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Contents

General assessment of the main risks and challenges to financial stability	5
1 Macroeconomic environment	8
2 Government sector	15
3 Household sector	19
Box 1 A new source of data on consumer lending standards	24
4 Real estate	27
Analytical annex: Commercial real estate market	30
Box 2 Regional differences in real estate demand	33
5 Non-financial corporate sector	36
Box 3 Croatian firms with characteristics of the fourth industrial revolution (I4.0)	41
Box 4 The survival of zombie firms and risks to financial stability	44
6 Credit institutions	47
Box 5 Climate changes and their importance for credit institutions	54
7 Stress testing of credit institutions	58
Box 6 Macro models for forecasting non-performing loans	64
8 Macroprudential policy implementation	68

General assessment of the main risks and challenges to financial stability

The beginning of the second year of the COVID-19 pandemic was marked by a high level of uncertainty regarding the development of the health and economic situations in the country and abroad. The emergence of new strains of the coronavirus, rising numbers of cases of new infections, the slow and uneven distribution of vaccines and extension of restrictive epidemiological measures around the world fuelled uncertainty regarding the recovery of economic activity and financial stability.

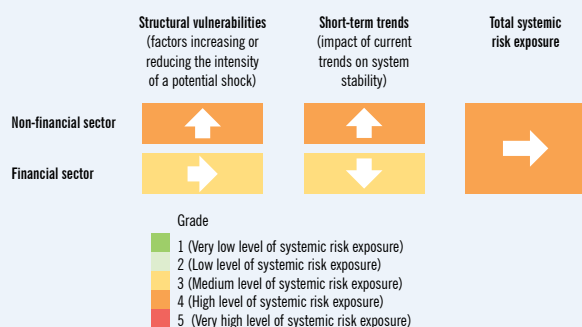
Owing to the swift action and ample support of fiscal and monetary policy, coupled with the relaxation of supervisory requirements, the effects of the pandemic and the associated restrictive epidemiological measures were largely contained, with the exception of economic segments highly sensitive to physical distancing, which were severely stricken. In the first year since the beginning of the crisis, the financial sector proved to be resilient, owing to the measures taken as well as to the liquidity and capital reserves built in the years before. It was under these extraordinary circumstances that, in mid-2020, Croatia joined the European Exchange Rate Mechanism (ERM II), with

the CNB becoming, through close cooperation, a participant in the European Single Supervisory Mechanism and Single Resolution Mechanism, one of the key steps on the path to euro introduction and reduction of the risks to financial stability.

The total exposure of the financial system to systemic risks remained high in the year following the outbreak of the pandemic (Figure 1). The risks associated with developments in the non-financial sector are estimated to have risen additionally, fuelled by uncertainty regarding the duration and final impacts of the pandemic. However, strong measures taken at the beginning of the pandemic soon mitigated initial volatility in the financial markets and the impact of some of the risks that materialised early on in the pandemic, such as the increase in debt risk premium or liquidity pressures, which had a favourable impact on short-term financial sector indicators. Nevertheless, credit institutions continue to be faced with the threat of rising credit risk cost and a further decline in interest income with an unfavourable impact on profitability. Exposures to the government and the real estate market also continued to rise.

Despite the unfavourable macroeconomic environment, social distancing and uncertainty regarding the pace and intensity of recovery, the real estate market has proved to be one of the most resilient segments of the economy during the crisis. Transactions fell only slightly while prices continued to grow, exhibiting regional divergence. In the same way as in the years before, demand was spurred by the government programme of subsidised housing loans, favourable lending terms against the backdrop of very low interest rates, stable employment and income with rising savings and the reduced attractiveness of alternative investments. Also, changes in life habits instigated by the pandemic, such as working from home and maintaining physical distance, added to rising demand. Although price growth slowed down from the previous year, prices are increasingly departing from the equilibrium level based on fundamentals, which increases the risks to financial stability arising from a possible sharp plummet in prices. Therefore, in the

Figure 1 Risk map



Note: The arrows show changes in relation to the Risk map published in Financial Stability, No. 21.
Source: CNB.

forthcoming period the CNB will pay particular attention to the analysis of developments in the real estate market and credit activities of banks associated with that segment of the economy. The new system for the collection of granular data on consumer lending standards will play a special role in this analysis as it will enable close monitoring of consumer lending standards, such as maturity, the burden of loan repayment on income, loan to value ratio or loan to collateral ratio, etc.

A very small increase in systemic risks in the household sector is the result of fiscal support measures for job preservation, which prevented a significant fall in employment and preserved the disposable income of households. Growing uncertainty and the erosion of consumer confidence as well as physically restricted presence in the consumption of individual goods and, particularly, of services, led to a sharp fall in consumption and a rise in savings, driven by citizens' efforts to channel their savings into the safest and most liquid forms of assets, such as deposits with credit institutions and early loan repayments. In contrast to the fall in general-purpose cash loans, there was a growth in housing loans, which accelerated, spurred by their greater availability. However, this was not sufficient to offset the fall in general-purpose cash loans with the result that total household lending slowed down considerably. Although moratoriums were granted for only a small part of household loans, most of which expired before the end of the last year, systemic risk materialisation in the household sector is still limited.

