an increase in provisions was observed (see E.3 Credit risk Figure E.19). In 2022, individual Croatian credit institutions also increased provisions for legal expenses that might materialise in the forthcoming period.

## E.5 Challenges for credit institutions

**The exposure of the Croatian banking system to the banks in the USA and Switzerland that were faced with financial problems is low, but this does not mean that the development of systemic risks can be completely ignored.** On one hand, Croatian banks have different business models, as well as stricter regulatory requirements than US banks. However, on the other hand, last year's experience of the sudden failure of a bank because of the materialisation of reputational risk shows that a sudden loss of confidence may be a significant threat for banks because clients can withdraw a large amount of funds within a short period<sup>12</sup>. Although a sudden deposit outflow is not expected, the development of banking services, primarily internet banking, enables a faster execution of orders, which in stress situations could additionally speed up the outflow of liquid assets from banks. This may have a significant impact on financial stability and requires reflections on the suitability of the existing liquidity indicators in the cases of stress events.

**Although the increase in interest rates exposes banks to the risk of reduced interest margin, due to the pronounced maturity mismatch between assets and liabilities, the inertia of deposits that allows banks a slower transfer of rising interest on liabilities, mitigates this risk.** A relatively high share of the assets is invested at interest rates that are fixed during a longer period, which mostly relates to loans and debt securities. Yields on those placements will be adjusted to market conditions only upon the expiry of the fixation period or instrument maturity. In contrast, on the liabilities side, assets are mostly financed by overnight deposits of the private non-financial sector, whose interest rate may currently change. The maturity mismatch between assets and liabilities thus exposes banks to the risk of (temporarily) reduced interest margin in the event that the rise of interest rates on liabilities closely follows interest rates on assets. However, the inertia of deposits allowed banks a much slower increase in interest on liabilities, which mitigates the risks to their profitability.

12 See: Financial Stability 23, Box 1 Effects of war in Ukraine on the financial stability in Croatia – failure of a Russian-owned bank prevented.

**The adjustments to the requirements from the EU strategy on a climate-neutral economy also play an increasingly important role for banks through the change in the structure of financing.** Under the European Green Deal, EU member states should implement the measures of transition to an energy-more-sustainable economy and by the end of 2050, Europe should become climate neutral<sup>13</sup>. In this process, banks

will have an important role in the reduction of the financing of enterprises with a high carbon footprint. On the other hand, the green transition will also be among the main tasks of credit institutions because through the decarbonisation of economies they could also have an important role in shaping more sustainable business processes.

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<sup>13</sup> For more, see: [https://reform-support.ec.europa.eu/what-we-do/green-transition\\_en](https://reform-support.ec.europa.eu/what-we-do/green-transition_en).



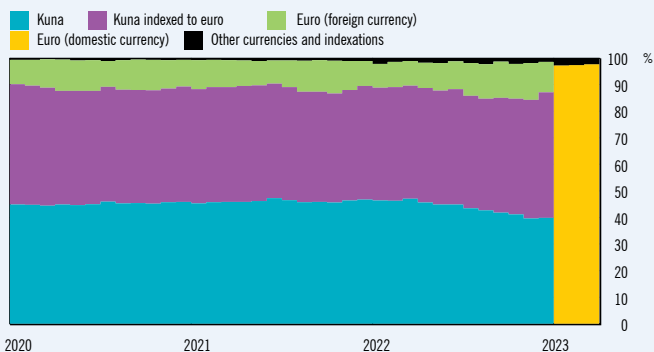
## Box 5 What does the introduction of the euro mean for banks?

The introduction of the euro brings numerous benefits for the Croatian economy and the financial system, the most important of which refer to the elimination of the largest part of currency risk and enabling the CNB to perform the role of the lender of last resort with the possibility of providing liquidity support in euro. Systemic risks are thus additionally reduced, which makes the financial system more resilient to external shocks. A further integration of the euro area is one of the key challenges faced by member states, in which through the efforts to complete the banking union, the exposure to financial risks would be further reduced.

**In the beginning of this year, the Republic of Croatia became the 20th member of the euro area, and the euro became the official monetary unit and legal tender in Croatia.** The CNB started participating in the creation of the common monetary policy of the euro area with the involvement of the Governor in the work of the Governing Council of the ECB and implements the policy in the Republic of Croatia. In addition, since its entry in what was called close cooperation in July 2020, the CNB has carried out the tasks of supervision over certain credit institutions in cooperation with the ECB, while it creates and implements macroprudential policy independently, although in coordination with the ECB and other members of the Single Supervisory Mechanism (SSM).

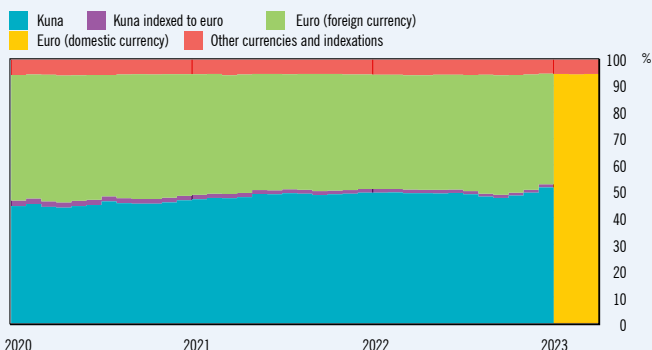
**The main benefits of the entry in the euro area for citizens and the economy are considerable,** from the elimination of currency risk, lower interest rates and transaction costs, stimulus to international trade and investments, to the participation in Eurosystem operations and access to financial assistance mechanisms in crisis situations ([Strategy for the Adoption of the Euro in Croatia](#), 2018). Currency risk has been the main characteristic of the domestic economy for decades through its high degree of euroisation (Figure 1 and Figure 2), so that by its elimination, the resilience of the financial system and the economy to

Figure 1 Share of loans in foreign currency or indexed to foreign currency drops from about 60% to 2%



Source: CNB.

Figure 2 Share of deposits in foreign currency drops from about 50% to 6%

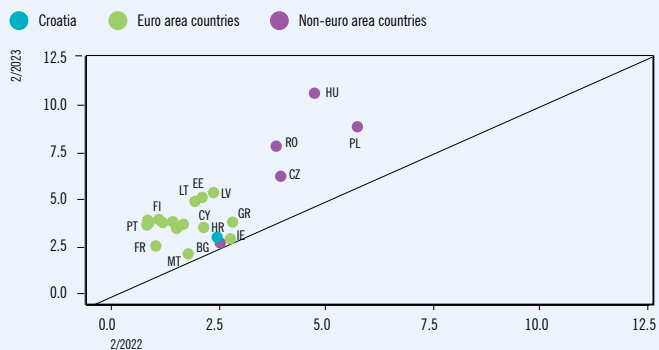


Source: CNB.

systemic risks also increases. At the same time, the borrowing cost for the citizens, the economy and the government relative to the scenario of keeping a national currency is reduced, which became evident even before the formal introduction of the euro (Zmc, 2022). The adjustment of monetary policy instruments also had a favourable effect on interest rates on new housing loans and loans granted to corporations, which at the end of 2022 for the first time were lower than the interest rates in most European countries (Figure 3 and Figure 4). The above is also the result of the fall in regulatory costs, which through the abolishing of the minimum required amount of foreign currency claims and the reduction of the reserve requirement to 1% (Figure 5) additionally strengthened the banks' lending potential and had an impact on the slower increase in interest rates.

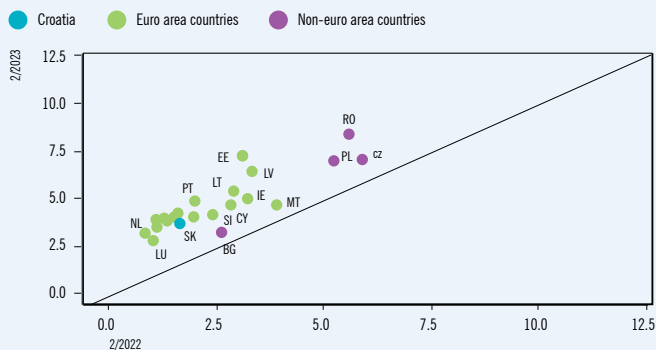
**Preparations for the introduction of the euro resulted in considerable one-off costs for the banks as well as a permanent loss of part of the income.** From 2023, banks will permanently lose a part of (euro) for-

Figure 3 Interest rates on housing loans to households remained almost unchanged



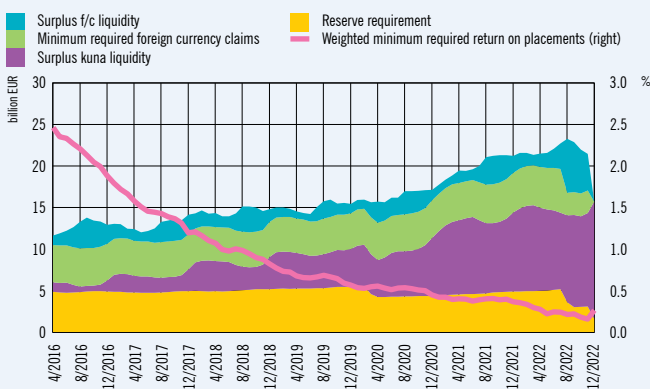
Note: The figure shows interest rates in February 2022 and 2023 on loans granted in the domestic currency. Source: ECB.

Figure 4 Interest rates to corporations increased, but more moderately than in other countries



Note: The figure shows interest rates in February 2022 and 2023 on loans granted in the domestic currency.  
Source: ECB.

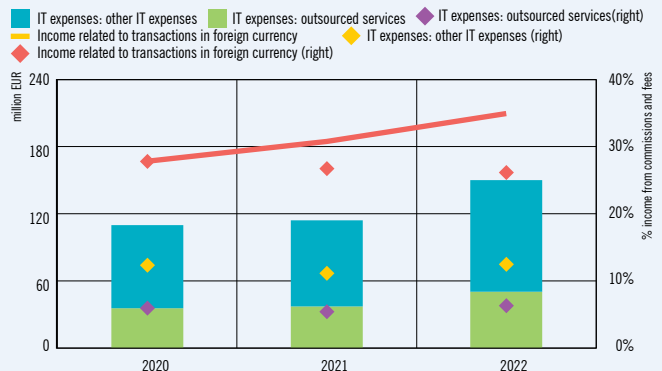
Figure 5 Before the introduction of the euro, regulatory costs were reduced considerably, while banking liquidity increased



Source: CNB.

eign exchange operations, which in 2022, accounted for a slightly more than 25% of income from commissions and fees (Figure 6). In addition to the loss of income, the most significant expense of the introduction of the euro for banks is related to the adjustment of the IT infrastructure, which throughout 2022 stood at EUR 150m. Moreover, from mid-December 2022 to mid-January 2023, in addition to the Financial Agency and Croatian Post, banks had an important role in supplying citizens and business entities with euro banknotes and coins free of charge, which in addition to branch offices of all institutions was also enabled by the adjustment of the ATM network.

Figure 6 Banks allocated a record amount for the adjustment of the IT infrastructure



Source: CNB.

**Many adjustments that bring long-term benefits were made in the financial system.** In addition to long-term benefits, such as the reduction of currency and interest rate risks, an additional benefit of the introduction of the euro comes from the complete elimination of the risk of a currency crisis (e.g. the depreciation of the domestic currency) as well as the reduction of risk and the cost of banking and the balance-of-payment crisis. Also, with the joining of the euro area, certain Croatian government securities become acceptable collateral in the Eurosystem operations, thus becoming more attractive to the participants in the European financial markets. In this way, the risk of the source of financing in the banking sector and the government was additionally reduced. Despite the establishment of the Single Supervisory Mechanism (SSM) and the Single Resolution Mechanism (SRM), long-term challenges are supervised in a further integration of the euro area countries into the banking union. The benefits of the banking union should be visible in larger transparency and competitiveness and, finally, in lower systemic risks through the single deposit insurance system, which should additionally stimulate the mobility of financial resources with the euro area members.

**Croatian payment systems were ready to embrace the new currency, and they will undergo further adjustment until the end of 2023.** Since the Croatian TARGET2 component was set up as early as in 2016 and the SEPA payment scheme for cashless transactions was also applied for payments in kuna, after the payment systems for the settlement of transactions in kuna ceased to operate, payment operations smoothly moved to the euro infrastructure. Until the end of 2023, the migration of the instant payment system and the central securities depository (CSD) to the European TIPS (TARGET Instant Payment Settlement) and T2S (TARGET2-Securities) systems remains to be completed.

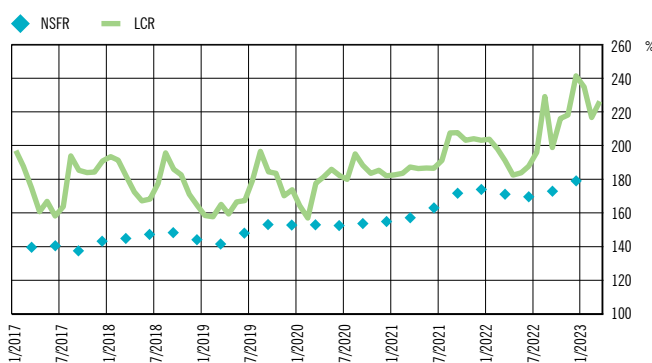
# II Resilience of credit institutions

The Croatian banking system remained profitable and highly capitalised in 2022, owing to ample capital and liquidity surpluses, while its resilience was additionally underpinned by a low level of leverage. Banks' capital position is still very strong, even though it edged down due to unrealised losses triggered by the decrease in the fair value of debt securities. This is also confirmed by the results of the stress test under a hypothetical scenario of unfavourable economic developments and surging inflationary pressures. The results of this year's stress test exercise were more favourable than those obtained last year, due to a significant profit growth on the back of rising interest rates.

# A Liquidity

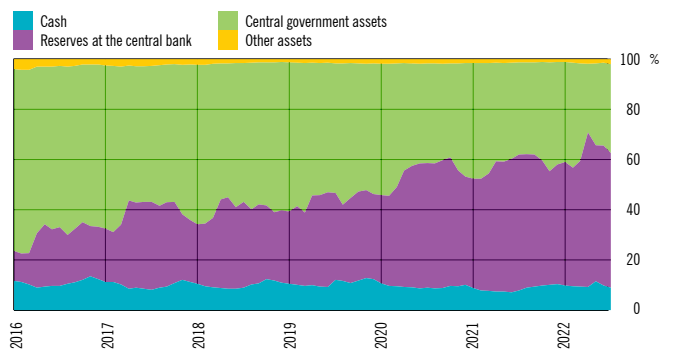
**The capacity to cover net outflows in the short term and the long-term capacity to finance liabilities remained at very high levels.** Driven by the release of reserve requirement funds and the minimum required foreign currency claims for the purpose of harmonising the CNB's monetary policy instruments with those of the ECB (see Box 5), which was carried out on two occasions in August and December 2022, the liquidity coverage ratio (LCR) increased from 203.1% to a very high 241.4% in late 2022. However, it edged down to 226.2% by the end of March (Figure II.1). As regards the structure of liquid assets, the share of deposits with the central bank rose. Together with cash, it accounted for 63% of liquid assets (Figure II.2), which is one of the highest shares in the EU. The relatively low exposure of Croatian banks to debt securities currently safeguards liquid assets from being severely affected by monetary policy tightening and volatility on financial markets, which directly decrease the value of fixed-income debt securities.

Figure II.1 Liquidity and stable funding ratio remained high



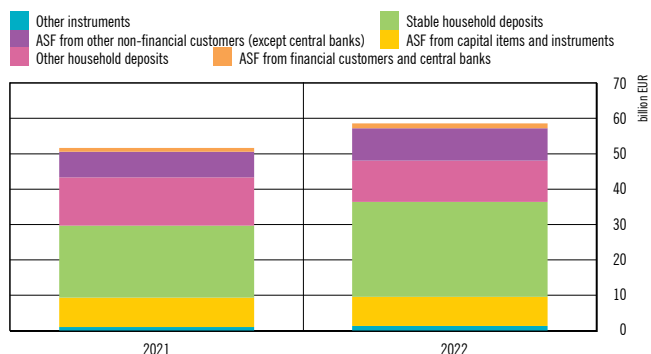
Source: CNB.

Figure II.2 Cash and reserves with the central bank are the most significant source of liquidity



Source: CNB.

Figure II.3 Household deposits account for the largest share of stable funding

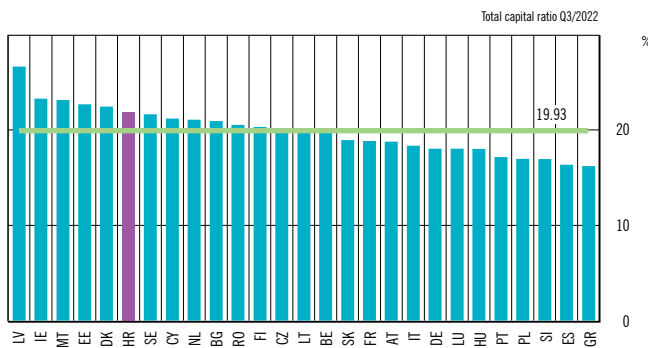


Note: ASF means available stable funding.  
Source: CNB.

The net stable funding ratio (NSFR) indicator also rose, triggered by a sharp growth in deposits (Figure II.3). The NSFR reached 179.1% at the end of 2022, reflecting the increasingly sharp growth in deposits of the private non-financial sector, which is still larger than credit growth. The extremely high level of the stable funding ratio indicator has reduced the sensitivity of credit activity to sudden changes in market conditions.

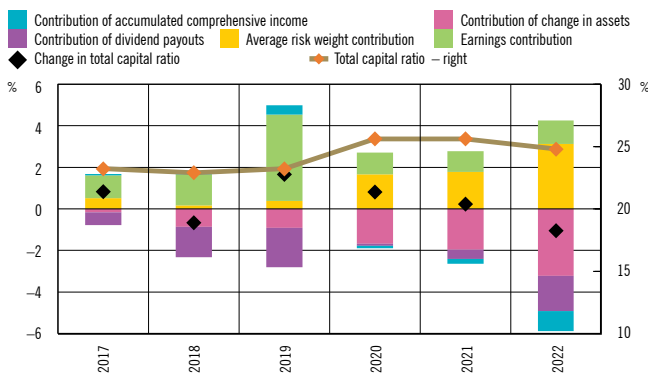
# B Capital position of banks

Figure II.4 Total capital ratio is among the highest in the EU



Note: For the sake of comparability, total capital ratio in this chart has been calculated on the basis of data from the consolidated balance sheet.  
Source: ECB.

Figure II.5 Total capital ratio decreased due to dividend payouts and unrealised losses



Source: CNB.

The Croatian banking system is highly capitalised. The total capital ratio stood at 24.8% at the end of 2022 and was among the highest in the EU (Figure II.4). At the level of the entire system, the total capital ratio edged down during the year, driven by the increase in total assets and the decline in the value of own funds. Systemically important banks maintained their capital ratios above the average level, while other banks maintained the lowest level of this ratio. The bulk of own funds (Figure II.6) was accounted for by Common Equity Tier 1 (CET1) capital as their highest quality component (97%), while the remaining part was accounted for by Additional Tier 1 (AT1) capital and Tier 2 (T2) capital.

The capital position of the banking sector shrank, largely triggered by unrealised losses due to the decrease in the fair value of bonds measured through other comprehensive income. Lower prices of debt securities pushed other comprehensive income into negative territory in late 2022, shrinking the total capital ratio by around 1 percentage point. Dividend payouts also contributed to capital depletion, in light of the fact that in the previous two years earnings were mostly retained in accordance with the CNB's restriction on distributions that applied until October 2021 as a response to the COVID-19 pandemic. Subsequent distributions of profit generated in previous years increased the dividend payout ratio relative to last year's profit to 74.5%, which is much above the average level of 22% recorded in 2020 – 2021. On the other hand, the decline in capital adequacy was cushioned by good business results and the channelling of funds towards less risky types of assets (Figure II.5).

Risk-weighted assets increased by 2% in 2022, while credit risk exposure, the main component of risk-weighted assets, rose by 1.6%. The increase in risk-weighted assets (total risk exposure amount (TREA)) was caused by the growth in total exposure amount by 11% (exposures to corporates, exposures to households and exposures secured by mortgages on immovable property) and the rise in the amount of cash balances at central banks, which are subject to a 0% credit risk weight. Consequently, the average credit risk weight decreased from

41.8% to 36.7% in 2022. This is still relatively high at the euro area level, and largely reflects the reliance on the standardised approach (Figure II.7).

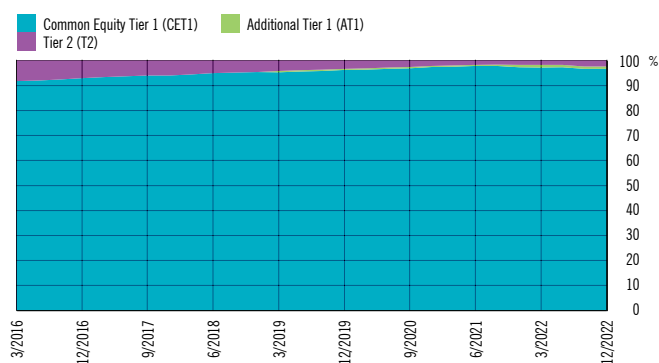
**Total capital requirements, comprising Pillar 1 and Pillar 2 requirements and combined buffer requirement, should increase in 2023, having edged down in 2022.** The decline in total requirements from 16.36% to 15.48% of the TREA at the end of 2022 was due to lower Pillar 2 requirements, which were lower by 95 basis points at the aggregate level from the level recorded in 2021 (Figure II.8). With the introduction of a higher countercyclical buffer rate (see Chapter III), capital requirements for banks increased by 0.5 percentage points at the end of March 2023, and will go up by a further 0.5 percentage points by the end of 2023. Capital in excess of regulatory requirements stood at 9.4% of the TREA in late 2022, suggesting that additional requirements can be smoothly met on

the system level. Against this background, the combined capital buffer remained fully available to cover potential losses if necessary, creating additional room for monetary policy manoeuvre in times of stress.

**Asset growth and the decline in banks' own funds led to a decrease in the leverage ratio to 9.7%, which is still substantially above the prescribed 3% requirement (Figure II.9).** In nominal terms, the leverage ratio requirement for banks was well below the parallel prudential requirements based on risk-weighted assets (see Box 6), as is usual for banking sectors with relatively high risk weights.

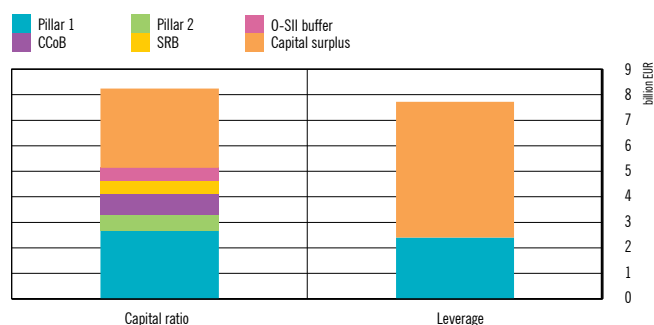
**At the end of 2022, banks also met the resolution objectives concerning the minimum requirement for own funds and eligible liabilities (MREL) (see Box 6).** At the aggregate level, resolution entities maintained their MREL capacities, which

Figure II.6 The bulk of banks' own funds is accounted for by Common Equity Tier 1 (CET1)



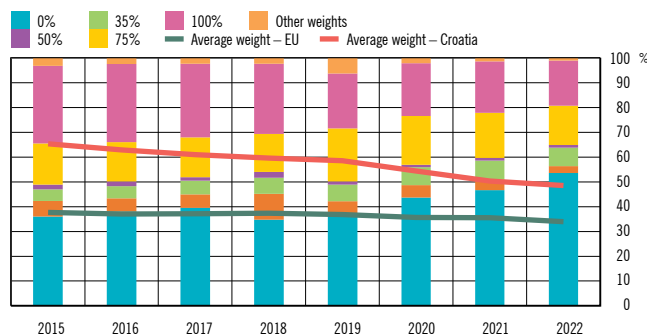
Source: CNB.

Figure II.8 Banks maintain sizeable capital surpluses that exceed the prudential requirements



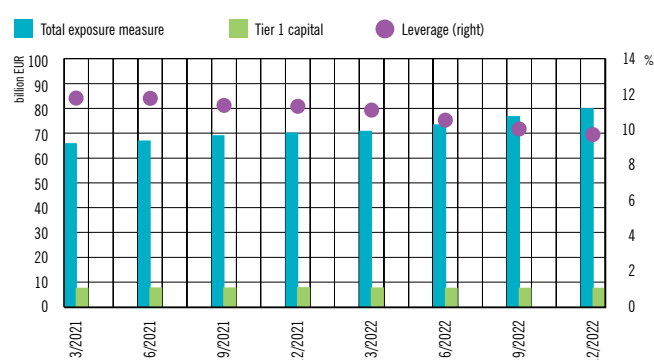
Notes: Balance as at 31 December 2022. Pillar 1 – minimum capital requirements; Pillar 2 – own funds requirements; SRB – systemic risk buffer, CCoB – capital conservation buffer; O-SII buffer – the capital buffer for other systemically important institutions. Source: CNB.

Figure II.7 Credit risk exposure continued its downward trend, largely due to the increase in categories with a 0% weight



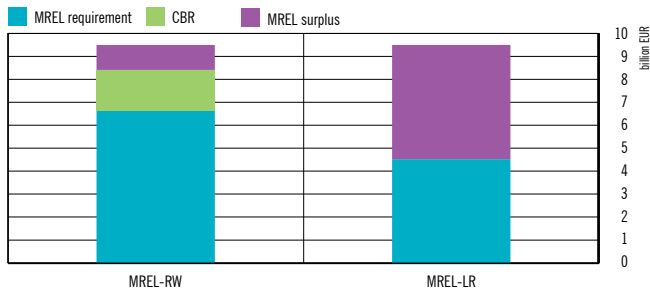
Notes: Risk weights have been calculated for banks applying the standardised approach to reporting. Average risk weights for Croatia and the EU in 2022 include observations for Q3/2022. Sources: CNB and ECB.

Figure II.9 Leverage continued its downward trend



Source: CNB.

Figure II.10 MREL capacity sufficient to cover the final MREL target



Notes: Balance as at 31 December 2022. MREL is expressed as two ratios to be met in parallel: as a ratio of risk-weighted assets (MREL-RW, expressed as a percentage of the TREA) and as a ratio of total exposure amount used for the calculation of the leverage ratio (MREL-LR, expressed as a percentage of the TEM). CBR – combined buffer requirement.  
Source: CNB.

were higher than the binding intermediate and final MREL targets at the end of 2022 (including the combined buffer requirement maintained on top of MREL expressed as a percentage of risk-weighted assets, MREL-RW). The largest part of banks' MREL capacities was accounted for by own funds (84%, of which 81% are in the form of Common Equity Tier 1 capital), while the rest was accounted for by eligible liabilities. In 2022, two banks issued bonds, primarily with the aim of maintaining these requirements. As with prudential requirements, in the resolution framework the MREL-RW requirements in nominal terms were higher than the parallel MREL requirements based on the total exposure amount (MREL-LR) (Figure II.10).



## Box 6 Capital requirements for credit institutions in the prudential and resolution regulatory frameworks

*Banks play a vital role in financial flows and the economy and are obligated to comply with strict regulatory requirements concerning the quantity and quality of capital with the aim of ensuring the continuity of their operations. Two parallel frameworks apply to banks in the European Union today: the prudential framework and the resolution framework. The prudential framework applies to all banks, with the primary objectives of ensuring an appropriate capital protection against risk exposure and preventing excessive use of leverage in banks' operations. The resolution framework ensures that all banks maintain appropriate capacity to absorb losses in case of failure. For banks that could jeopardise the financial system stability and public interest if they left the market, the framework also prescribes the recapitalisation amount. Croatian banks are currently in a transitional period of harmonisation with the resolution requirements set by the Single Resolution Board and the CNB, which will become binding on 1 January 2024.*

**The key prerequisite for maintaining the stability and safety of the banking system is for banks to have sufficient capital to cover the risks they are exposed to in their operations, that is, to absorb losses that might be incurred should these risks materialise.** This is why banks must comply with strict regulatory requirements concerning the quantity and quality of capital they must maintain. Many of these requirements have been introduced or tightened in response to the global financial crisis, with the aim of increasing the resilience of the banking system. Awareness has also been raised about the importance of orderly, fast and efficient resolution of financial difficulties in failing banks, in order to avoid financial contagion and passing on the costs of crisis to taxpayers. Based on these insights, in addition to the prudential framework, whose primary objective, *inter alia*, is to ensure that banks have sufficient capital to be resilient to potential losses on a going-concern basis, a resolution framework was developed address crisis situations in banks in an orderly manner on a gone-concern basis. For most banks, [resolution of a crisis situation](#) means exiting the market through normal insolvency proceedings. However, in the case of banks whose failure would jeopardise public interest, that is, financial system stability and economic activity, a resolution mechanism is needed in order to distribute the resolution costs to banks' shareholders and creditors to the largest extent possible, with the aim of ensuring the continuity of banks' critical functions, avoiding significant adverse effects on financial stability and protecting public funds.

**The resolution and prudential frameworks apply in parallel and are complementary,** with the common goal of achieving long-term sustainability, stability and efficiency of the financial system, as well as reducing the probability and costs of potential future financial crises. In the harmonised EU legislation, transposed to the legal framework of the Republic of Croatia, the revised prudential and resolution requirements for credit institutions are laid down in the so-called Banking Package<sup>1</sup>.

<sup>1</sup> The Banking Package includes the Capital Requirements Regulation (CRR), the Capital Requirements Directive (CRD), the Bank Recovery and Resolution Directive (BRRD) and the Single Resolution Mechanism Regulation (SRMR).

### Prudential framework

**Within the scope of the prudential framework, banks must comply with two types of capital requirements:** requirements proportional to the riskiness of assets, expressed as a percentage of risk-weighted assets (total risk exposure amount, TREA) and requirements for leverage, where capital is observed relative to total exposure measure (TEM)<sup>2</sup>, regardless of its estimated riskiness. These requirements are complementary. Accordingly, in addition to limiting excessive reliance on debt financing, the leverage requirement also safeguards against errors in risk measurement models and in determining the risk weight in banks applying the internal ratings-based approach to the calculation of own funds requirement. Namely, the actual protection provided by capital requirements expressed as a percentage of the TREA strongly depends on the correct estimation of risk weights. If risk weights have been underestimated, this causes an unwarranted reduction in the base for the calculation of capital requirements and consequently the amount of capital required for these requirements to be met. In such a case, the leverage ratio, which is not dependent on risk weights, ensures that banks with low risk weights are also able to maintain the appropriate level of capital relative to their total exposures.

### Prudential capital requirements for risk-weighted assets

**Prudential capital requirements expressed as a percentage of the TREA ensure that banks maintain the level of capital that is proportionate to the riskiness of their assets.** They comprise three main elements: minimum capital requirement (Pillar 1 requirement, P1R); additional capital requirement (Pillar 2 requirement, P2R) and the combined buffer requirement (CBR). All banks under European banking supervision must comply with the minimum capital requirement set out in the Capital Requirements Regulation (CRR), set at the level of 8% of total risk exposure.

**Additional capital requirements are bank-specific and are determined by microprudential supervisory authorities** (from the European Central Bank and member states). Within the scope of annual Supervisory Review and Evaluation Process (SREP), these authorities evaluate the risks banks are exposed to and check their capacity to manage these risks appropriately. Minimum and additional capital requirements are jointly referred to as the total SREP capital requirement, which is legally binding for banks, a breach of which leads to the imposition of supervisory measures and sanctions and in extreme cases to the withdrawal of authorisation. On top of the total SREP capital requirement, banks are also expected to comply with the Pillar 2 guidance (P2G) set by the ECB, recommending the level of capital banks are expected to maintain in order to be able to withstand financial stress. The Pillar 2 guidance is not legally binding, but is rather a supervisory expectation, where failure to meet this expectation in the medium term can have certain consequences (e.g. a guidance can be translated into a Pillar 2 requirement and thus become binding).

<sup>2</sup> The total exposure measure is the sum of the exposure value of assets (unless they are deducted when determining the Tier 1 capital), derivatives, add-ons for counterparty credit risk in some transactions and off-balance sheet exposures.

**Capital buffers make the third element, serving to increase the resilience of the banking system as a whole to different types of systemic risks.** Capital buffers help banks to absorb losses in times of stress<sup>3</sup>, protecting them from breaching their total SREP requirement. This safeguards the continuity of banks' operations and supports credit activity, underpinning economic recovery during crisis periods. A breach of the combined buffer requirement does not result in supervisory measures or sanctions, so as to avoid limiting the possibility of their use in times of stress. Instead, a bank that does not meet the combined buffer requirement is subject to restrictions on dividend payments (in proportion to the severity of breach) and the obligation to draw up a capital conservation plan, applicable until combined buffer requirement is met again.

### Leverage ratio requirement

**Leverage ratio, calculated as the ratio of a bank's Tier 1 capital to its total exposure, is a measure monitoring banks' exposure to the risk of excessive debt financing.** Unlike other capital requirements within the scope of the prudential framework, leverage ratio does not consider the riskiness of individual exposures (assets). Instead, capital is observed relative to the total exposure measure (TEM). In light of their parallel application, leverage ratio complements capital requirements expressed as a percentage of the TREA and mirrors their structure: it comprises Pillar 1 requirement (P1R-LR, currently standing at 3%) and Pillar 2 requirement (P2R-LR), and may further be complemented by Pillar 2 guidance, that is, a legally non-binding supervisory expectation on top of leverage ratio (P2G-LR). Banks identified as global systemically important institutions (G-SIIs) are also required to maintain leverage ratio buffer requirement<sup>4</sup> in addition to leverage ratio. Like the total SREP requirements, leverage ratio is a minimum regulatory requirement<sup>5</sup> banks are required to maintain at all times; its breach will trigger the application of a number of regulatory measures, including early intervention measures and supervisory measures, and can, in extremis, also lead to the withdrawal of authorisation<sup>6</sup>.

### Resolution framework

**The resolution framework sets out the minimum requirement for own funds and eligible liabilities (MREL)**<sup>7</sup> to ensure that banks maintain at all times sufficient levels of own funds and liabilities in the form of eligible instruments to facilitate the implementation of the preferred resolution strategy in a case in which a bank is failing or is likely to fail. A bank's resolution strategy is set by a resolution authority in a resolution plan. Depending on a given bank's importance, it can involve

normal insolvency proceedings (where a bank's market exit via normal insolvency proceedings would not jeopardise financial stability and/or cause disturbance in the economy) or resolution by the application of resolution tools and powers (where this is in the public interest due to the bank's size, interconnectedness and complexity). A resolution plan also sets out MREL requirements in order to meet the objectives such as ensuring the continuity of a bank's critical functions, avoiding significant adverse effects on financial stability, in particular by preventing financial contagion, and avoiding having to resort to public funds in addressing the failure of a bank.

**MREL requirement is composed of two components:** the first component involves the loss absorption amount (LAA) to be maintained by all banks, regardless of their resolution strategy, serving to cover losses that might arise should a bank fail. The second component involves the recapitalisation amount (RCA), applicable only to institutions to be subjected to resolution in the case of failure, that is, to those institutions for which a resolution plan envisages the implementation of resolution measures or the exercise of powers for write-down and conversion of relevant capital instruments and eligible liabilities. It ensures that an institution maintains sufficient own funds necessary for recapitalisation, up to the level that it can continue to comply with its conditions for authorisation and carry on its operations. Depending on the resolution strategy and decision by the resolution authority, the recapitalisation amount also includes a market confidence charge (MCC) to ensure that a bank sustains investor and market confidence post-resolution. MCC equals a bank's combined buffer requirement, less countercyclical buffer.

**The MREL requirement is expressed as two ratios to be maintained in parallel:** as a ratio of risk-weighted assets (MREL-RW, expressed as a percentage of the TREA) and as a ratio of total exposure amount used for the calculation of leverage ratio (MREL-LR, expressed as a percentage of the TEM). The market confidence charge (MCC) is applied only within the scope of the MREL-RW requirement. Banks identified as resolution entities are also required to meet the combined buffer requirement on top of MREL-RW<sup>8</sup>. This is not required in the case of MREL-LR which can be met by using capital maintained for the purpose of meeting the combined buffer requirement in the parallel framework (based on riskiness of assets) (Figure 1). MREL requirements can be maintained from own funds and eligible liabilities. The criteria for eligible liabilities instruments for credit institutions vary depending on the chosen resolution strategy of a banking group (SPE vs. MPE)<sup>9</sup>.

**MREL requirements are by definition minimum regulatory requirements to be met by banks at all times.** This means that their breach will trigger various measures<sup>10</sup> imposed by the competent resolution

<sup>3</sup> Except for the countercyclical capital buffer, which can be released in the case of cyclical systemic risk materialisation in accordance with the applicable regulations.

<sup>4</sup> The rate of this buffer is set at one-half of the G-SII buffer rate expressed as a percentage of the TREA, and applies to the amount of the TEM.

<sup>5</sup> Article 92 of CRR.

<sup>6</sup> Article 27 of BRRD and Articles 104 and 18d of CRD.

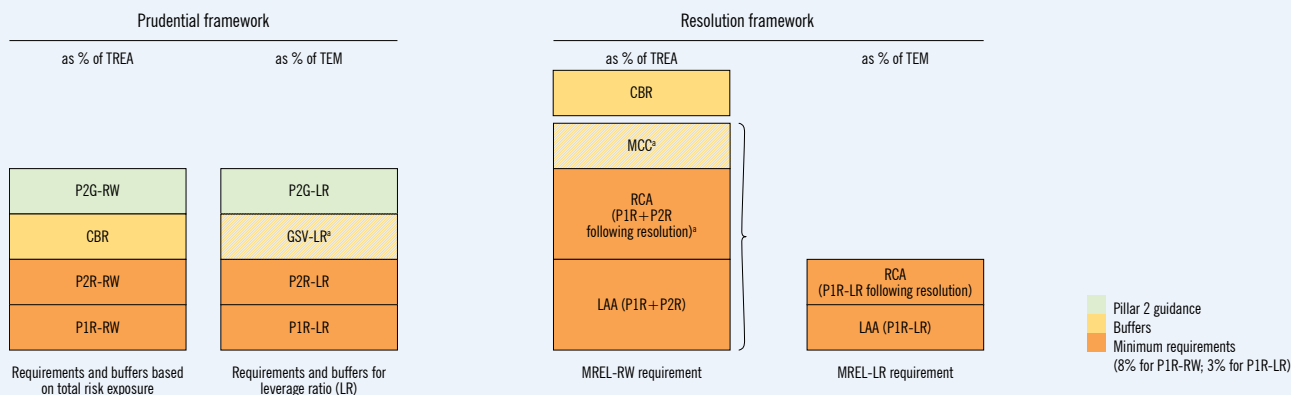
<sup>7</sup> The EU resolution framework relies on the international standards developed by the Financial Stability Board (FSB); consequently, MREL requirements aim to pursue the same regulatory objectives of ensuring sufficient loss absorption and recapitalisation capacity as the international standard TLAC (total loss absorption capacity) which applies to global systemically important banks.

<sup>8</sup> The level of the combined buffer requirement substantially increases total requirements, especially for banks that are also required to maintain MCC.

<sup>9</sup> The regulatory framework provides two types of resolution strategies for credit institution groups: resolution strategies with a single point of entry (SPE) and resolution strategies with a multiple point of entry (MPE). The MREL requirement for resolution entities is set at the consolidated level of the resolution group (external MREL) and it has to be met with own funds at the level of the resolution group and eligible liabilities issued externally. The MREL requirement for institutions that are not themselves resolution entities is set at individual level or sub-consolidated level (internal MREL).

<sup>10</sup> Article 45k of BRRD.

Figure 1 Illustration of minimum requirements and capital buffers in the prudential and resolution frameworks



<sup>a</sup> G-SII-LR buffer applies only to G-SIIs; MCC applies only to some resolution entities depending on the resolution strategy and the assessment by the resolution authority. The resolution framework shows a combined buffer requirement which does not form a part of MREL-RW, but must be met on top of it. Requirements within the scope of the resolution framework are illustrated in a simplified way given that a resolution authority can make certain adjustments in calculating the MREL requirement, especially in calculating the RCA.

Notes: Relates to a bank that is a resolution entity. The size of fields in the figure does not illustrate the actual relation between different requirements. Abbreviations: TREA – total risk exposure amount; TEM – total exposure measure; P1R – Pillar 1 requirement; P2R – Pillar 2 requirement; CBR – combined buffer requirement; P2G – Pillar 2 guidance; RW – risk-weighted; LR – leverage ratio; LAA – loss absorption amount; RCA – recapitalisation amount; G-SII – global systemically important institution; MCC – market confidence charge.

Source: CNB illustration based on BRRD and CRR.

authorities with the aim of ensuring that the requirements are met, including the assessment of whether a bank is failing or is likely to fail. Such measures can include supervisory measures, early intervention measures, distribution restrictions and/or administrative penalties, even though, unlike supervisory authorities, resolution authorities do not have the power to withdraw authorisation. If a bank meets the MREL requirements, but fails to meet the combined buffer requirement on top of MREL-RW, restrictions to distributions are not automatic as in the case of a breach of combined buffer requirement on top of total SREP requirement. Instead, the resolution authority, after it has performed its own assessment and consulted the competent authority, has the power to prohibit a bank from distributing more than the maximum

distributable amount related to the MREL (M-MDA), through any of the following actions:

- (a) make a distribution in connection with Common Equity Tier 1 capital;
- (b) create an obligation to pay variable remuneration or discretionary pension benefits, or to pay variable remuneration if the obligation to pay was created at a time when the entity failed to meet the combined buffer requirement; or
- (c) make payments on Additional Tier 1 instruments.<sup>11</sup>

<sup>11</sup> Article 16a of BRRD.

# C Stress testing of credit institutions<sup>14</sup>

**Credit institutions' stress testing exercise has shown that, given the current level of capitalisation, credit institutions are capable of withstanding the materialisation of risks under the hypothetical scenario.** The exercise encompassed a three-year horizon and considered the level of solvency in two different economic scenarios in the period from 2023 to end-2025. The results contribute to the comprehensive assessment of systemic risk in the financial system and can be used as additional information for calibrating macroprudential measures aimed at mitigating such risks. This year's exercise included the announcement of a higher countercyclical capital buffer rate of 1% as of 31 December 2023 (see Chapter III), meaning that the total capital requirements rate at the end of all the years of the stress testing horizon was 1 percentage point up from the rate that applied at the end of 2022. Banks are expected to meet this requirement by relying on the existing capital surplus. This tests whether there is sufficient capital to protect banks from extremely unfavourable cyclical developments.

## C.1 Macroeconomic scenarios for stress testing

**Stress testing of credit institutions in the period from 2023 to 2025 was carried out based on two different scenarios, that is, the baseline scenario and the adverse scenario.** Macroeconomic developments under the baseline scenario are derived from the CNB's March 2023 macroeconomic projections. Following the high growth rate of economic activity in 2021 and

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<sup>14</sup> Stress testing of credit institutions tests their resilience under hypothetical, extremely unfavourable, macroeconomic and financial conditions that pose highly unlikely, albeit possible materialisation of systemic risks deemed relevant for the operation of the banking sector in Croatia. Even though stress testing is not a projection of unfavourable developments expected in the financial sector, it contributes to a timely assessment of systemic risks and stability maintenance.

Table II.1 Main features of the baseline and adverse macroeconomic scenario

	Initial value	Baseline scenario			Adverse scenario		
	2022	2023	2024	2025	2023	2024	2025
<b>International environment</b>							
GDP EA (annual rate of change, %)	3.5	0.4	1.8	1.9	-3.5	-4.2	1.6
EURIBOR 3M, %	1.8	3.3	3.3	2.8	3.9	4.6	4.0
<b>Macroeconomic developments</b>							
GDP (annual rate of change, %)	6.3	1.5	2.7	2.6	-5.6	-2.3	3.7
Personal consumption (annual rate of change, %)	5.2	0.3	2.7	2.6	-5.6	-2.5	4.3
Investments (annual rate of change, %)	5.8	4.2	2.8	2.5	-7.4	0.0	7.3
Unemployment rate (%)	7.1	7.0	6.8	6.1	7.3	8.1	6.6
Real estate prices (annual rate of change, %)	16.5	7.9	3.4	1.5	-6.1	-6.6	6.5
Inflation (%)	10.7	7.8	3.6	2.1	7.6	2.6	0.7
<b>Financing conditions</b>							
Yield on government bonds	3.5	3.5	3.5	3.5	7.6	6.2	5.8
Lending rates on new business of households, housing loans	2.7	3.8	4.4	4.3	4.6	5.6	5.4
Lending rates on new business of corporates	3.0	3.8	4.1	4.0	4.6	5.6	5.1
Deposit rates on new business of households, time deposits	0.2	0.5	0.6	0.5	0.6	0.8	0.7
Deposit rates on new business of corporates, time deposits in EUR	0.6	1.4	1.5	1.2	1.5	1.7	1.4

Sources: CBS and CNB, Eurostat, ECB, CNB's March 2023 macroeconomic projections for the baseline scenario and the simulation of the macroeconomic model PACMAN for the adverse scenario.

2022, against the backdrop of elevated inflation the baseline scenario assumes that the growth in economic activity will decelerate in the upcoming years, with a cumulative increase in the period from 2023 to 2025 by 7.1 percentage points. The baseline scenario also assumes a gradual slowdown in consumer price inflation. The fall in energy prices in international markets, combined with the continued application of measures to rein in the rise in the prices of energy and essential food products amid tightened financing conditions and the slowdown in economic activity, should exert downward pressure on consumer prices. However, claims for real wage adjustments should limit a strong correction in the first year of the horizon. It is assumed that the inflation should gradually return to its long-term target level towards the end of the projection horizon. The rise in residential real estate prices is expected to gradually slow down, mostly in later years due to the base effect of the surge in prices at the end of 2022. Although it is assumed that monetary policy will remain unchanged relative to March 2023, financing conditions are expected to tighten further and bank lending rates are expected to continue their upward trend across all sectors of the economy, taking account of time lags and the transmission of monetary policy tightening to domestic financing conditions.

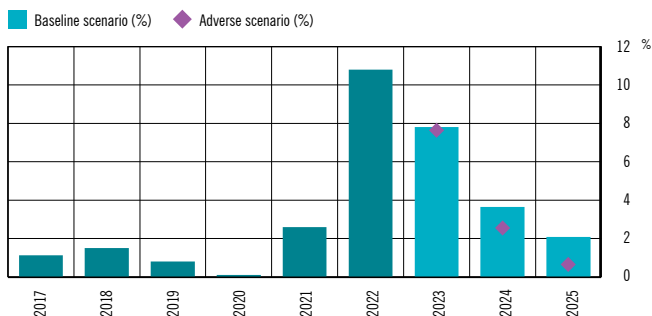
**The key assumption under the adverse scenario is a severe contraction of economic activity, with additional pressures on supply and the prices of raw materials, but with lower inflation.** Geopolitical polarisation following the Russian invasion of Ukraine intensifies and causes disruptions in global

production chains, dampening world trade and pushing up the prices of energy and raw materials. High prices of raw materials and energy, coupled with tightened global financing conditions and elevated uncertainty, pose a strong negative shock for the world economy, putting a large pressure on foreign demand and weighing on domestic economy. Strong inflationary pressures increase inflationary expectations, spurring a rise in claims for the adjustment of eroded real wages. The wage-price spiral exerts upward pressure on prices, even though the strong economic contraction ultimately has a dampening effect on demand and leads to a drop in inflation. Against the backdrop of worsened market expectations, financing conditions for the real economy deteriorate, causing a further decrease in consumption and investments. A bleak economic outlook and tightened financing conditions lead to a substantial real estate price correction, followed by rising concerns about the levels of public debt, exerting additional pressure on government bond yields. Table II.1 provides an overview of the developments in the main macroeconomic indicators under the baseline and the adverse scenario.

## C.2 Earnings under baseline and adverse scenario

**The stress testing exercise involved using an improved model for projecting net operating earnings,** assessing separately the net interest income in corporate and household sectors relative to interest rate trends and the net income from fees and com-

Figure II.11 Developments in consumer price inflation under baseline and adverse scenario



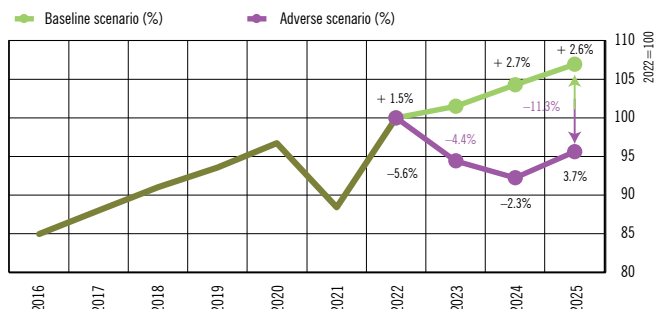
Sources: CBS and CNB's March 2023 macroeconomic projections for the baseline scenario and the simulation of the macroeconomic model PACMAN for the adverse scenario.

missions, under the assumption that other items of operating earnings remained unchanged from 2022. Net interest income has been assessed based on model assessments of lending and deposit interest rates on new loans to households and corporates (Figure II.13). The rise in interest rates in 2025 mirrors the current and lagged pass-through of monetary policy tightening, with an assumed stagnation in interest rates until the end of the projection horizon under both scenarios.

**Under the influence of a strong pass-through of monetary policy to lending rates relative to deposit rates, net interest spread for households and corporates is projected to grow, having a positive effect on net interest income.** In the light of the adoption of the euro, the effect of the permanent loss of most of the income from the currency exchange business has also been taken into account, while administrative costs remained at the levels recorded last year (with projected lower IT costs following last year's costs incurred in making adjustments due to the introduction of the euro, offsetting the rise in wages and other administrative expenses amid elevated inflation in 2023). Net operating earnings remained relatively stable under the baseline scenario, while the adverse scenario assumes their fall in 2024 relative to the previous year due to additional costs of impairment caused by the growth in non-performing loans. Net operating earnings are assumed to grow in 2025 owing to the recovery in the portfolio credit quality (i.e. lower NPLR), with stable net interest income of banks.

**Total NPLR under the baseline scenario could continue its downward trend, decreasing from 3.0% at the end of 2022 to 2.6% at the end of 2025.** The rise in the nominal income

Figure II.12 Developments in real GDP under baseline and adverse scenario



Sources: CBS and CNB's March 2023 macroeconomic projections for the baseline scenario and the simulation of the macroeconomic model PACMAN for the adverse scenario.

of households amidst continued favourable economic developments has alleviated the adverse effects of elevated inflation and high interest rates on the debt repayment ability of households<sup>15</sup>, and consequently NPLR is projected to decrease for both housing and consumer loans. With regard to non-financial corporations, the decrease in NPLR<sup>16</sup> under the baseline scenario arises from improved business performance (measured by the growth in gross operating surplus) amid inflation, offsetting the negative effect of higher interest rates on debt repayment ability.

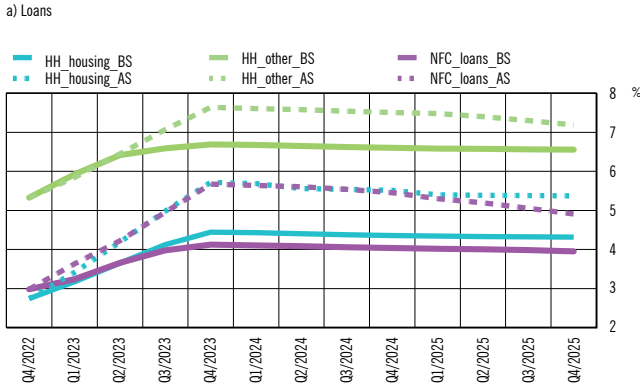
**The hypothetical adverse scenario envisages the possibility of a reversal and deterioration in loan quality, with the total NPLR potentially reaching 5.9% by the end of 2025.** The increase in NPLR is driven by the contraction of economic activity and the rise in interest rates assumed under the adverse scenario. Simulated NPLR growth is weaker for the household sector, and slightly stronger for the non-financial corporate sector, which is more sensitive to rises in interest rates.

**Apart from the impact of non-performing exposures, the adverse scenario also projects additional costs of impairments and provisions for exposures that have not yet become non-performing,** equal to the expected credit loss (Stage 2 of credit risk) in accordance with the IFRS 9. The increase in value impairments for expected credit loss (Stage 2) is most pronounced in the first year of the adverse scenario, witnessing the strongest deterioration in economic developments and the most pronounced growth in interest rates, while the growth in value impairments and provisions for non-performing exposures (Stage 3) is stronger in the second year of the adverse scenario.

15 The existing models for forecasting non-performing loans were upgraded (see Financial Stability No. 22, Box 6) so that instead of common averaging of the results of ten selected models with the smallest RMSE value from the set of estimated models, the BACE method (Bayesian Averaging of Classical Estimates, see Sala I. Martin et al., 2004) was employed, aggregating all the estimated models into a single posterior model by applying a method which is an approximation of Bayesian model averaging (BMA).

16 Over a three-year horizon, by 0.8 percentage points for loans to non-financial corporations and housing loans to households and by 0.7 percentage points for other household loans.

Figure II.13 Projected interest rates on new business



Note: Interest rates on time deposits of corporates include only deposits in euro.  
Source: CNB.

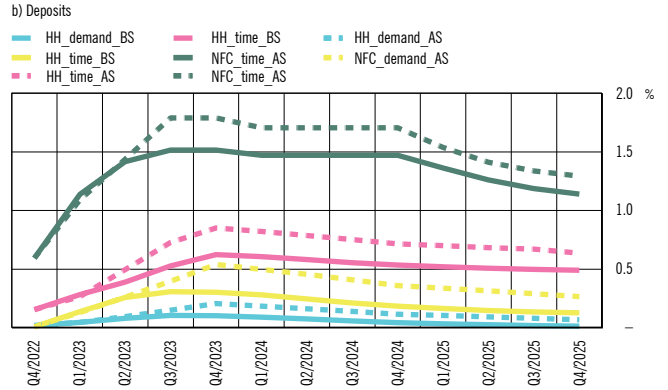
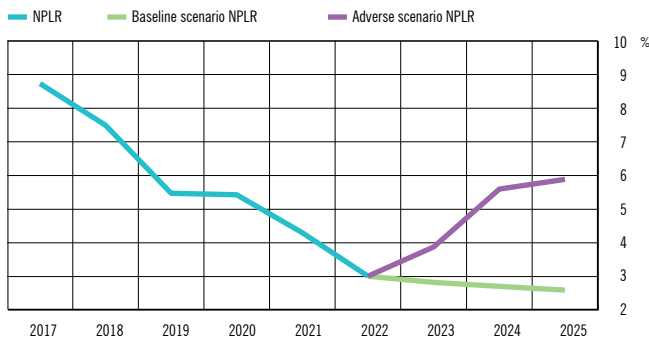
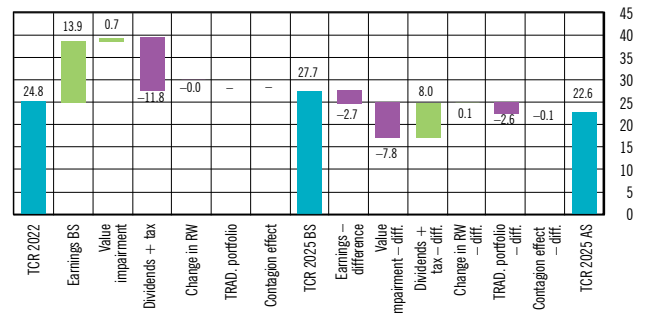


Figure II.14 Developments in total NPLR under baseline and adverse scenario



Source: CNB.

Figure II.15 Decomposition of the change in the capital ratio under baseline and adverse scenario over a three-year period from the end of 2022 to 2025



Notes: TCR 2025, BS denotes total capital ratio under the baseline scenario and TCR 2025 AS denotes the adverse scenario. In the adverse scenario, deviation from the baseline scenario is observed.  
Source: CNB.

### C.3 Assessment of banking system stability

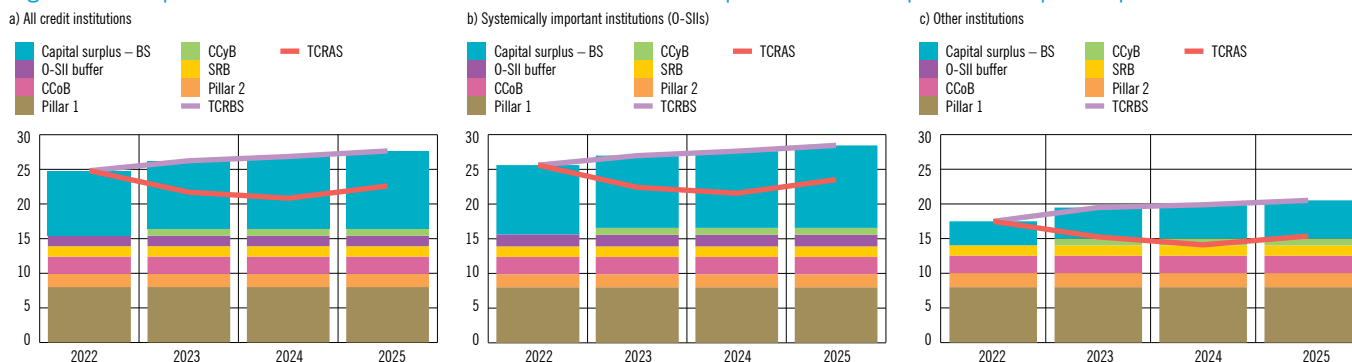
**Under the baseline scenario, the capital ratio increases from 24.8% at the end of 2022 to 27.7% at the end of 2025.** The rise in the capital ratio is primarily the result of the profit generated by credit institutions under that scenario. Both scenarios assume that credit institutions, if they have generated profit in the current year, pay taxes and make dividend payouts amounting to 80% of profit generated in the previous calendar year, which means that only a part of its earnings will be included in capital. The assumed amount of dividend payouts is limited where such payouts would mean dipping into capital buffers.

**Under the adverse scenario, the capital ratio keeps declining in the first two years of the test horizon, recovering in 2025, reaching 22.6% at the end of the period.** The differences in the estimated solvency of credit institutions under the adverse

and baseline scenarios arise from additional impairments due to credit risk materialisation in times of stress. The increase in the number of debtors with difficulties in servicing debt to credit institutions, that is, the rise in credit risk, directly spills over into lower net operating earnings. In addition, the rise in the yields on government bonds under the adverse scenario decreases their market value, with a negative effect on capital. An additional small negative effect derives from interbank contagion, measured by the indirect effects of the common exposures of all credit institutions to those institutions with insufficient capital to meet supervisory capital requirement.<sup>17</sup> Credit institutions generate less profit in the adverse scenario than in the baseline scenario, and the item “dividend payouts and taxes”

<sup>17</sup> Direct interbank contagion spreads through direct placements and obligations among credit institutions, while indirect interbank contagion spreads through the simulation of the sale of government securities by credit institutions that failed stress testing.

Figure II.16 Capital ratio under baseline and adverse scenario with respect to minimum prudential capital requirements



Notes: Pillar 1 – minimum capital requirements; Pillar 2 – own funds requirements appropriate to overall system average; SRB – systemic risk buffer; CCoB – capital conservation buffer; O-SII buffer – the capital buffer for other systemically important institutions; CCyB – countercyclical capital buffer; TCRBS – total capital ratio under the baseline scenario; TCRAS – total capital ratio under the adverse scenario. Capital surplus is defined as the balance between the total capital ratio of a credit institution and the sum total of the minimum legally prescribed capital requirements for that credit institution, i.e. as the TCR – (Pillar 1 + Pillar 2 + CCoB + SRB + O-SII buffer + CCyB). The green dashed area under the red line indicates capital surplus under the adverse scenario.  
Source: CNB.

(observing the adverse scenario relative to the baseline scenario) has a positive effect on total capital ratio.

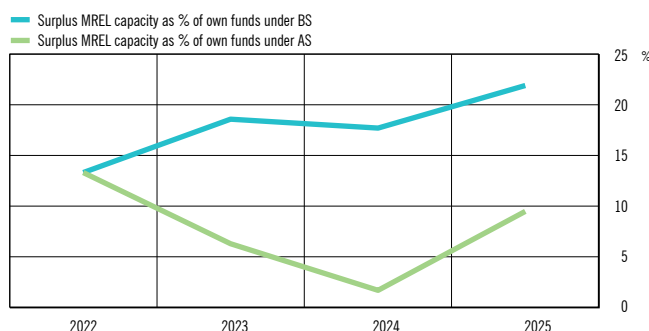
**The stress test results suggest a substantial heterogeneity across institutions (Figure II.16).** The total banking system and the aggregate of systemically important credit institutions achieved relatively good results under the adverse scenario, the accumulated capital surpluses efficiently absorbing the unfavourable effect of macroeconomic developments, so that the capital adequacy ratio held at above the legally prescribed requirements. As for other credit institutions, the significantly lower observed capital surplus was not sufficient to absorb the effect of several years of unfavourable economic developments, so other credit institutions depleted their capital surplus as early as the first year of the adverse scenario and slightly encroached on the combined capital buffer. Further economic contraction in the forthcoming years led to a gradual depletion and dipping into the combined buffer (especially in 2024). The individual results of the simulations made suggest that nine credit institutions would dip into capital buffers in the case of unfavourable macroeconomic conditions. In addition, one more credit institution would breach the own funds requirement (Pillar 2), and another would also breach the Pillar 1 requirement. Two credit institutions in total, accounting for 1.0% of total banking system assets, would not have sufficient capital to meet the supervisory capital requirement (total SREP capital ratio (TSCR)) at the end of the observed horizon.

**The stress test results are better than the previous year’s results** due to improvements in the performance of banks, and also owing to a somewhat different scenario. In the conditions of rising interest rates, credit institutions generated additional earnings from net interest income. Costs of impairments and provisions have also been reduced in this year’s stress testing exercise due to a more favourable projection of NPLR for non-financial corporations, less affected by inflation than in the previous exercise owing to the upgrading and re-estimation of the NPLR projection model. In 2022, credit institutions reduced their exposure in portfolios sensitive to the trends in

the prices of financial instruments on the market and increased their exposure in the portfolio in which the trends in the prices of debt and other financial instruments do not directly impact the value of exposure on the balance sheet. However, even though this seems to make the system safe, potential losses might be incurred if these financial instruments are to be sold.

**On top of prudential capital requirements, the banking system was capable of meeting more stringent MREL<sup>18</sup> requirements under the adverse scenario (Figure II.17).** The total banking system met the final MREL targets under both the baseline and the adverse scenario, even though in 2024 and 2025 one O-SII does not have sufficient own funds and eligible liabilities to meet both the MREL and the combined buffer requirement.

Figure II.17 Surplus MREL capacity with respect to own funds



Note: Surplus MREL capacity means own funds and eligible liabilities that exceed the MREL and combined buffer requirements.  
Source: CNB.

18 Minimum requirement for own funds and eligible liabilities.



**The test has shown that the banking system is resilient in the face of a hypothetical crisis and increased credit losses under this highly unlikely scenario.** High capitalisation of banks enables the system to remain unscathed in a highly unlikely, albeit possible hypothetical scenario of intensified and prolonged negative effects of high prices of energy and raw materials and tightened global financing conditions. Capital buff-

ers play a key role, and their build-up increases the resilience of the banking sector and creates additional room for monetary policy manoeuvre in times of crisis, in order to alleviate the potential negative effect on credit activity. At the same time, by voluntarily maintaining capital surpluses above the prescribed requirements, credit institutions are able to meet the increased buffer requirements smoothly.



# III Macroprudential policy implementation

The upward phase of the financial cycle in the Republic of Croatia continued despite uncertainty and subdued economic and financial developments at the turn of the year. Total exposure to systemic risks at the end of 2022 edged down, largely as a result of the accession to the euro area and the elimination of currency risk. The banking system remained stable and profitable. Its good capital and liquidity position enabled the continuation of intensified lending to the private non-financial sector. In such conditions, the CNB continued to pursue its macroprudential policy aimed largely at strengthening and preserving the resilience of the banking system.

# A Macroprudential policy instruments and activities

**Amid heightened uncertainty and the continued upward phase of the financial cycle, the Croatian National Bank continued to pursue its macroprudential policy aimed at preserving the resilience of the financial system.** Despite slight improvements, the weak economic growth and inflationary pressures remained the main sources of risk to financial stability, with Croatia, as a small and open economy, being extremely sensitive to spillover of surrounding unfavourable trends. Recent upheavals in the global banking industry have so far had no effect on the domestic banking market, even though their increased spillover to the EU and especially to the markets of parent institutions of domestic banks might have an adverse impact on the stability of the financial system.

**The priority of the CNB's macroprudential policy is to build up capital buffers, which increase the ability of banks to withstand potential losses should adverse economic and financial scenarios materialise.** At the end of the first quarter of 2022, the combined capital buffer for all credit institutions ranged from 4.5% to 6.5% of total risk exposure amount. It consists of the capital conservation buffer of 2.5%, the countercyclical capital buffer of 0.5% applicable as of 31 March 2023 and the structural systemic risk buffer of 1.5%, and of the corresponding O-SII buffer, which applies to other systemically important credit institutions (O-SIIs) on top of the foregoing buffers. Measures related to risk weights for real estate-secured exposures and two recommendations adopted with the aim of mitigating credit and interest rate risk in long-term consumer loans apply in addition to the above buffers (Table III.1).

## A.1 Countercyclical capital buffer

**The indicators of cyclical systemic risk continued to grow in late 2022 driven by the growth in lending and the acceleration of real estate price growth.** Credit growth was largely driven by a strong rise in demand for loans by non-financial corporations because of the increased need to finance working capital against the backdrop of surging prices of energy and

Table III.1 Macroprudential policy instruments in Croatia applicable at the end of the first quarter of 2023

Measure	Year of adoption	Description
Macroprudential measures provided in harmonised European regulations		
Capital conservation buffer	2014	2.50%
Structural systemic risk buffer	2014	1.5% for all credit institutions
O-SII buffer	2015	Seven O-SIIs with O-SII buffer ranging from 0.5% to 2%
Countercyclical capital buffer	2015	0.5%, applicable from 31 March 2022 (announced rate of 1% to be applied from 31 December 2023)
Risk weights for exposures secured by residential real estate	2014	Stricter definition of residential real estate for the use of the preferential weight of 35%
Risk weights for exposures secured by commercial real estate	2016	100%
Additional criteria for consumer creditworthiness assessment when consumer housing loans are granted	2017	When assessing consumer creditworthiness, credit institutions must take into account minimum costs of living in accordance with the Foreclosure Act
National macroprudential measures		
Recommendation to mitigate interest rate and interest rate-induced credit risk	2017	
Recommendation on actions in granting of non-housing consumer loans	2019	

Source: CNB.

some raw materials. Loans to households continued to grow steadily, especially in the segment of housing loans (see Chapter I.B). Residential real estate prices continued to rise at a high rate throughout 2022, their growth accelerating towards the end of the year, reaching 17.3% on an annual level in the fourth quarter, followed by a decline in the number of market transactions (see Chapter I.D).

**In light of such trends, credit gap indicators and the composite indicator of cyclical systemic risk signalled the need to increase the countercyclical buffer rate at the end of 2022.** In addition to the acceleration in lending, closing of the credit gap was also influenced by the protracted decline in the trend value of the credit-to-GDP ratio, which recorded a sharper fall than the credit-to-GDP ratio in 2022. Despite the growth in loans, the credit-to-GDP ratio edged down due to a relatively faster growth of GDP, which can be associated with inflation, which tends to have an immediate effect on GDP and a lagged effect on the stock of loans. As a result, specific credit gap indicators for the Republic of Croatia<sup>19</sup> continued to close, with some gap indicators already moving into positive territory (Figure III.1). The movements of the cyclical risk composite index also suggest the continuation of the upward phase of the financial cycle. The composite index comprises a wide range of indicators related

to excessive credit growth, divided into six risk categories as recommended by the ESRB<sup>20</sup>, which have been assigned equal weights<sup>21</sup>. Almost all indicator categories contributed to the rise in the composite index in 2022, with the largest contribution coming from credit dynamics and trends in the residential real estate market (Figure III.2).

**Due to further accumulation of cyclical risks, the CNB decided to further increase the countercyclical buffer rate.** By building up the countercyclical buffer, the CNB boosts the resilience of banks and creates additional room for macroprudential policy action in the event of adverse economic and financial scenarios materialising. The [decision on the increase of the rate](#) from 0.5% (applicable as of end-March 2023) to 1% (to be applied as at the end of the year) was adopted in December 2022, while its likely increase in the face of protracted accumulation of cyclical risks was announced as early as in August. The CNB also took account of the good capital position and profitability of banks (see Chapter II). Banks have been maintaining considerable surplus capital at the aggregate level, and thus meeting the new capital requirement should not have a negative impact on the availability of bank lending.

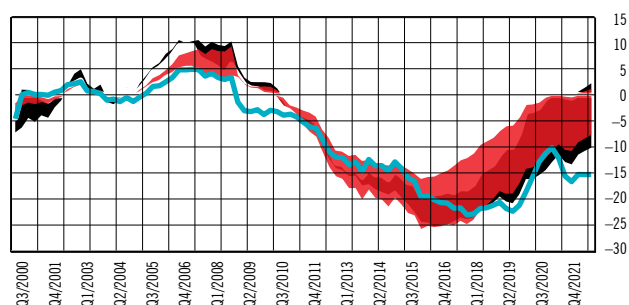
**The CNB will continue to timely adjust the countercyclical**

19 Specific credit gap indicators for the Republic of Croatia include 12 indicators: six absolute and six relative gaps, calculated by using different definitions of credit and different smoothing parameters. For more information, see the CNB's publication [Macroprudential Diagnostics No. 16](#) and Škrinjaric, T. (2022), New Indicators of Credit Gap in Croatia: Improving the Calibration of the Countercyclical Capital Buffer, [Working Papers W-69](#), June.

20 Recommendation of the European Systemic Risk Board of 18 June 2014 on guidance for setting countercyclical buffer rates ([ESRB/2014/1](#)).

21 For more details, see CNB's publication [Macroprudential Diagnostics No. 16](#) from February 2022 and Škrinjaric, T. (2022), Introduction of the composite indicator of cyclical systemic risk in Croatia: possibilities and limitations, [Working Papers W-68](#), July.

Figure III.1 Credit gap



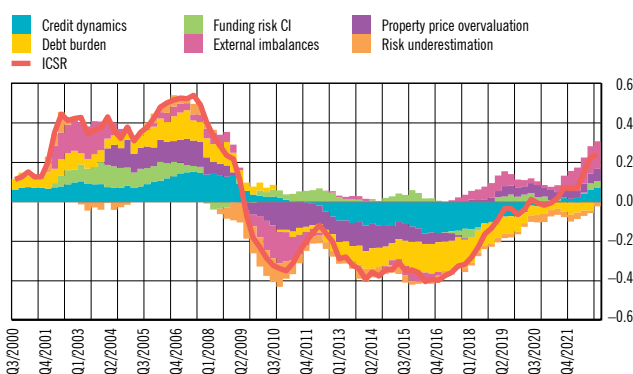
Notes: The figure shows the Basel gap (blue curve) and the range of 12 credit gap indicators which have better signalling properties for the Republic of Croatia than the Basel gap. The red shaded areas indicate the range of absolute gaps, while the black shaded areas indicate relative gaps.  
Source: CNB.

**buffer rate to the evolution of cyclical risks in the light of domestic and global financial and economic developments.** The build-up of cyclical vulnerabilities in the mature phase of the cycle, amid relatively favourable macrofinancial circumstances, might trigger additional increases in the countercyclical buffer rate. Responding to the regular quarterly risk assessment, the CNB submitted for public consultation its draft decision on the additional increase of the rate to 1.5%, applicable as of June 2024. This expands room for a counter-cyclical macroprudential policy action in the case of a reversal in the financial cycle, given that a clear and strong materialisation of systemic risks might induce a reduction or cancellation of the countercyclical buffer, if necessary, and thereby support the continuity of the credit activity of banks.

## A.2 Coverage of risks associated with the real estate market

**In order to increase banks' resilience to risks associated with the real estate market, the CNB also applies measures related to risk weights for banks' exposure to residential real estate** (stricter definition of residential real estate for the application of the preferential risk weight of 35%) and **commercial real estate** (higher risk weight for exposures secured by commercial real estate – 100%). Risk weights are reviewed annually in light of the incurred and expected losses on these exposures, also by taking into account the real estate market trends and other financial and economic developments. The last review was carried out in the second quarter of 2022, and it has been found that the applicable risk weights are still commensurate to the established risks. The CNB also regularly monitors and analyses data on household lending standards (see Chapter 1.B), but has so far not introduced any borrower-based macroprudential measures. Considering the relatively low bank exposure arising from housing loans and the reduced scope of such measures in the light of the fact that a large portion of residential property purchase and sale transactions were not financed with bank

Figure III.2 Indicator of cyclical systemic risk (ICSR)



Note: ICSR with equal weight of 1/6 by groups of indicators.  
Source: CNB.

loans, with a large share of housing loans being accounted for by subsidised loans that are usually not subject to restrictions, the CNB has not seen the need to introduce such measures so far.

## A.3 Coverage of structural systemic risks

**The exposure of the financial system to structural systemic risk remained at a moderately elevated level.** Of the structural vulnerabilities of the domestic economy, which, as a small and open economy, is highly susceptible to the spillover of the effects from the international environment, particularly noteworthy are a relatively high public debt level, high exposure of the banking sector to the government and the imbalances in the labour market seen in the very low rates of labour force participation and unfavourable demographic and migration trends that limit the potential for economic growth (see Chapter 1.A). In light of the above, following its regular review of the structural systemic risk buffer rate at the end of 2022, the CNB **maintained** this rate at the current level of 1.5% of the total amount of risk exposure for all credit institutions. In addition, even though Croatia's entry into the euro area at the beginning of 2023 reduced structural vulnerabilities associated with currency risk (see Box 5), this will not lead to a change in the structural systemic risk buffer given that these risks were covered by bank-specific capital requirements set by microprudential supervisory authorities.

**Market concentration risks remained stable, given that banking market structure in the Republic of Croatia did not undergo any significant changes.** The regular review of the systemic importance of credit institutions carried out in the last quarter of 2022 confirmed that there were still **seven other systemically important credit institutions**. They were identified by using the standard scoring approach, complemented by expert judgement, which resulted in one institution, whose score was for the first time below the threshold, keeping its O-SII status.

Table III.2 Other systemically important institutions

O-SII CREDIT INSTITUTION	Buffer rate set for O-SII as from 1 January 2023	Buffer rate that O-SIIs are obligated to maintain as from 1 January 2023 <sup>a</sup>
Zagrebačka banka d.d., Zagreb	2.0%	2.0%
Privredna banka Zagreb d.d., Zagreb	2.0%	1.75%
Erste&Steiermärkische Bank d.d., Rijeka	2.0%	2.0%
Raiffeisenbank Austria d.d., Zagreb	1.5%	1.5%
OTP banka Hrvatska d.d., Split	1.5%	1.5%
Hrvatska poštanska banka d.d., Zagreb	0.5%	0.5%
Addiko Bank d.d., Zagreb	0.5%	0.5%

<sup>a</sup> Taking into account the status of the parent O-SII or G-SII in the EU, where applicable.

Source: CNB

**The capital buffer rates to be maintained by O-SIIs range from 0.5% to 2% of the total risk exposure amount**, in proportion to their systemic importance and historical losses in the banking system (Table III.2). For two O-SIIs, the rates were adjusted from the year before in order to better reflect their relative systemic importance compared to the largest O-SIIs. In addition, if an O-SII authorised in the Republic of Croatia is also a member of a group that is an O-SII or a global systemically important institution in the EU on a consolidated level, such a credit institution is obligated to maintain the O-SII buffer up to the rate applicable to the parent institution increased by 1 percentage point, up to a maximum of 3%. Accordingly, in 2023 one O-SII in the Republic of Croatia is required to maintain a lower rate than the prescribed rate.

# B Implementation of macroprudential policy in European countries

**In early 2023, the ESRB warned about the increase in systemic risks associated with the commercial real estate market in the European Economic Area.** Following the analysis of vulnerabilities related to the residential real estate market and the issued warnings and recommendations to several member states in late 2021, in 2022 the ESRB also analysed the vulnerabilities linked to the commercial real estate market. In this context, in January 2023 the ESRB recommended<sup>22</sup> all member states to improve the control and monitoring of risks associated with this real estate market segment, ensure sound financing practices and increase the resilience of financial institutions to the related risks. The European Commission was recommended to start developing activity-based tools aimed at mitigating risks associated with the commercial real estate market, applicable across all financial institutions exposed to the commercial real estate market.

**Considering the slowdown of the financial cycle in most member states, only some of them tightened their macroprudential policy measures in the first quarter of 2023.** Following a widespread tightening in 2022, in the first quarter of 2023 only two countries – France and Iceland – increased the announced countercyclical capital buffer rate. As previously announced, France raised the rate from 0.5% to 1%, applicable as of January 2024, in order to reinforce the resilience of its banking system to potential losses associated with the reversal of the financial cycle and the related deterioration in the financial situations of highly indebted households and corporates. Similarly, the central bank of Iceland lifted the countercyclical buffer rate from 2% to 2.5%, applicable as of March 2023. Malta and Finland adopted new structural measures. Malta introduced a sectoral systemic risk buffer for exposures to mortgage loans of 1.5% and joined several other countries that have adopted this measure in the last two years (Belgium, Germany, Slovenia,

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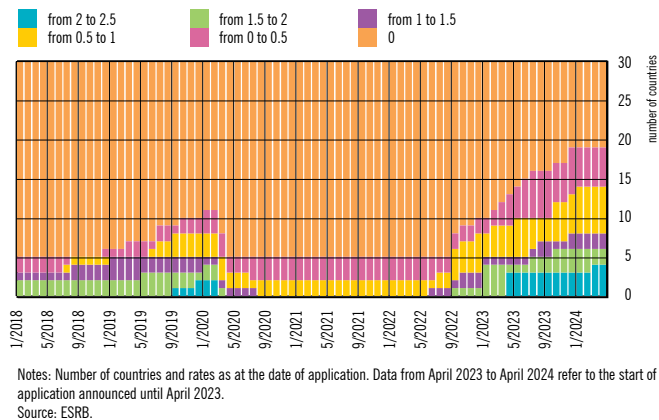
<sup>22</sup> Recommendation of 1 December 2022 on vulnerabilities in the commercial real estate sector in the European Economic Area (ESRB/2022/9)



Lithuania and Lichtenstein). Finland introduced a structural systemic risk buffer of 1% for all exposures, to be applied from April 2024. The intention is to increase the overall resilience of the financial system to potential losses in the case of recession, having regard to stress test results that have shown the necessity to increase capital buffers.

**The number of member states applying the countercyclical capital buffer increased substantially over the past year.** Following the shock caused by the pandemic, there is a growing number of countries that started applying the countercyclical capital buffer as a response to the build-up of cyclical risks following economic recovery. The tightening of the countercyclical buffer in many countries continued even after the outbreak of war in Ukraine, despite elevated uncertainty, inflationary pressures and a deteriorating economic outlook, with the aim of making the surplus capital available for use and in order to boost banking sector resilience regardless of the maturing financial cycle. Drawing on the experience from the shock that was induced by the sudden outbreak of the pandemic and was not associated with any previous accumulation of cyclical risks, some countries decided to introduce a positive neutral rate for the countercyclical buffer (Cyprus, Estonia, Ireland, Lithuania and the Netherlands). A positive neutral rate means maintaining the rate above zero also when cyclical risks are not yet elevated, thus creating a capital buffer that is available for a release when sudden crises not related to the financial cycle occur.

Figure III.3 Countercyclical capital buffer in the EEA



According to the latest announcements, by end-April 2024, a countercyclical buffer rate above zero will be applied in more than two-thirds of the EEA member states (in 19 out of 30 member states), the highest number since its introduction in the European regulatory framework. In addition to the activation of a positive rate, these countries also increased the existing rates of this buffer (Figure III.3) that applied in the pre-pandemic period.

## Box 7 Assessment of the macroprudential policy stance by applying the growth-at-risk approach

The growth-at-risk approach is one of the ways to assess the efficiency of macroprudential policy. The costs arising from the potential decrease in the average future growth and the benefits of macroprudential policy implementation in reducing the severity and probability of crises are observed through the projection of the full distribution of future economic growth. The empirical assessment for the Republic of Croatia suggests that the tightening of macroprudential policy in normal times does not have a negative impact on the expected future growth, but can decrease negative risks under adverse scenario.

### Motivation and introductory definitions

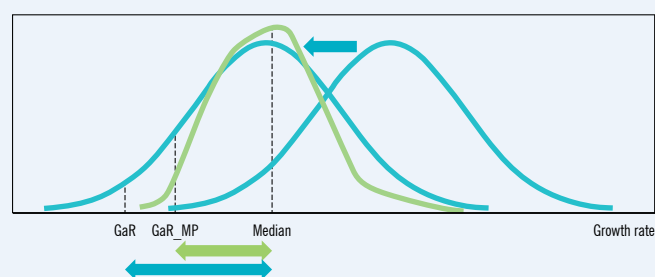
**Macroprudential policy<sup>1</sup> can be regarded as risk management.** The conduct of policies involves balancing the risk of a financial crisis in the case of an under-capitalised banking system against the risk that an overly stringent policy could excessively subdue lending and economic growth. In other words, macroprudential policy involves comparing the expected costs and benefits of alternative stance measures in different macroeconomic scenarios. The macroprudential measures aimed at taming the financial cycle and boosting the resilience of the financial system come at a price, in view of the negative impact on the average growth of economy under baseline, most likely, scenarios. On the other hand, these measures cushion the intensity and the consequences of financial crises in unlikely, albeit still possible, adverse macroeconomic scenarios. The calibration of macroprudential measures involves finding the balance between systemic risk and resilience in the context of the implemented macroprudential policy, where the residual level of systemic risk following the implementation of mitigation measures is acceptable and viable in the financial system in the long term (see Box 1).

**One of the methodologies for comparing potential costs and benefits of macroprudential policy is the growth-at-risk approach (GaR).** It is an empirical model which links the current macrofinancial conditions and macroprudential policy stance with the distribution of economic growth, that is, examines their impact on the probability of the materialisation of adverse macroeconomic scenarios.

**The GaR approach considers the full distribution of future economic growth,** with the actual macroprudential policy trajectory being one of the variables used in projecting the real developments in different scenarios. Focusing on the full distribution of economic growth provides an overview of the average impact of macroprudential policy on expected growth, but also enables the assessment of its impact on the probability of materialisation of less likely, negative, outcomes (Adrian et al., 2016). In such an analytical framework, macroprudential policy tightening should increase the future growth-at-risk (that is, reduce the probability of materialisation of adverse future economic scenarios), albeit at the cost of a reduced median (or average) growth. To be more precise, the model assesses growth-at-risk, which is defined as the GDP growth under an adverse

scenario<sup>2</sup>, the expected median growth and their distance to tail (DTT). Active implementation of macroprudential policy should have a positive effect on the lower tail of the future growth rate distribution, and the value of growth rate at some of the lower percentiles should draw close to the central part of distribution (Figure 1). Such a change in growth distribution implies that a more stringent macroprudential policy stance reduces the probability and the severity of extremely unfavourable economic scenarios. In contrast, a relaxed macroprudential policy usually increases the distance between these two growth rates.

Figure 1 Comparison of growth distributions before and after a negative shock, with and without macroprudential policy



Notes: The right distribution in blue denotes growth rate prior to shock. The left distribution in blue denotes future growth rate following a negative shock, without any macroprudential policy measures being implemented. The distribution in green denotes future growth rate following a negative shock, with the application of current macroprudential policy. DTT for the distribution marked in green is shorter than the one marked in blue. GaR and GaR\_MP denote growth-at-risk in the economy with and without macroprudential policy.  
Source: adjusted according to Duprey and Ueberfeldt (2020).

### Methodology description and results

**In order to empirically assess the efficiency of macroprudential policy based on the growth-at-risk approach, assessment should be made of the model linking the macrofinancial conditions in the economy and the actual macroprudential policy with the full distribution of future economic growth.** In the literature (see Adrian et al., 2016), such a model is usually assessed by using quantile regression, which allows for an assessment of the effects of the selected variables on the dependent variable in any band of distribution of variable  $y$ :

$$y_{t+h}(\theta) = \beta_0(\theta) + \beta_1(\theta)MPI_t + \beta_2(\theta)y_t + \beta_3(\theta)Stress_t + \beta_4(\theta)FR_t + \varepsilon_t(\theta)$$

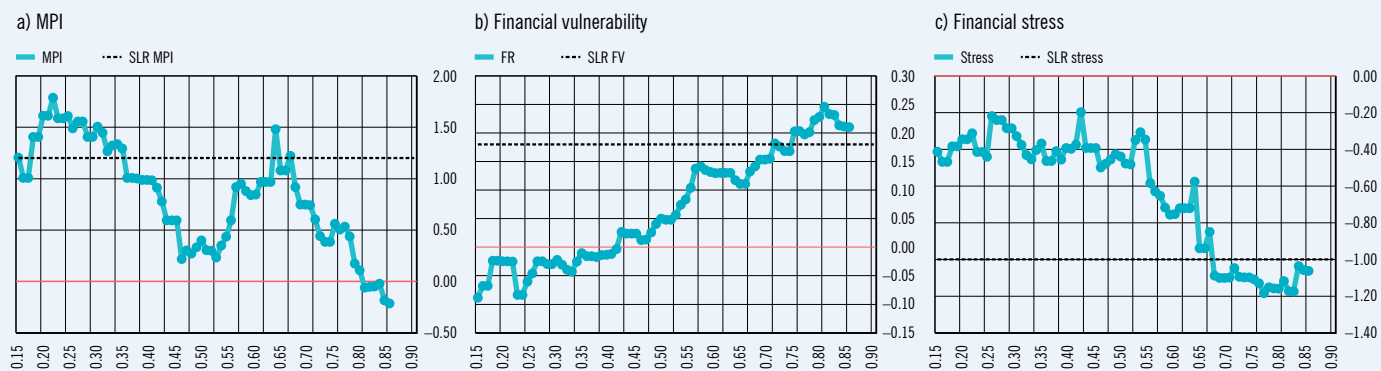
where  $y$  denotes real GDP growth rate, MPI denotes the indicator of macroprudential policy stance, measured by the macroprudential policy index constructed as the difference between the number of measures aimed at tightening and loosening of macroprudential policy<sup>3</sup>, stress

2 In the literature, GDP growth is usually observed at the 5th, 10th or 15th percentile of distribution, depending on data availability. Lower percentiles can be used for panel analyses or analyses of long time series due to a sufficient number of available observations. This research uses the 15th percentile of GDP growth distribution given the relatively small number of available observations (from the third quarter of 1994 to the second quarter of 2022). Using a narrower tail of distribution (at the 1st or the 5th percentile) would additionally reduce the reliability of results. See Koenker, R. (2005): Quantile regression, Cambridge University Press.

3 Macroprudential policy index was constructed by the CNB by adjusting data derived from two international databases (ECB and IMF) and using available information about past CNB measures and expert judgement.

1 For more information on the importance of macroprudential policy in the aftermath of the global financial crisis, see Carstens, A. (2021); Ampudia et al. (2021) and Portes et al. (2020).

Figure 2 Estimated parameters of quantile regression, four quarters ahead



Notes: SLR denotes the value of the estimated coefficient in a simple linear regression (black dotted line). The red dotted line denotes 0 value. The x-axis shows percentiles used for the purpose of estimation, while the y-axis shows the values of the estimated parameter for the selected explanatory variable.  
Source: CNB calculation.

denotes the measure of stress on financial markets, measured by the financial stress index (HIFS)<sup>4</sup>, while FV denotes financial vulnerabilities, measured by observing the annual changes in credit-to-GDP ratio, reflecting the accumulation of cyclical risks. While stress in financial markets has a negative effect on economic growth as early as in the short term, the adverse impact of financial vulnerabilities can be expected no sooner than in the medium term.

**Due to the issue of multicollinearity and endogeneity of macroprudential policy, instead of using the original macroprudential policy index, the above model uses the residual component of the ordered probit regression model as the MPI variable.**<sup>5</sup> In the ordered probit regression, the macroprudential policy index represents the dependent variable, while  $y$ , FV and stress in the previous three quarters represent explanatory variables;  $q$  denotes quarter, while  $h$  is the number of the forthcoming quarters, that is, the future growth rate projection horizon,  $\theta$  is the quantile at which the model is estimated<sup>6</sup> and  $\varepsilon$  is a random component.

**The results of the analysis suggest that the values of individual assessed parameters change depending on the position in the economic growth distribution** (one year ( $h =$  four quarters)) in the future, justifying the application of quantile regression (Figure 2). The parameters of the macroprudential policy variable show that the effect of its change is the strongest at the lower tail of future growth distribution (the fifteenth

percentile and the percentiles near the fifteenth percentile), while it decreases at higher percentiles, meaning that the effect is almost immaterial for the median growth. This means that macroprudential policy tightening decreases the probability of very adverse economic outcomes in the short term, but should not have a substantial negative impact on the average growth. The positive parameters of the macroprudential policy variable have also been assessed at some higher percentiles, which is not intuitive.

**Observing the effect of macroprudential policy on the future growth over longer horizons, a substantial positive effect at the lower tail of growth distribution can be seen** for all horizons (except for three years ahead, which might be the result of short time series, making the estimation more difficult) (Figure 3). The assessed parameters linked to the financial vulnerability variable suggest their small negative effect on the left part of the future growth distribution, and a positive effect on its right part. This is not surprising given that indicators such as the credit ratio are used to foresee crises over the medium term (12 – 16 quarters, see Škrinjarić and Bukovšak, 2022), while in the short run, the financial cycle often overlaps with the business cycle, especially in their upward phases.

**As expected, there is a negative correlation between financial stress and economic growth in the short term, over the entire distribution of economic growth.** Significant disruptions in financial markets quickly exacerbate the perception of risk and general uncertainty, with a negative effect on spending and investment decisions, and consequently on real economic activity, with such an effect being most prominent during strong expansionary phases.

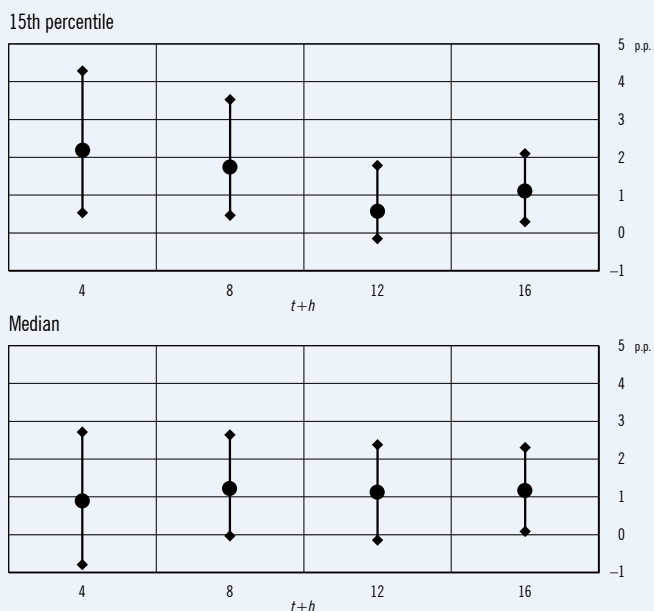
**In order to clearly illustrate the effects of macroprudential policy on the intensity of bad economic growth outcomes, Figure 4 shows the distance to tail (DTT) between the median growth and growth-at-risk** for  $h = 4$ , where, e.g., the observations in June 2022 are interpreted as the value of DTT in the given quarter, with macroprudential policy action and trends in financial stress and vulnerability the year before. As these are estimated values based on quarterly data, the value of the distance fluctuates considerably, but its trend can be isolated (the grey curve), with the red arrows denoting its changes. As the preferences of macroprudential policy makers concerning the acceptable distance have

4 Financial stress index (HIFS) means the indicator described in Box 1 of Financial Stability No. 20, while stress as defined in Box 2 of this publication should be used for the period from 2023 onwards. The FV variable has been calculated as the ratio of bank loans to the non-financial private sector and the sum of the four trend values of seasonally adjusted nominal GDP (the value in the current quarter and in the previous three quarters).

5 Macroprudential policy is not exogenous in the analysis because it depends on macroeconomic developments. Consequently, if the intention is to observe the effects of macroprudential policy on future economic growth, the problem of endogeneity should be at least partly alleviated. The estimated residuals denote macroprudential policy shock based on the observed macrofinancial conditions in the economy.

6 By selecting  $\theta = 0.5$  and  $0.15$ , the model is assessed for median growth and the growth-at-risk, serving as a basis for the calculation of DTT:  $y_{t+h}(\hat{0}, 0.5) - y_{t+h}(\hat{0}, 0.15)$  and serves as a basis for assessing macroprudential policy stance.

Figure 3 The effects of macroprudential policy on future growth (one to four years ahead), for the 15th percentile and median



Notes: Interval estimates are obtained by using the block bootstrap method, with 1000 iterations, representing 90% intervals. The x-axis shows the future horizons for  $h = 4, 8, 12$  and  $16$  quarters, while the y-axis shows the value of estimated parameters for the MPI variable in quantile regression (effect on the GDP growth rate). Source: CNB.

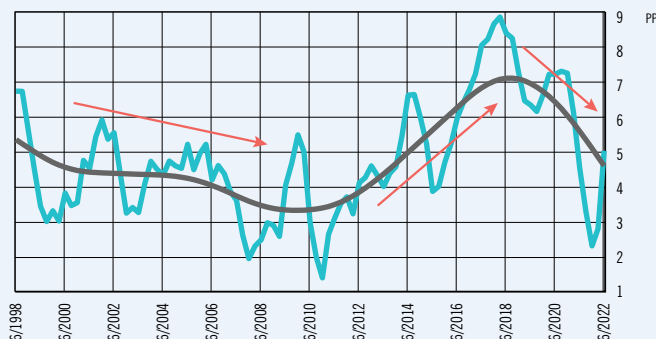
not been defined a priori, the figure shows only the general trend of the value, without any indication of the preferred DTT span, which depends on the risk tolerance of macroprudential policy makers. Naturally, in addition to macroprudential policy, there are also numerous additional economic, financial and other factors influencing the movements of DTT.

**The movement of DTT is closely linked to the periods in which the CNB tightened or loosened its macroprudential policy stance.** In the years before the global financial crisis, the CNB intensively worked on introducing new and strengthening the existing measures to rein in excessive credit growth and alleviate related macroeconomic imbalances. These included various measures of increasing liquidity and capital requirements, quantitative limits on credit growth and other similar measures<sup>7</sup>. The estimated DTT gradually decreased as the monetary stance tightened. Following the outbreak of the crisis and during the lengthy recession that followed, DTT started to grow, influenced by the lifting or loosening of measures (e.g. marginal reserve requirement and the measure on the subscription of compulsory CNB bills were lifted in 2008), and its upward trend mostly continued steadily until 2017. As the economy emerged from the recession and banks' lending activity gradually intensified, DTT started to decrease, partly due to the unprecedented contraction of GDP following the outbreak of the pandemic<sup>8</sup> and the gradual tightening of the CNB's macroprudential policy. For instance, in early 2019 the CNB responded

7 For more details, see e.g. Vujčić, B. and Dumičić, M. (2016).

8 Even though efforts were made to correct the large decline in 2020 following the outbreak of the coronavirus pandemic and the surge in the GDP growth rate the following year, given that the assessment involves a dynamic model, where shock is found in variables on both the left and the right side of equality in the model for

Figure 4 Distance between the median growth and the growth-at-risk



Source: CNB calculation.

to the fast growth in cash loans to consumers amidst relatively relaxed credit standards by issuing its Recommendation on actions in granting non-housing consumer loans.

**The growth-to-risk approach is a tool that enables the macroprudential policy makers to estimate the benefits and costs of macroprudential measures in terms of their impact on the future economic growth under various macroeconomic scenarios.** However, the model does not provide a solution as to the optimal macroprudential policy stance; rather, it depends on the preferences of and caution on the part of policy makers. The findings for the Republic of Croatia suggest that macroprudential policy tightening in normal times does not disturb the future average economic growth, but might cushion the intensity of downside risks if they materialise. This finding is consistent with the core objectives of macroprudential policy: boosting the resilience of the financial system and mitigating the negative effects of risk materialisation, with the ultimate goal of contributing to economic growth.

**However, this approach to measuring the macroprudential policy stance suffers from several drawbacks.** The results are sensitive to changes in the definition and transformation of explanatory variables, for which no consensus has yet been reached, and so the findings in the empirical literature are not comparable and are often contradictory. The definition of the macroprudential policy variable does not capture the intensity of measures. Instead, it only involves listing of the tightening and loosening measures. Finally, the relatively short time series that are used in such analysis also affect the quality of results since they do not cover a large number of observations for individual quantiles of growth rate distribution or there are insufficient observations of macroprudential policy measures, especially in the periods of their relaxation. The GaR model provides a simplified, bird's-eye view of macroprudential policy effects and the analysis should be complemented by micro-analyses focusing on the actual objectives that macroprudential policy measures strive to achieve.

different time shifts, no optimal way to make such correction has been found. A potential solution has been proposed in Kipriyanov (2022), where the author made recursive estimations every time new data were obtained. However, after the models were updated with data for the entire COVID-19 period, none of them managed to successfully capture the large shock in the GDP dynamics.

## Abbreviations and symbols

### Abbreviations

AS	– adverse scenario	ILO	– International Labour Organization
bn	– billion	IMF	– International Monetary Fund
BS	– baseline scenario	IR	– interest rate
CAR	– capital adequacy ratio	LTIR	– long-term interest rates
CBS	– Central Bureau of Statistics	m	– million
CCE	– Croatian Chamber of Economy	MoF	– Ministry of Finance
CDCC	– Central Depository & Clearing Company	MRR	– marginal reserve requirements
CDS	– credit default swap	NFC	– non-financial corporations
CEE	– Central and Eastern European	NPLR	– ratio of non-performing loans to total loans
CES	– Croatian Employment Service	OECD	– Organisation for Economic Co-operation and Development
CICR	– currency-induced credit risk	OF	– own funds
CIHI	– Croatian Institute for Health Insurance	ON USLIBOR	– overnight US dollar London Interbank Offered Rate
CIs	– credit institutions	pp	– percentage points
CM	– Croatian Motorways	RC	– Republic of Croatia
CNB	– Croatian National Bank	ROAA	– return on average assets
CPII	– Croatian Pension Insurance Institute	ROAE	– return on average equity
DAB	– State Agency for Deposit Insurance and Bank Resolution	RR	– reserve requirements
EAD	– exposure at default	RWA	– risk-weighted assets
EBA	– European Banking Authority	SDR	– special drawing rights
EBITDA	– earnings before interest, taxes, depreciation and amortisation	SEE	– South-Eastern European
EC	– European Commission	yoy	– year-on-year
ECB	– European Central Bank	ZIBOR	– Zagreb Interbank Offered Rate
EFSF	– European Financial Stability Facility	ZSE	– Zagreb Stock Exchange
EIZG	– Institute of Economics, Zagreb		
EMBI	– Emerging Market Bond Index		
EMU	– Economic and Monetary Union		
EONIA	– Euro Overnight Index Average		
ERM	– Exchange Rate Mechanism		
ESM	– European Stability Mechanism		
EU	– European Union		
EULIBOR	– Euro London Interbank Offered Rate		
EUR	– euro		
EURIBOR	– Euro Interbank Offered Rate		
f/c	– foreign currency		
FDI	– foreign direct investment		
Fed	– Federal Reserve System		
FINA	– Financial Agency		
FRA	– Fiscal Responsibility Act		
FSI	– financial soundness indicators		
GDP	– gross domestic product		
GFS	– Government Finance Statistics		
HANFA	– Croatian Financial Services Supervisory Agency		
HBS	– Household Budget Survey		
HH	– households		
HREPI	– hedonic real estate price index		
HRK	– Croatian kuna		
IBIR	– interbank interest rates		

### Two-letter country codes

BA	– Bosnia and Herzegovina
BG	– Bulgaria
CZ	– Czech Republic
EE	– Estonia
HR	– Croatia
HU	– Hungary
LT	– Lithuania
LV	– Latvia
MK	– The former Yugoslav Republic of Macedonia
PL	– Poland
RO	– Romania
SI	– Slovenia
SK	– Slovak Republic

### Symbols

–	– no entry
....	– data not available
0	– value is less than 0.5 of the unit of measure being used
∅	– average
a, b, c,...	– indicates a note beneath the table and figure
*	– corrected data
( )	– incomplete or insufficiently verified data





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