Systemic risks associated with the non-financial corporations sector are more pronounced. The impact of the crisis on individual activities is highly heterogeneous, with operating income of companies in accommodation and food service activities, transport and service activities falling the most. Neither the relatively ample fiscal support measures and the moratoriums on financial obligations, nor the measures taken to cut back on expenses have been able to compensate for the fall in income, with companies in the affected activities increasing the use of new liquidity and working capital loans and curtailing development projects. Temporary suspension of foreclosure and bankruptcy proceedings and financial support provided to the economy decreased the intensity of entries and exits of companies from the market, which over a long term carries specific risks to financial stability; amid decreased dynamics, companies with unsustainable business models that do not contribute to productivity growth in the economy also remained on the market, reducing the availability of resources for the growth of sound companies. By contrast, technologically more advanced companies showed themselves to be more resilient at the time of crisis, and given their superior business results, such companies will be able to kick start a healthy recovery of the economy. It is therefore vital to continue monitoring companies' entries into and exits from the market and the structure of companies active in the market, and to channel support measures to companies with sustainable business models.

Public finances have deteriorated, adversely affected by unfavourable economic developments and support measures to the economy during the pandemic. The fall in total revenues and

rise in the expenditures of the consolidated general government led to a big budget deficit and a large increase in public debt. However, low and considerably stable sovereign risk premiums and favourable financing conditions facilitated deficit financing, mainly relying on domestic sources of financing. Also, the government's financial position was alleviated by increased transfers from the EU budget. Persistently strong ties between the government and the banking sector in the RC and unfavourable developments in the government sector increase potential risks to overall financial system stability.

Unfavourable impacts of the pandemic have thus far spilt only partially over onto credit institutions owing to the measures taken to facilitate debtors' positions, which also indirectly help banks, and the temporary favourable regulatory treatment of the moratoriums. Credit institutions used the growth in the sources of funds, spurred primarily by growth in residents' deposits, for housing loans and to a lesser extent for government and companies' working capital financing. The fall in interest rates and the change in the structure of placements towards lower yield assets had an adverse impact on revenues, which, together with the increase in value impairment costs on other placements halved bank profits and consequently reduced profitability indicators. The banks did not make any significant cuts in operating expenses in the short term, and the process of digitalisation, which can increase banks' cost efficacy, is relatively slow. Credit institutions must prepare for post-pandemic business operations, which implies digitalisation and adjustment to the green economy, and take into account the impact of climate risks on their operations.

In the extraordinary circumstances caused by the COVID-19 pandemic, stress testing of credit institutions is vital, and more than ever sensitive to the assumptions used regarding future macroeconomic developments (both in the baseline and in the adverse scenario). Taking into account the specific character of this crisis, and the temporary regulatory framework in force during the pandemic, the usual modelling procedures were adjusted for differences in the of structure clients, depending on the extent to which they were hit by the pandemic. The results of the stress scenario, which hypothetically assumes that the health crisis and unfavourable economic conditions will persist, show that capital surpluses accumulated in the system and maintained by credit institutions above the legally prescribed minimum requirements, are vital for the absorption of unfavourable developments, even under an adverse scenario. The results show that credit institutions respond to stress conditions in different ways, depending on the specific features of their business operations as well as on their exposure to the activities most severely hit by the crisis.

Given the accumulated high capital and liquidity reserves of the banking sector and the monetary and supervisory measures taken, in 2020 there was no need to take macroprudential measures to mitigate the negative impacts of the pandemic. However, given that the uncertainty regarding the duration and intensity of the crisis associated with the pandemic and its impacts on credit institutions continued into 2021, the CNB

issued a decision in January temporarily restricting credit institutions' distributions to help strengthen their potential loss absorption capacity in the case of systemic and credit risk materialisation. Only once economic developments return to normal

and support measures come to an end, will it be possible to determine the full impacts of this crisis on the banking sector; until then efforts should be directed at strengthening credit institutions' potential loss absorption capacity.

1 Macroeconomic environment

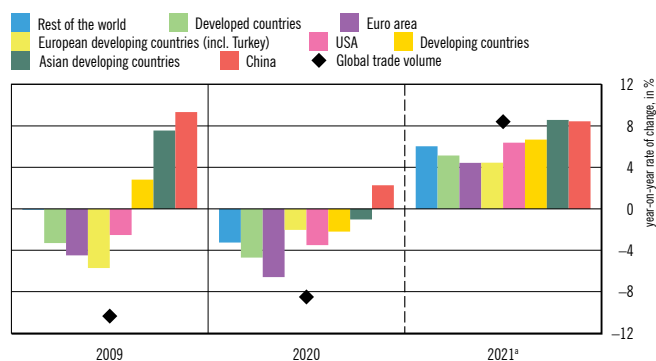
Uncertainty regarding the speed and intensity of the recovery of the global economic activity is still pronounced, with negative risks to economic activity and thus to financial stability prevailing. Amid such conditions, the exposure to systemic risks in the domestic environment have remained high. With acceleration in vaccination of the population and under the assumption that the epidemiological situation will gradually stabilise and epidemiological measures become more relaxed, the strengthening of economic activity might increase in the second half of this year.

International environment

The COVID-19 pandemic and the ensuing restrictive epidemiological measures led to a sudden halt in social and economic activities throughout the world. Amid such conditions, global economic activity contracted strongly, with economies witnessing unparalleled erosion of economic optimism and significant changes in the behaviour of all participants in the economy. Despite unprecedented fiscal and monetary support measures, the worsening of global economic conditions was stronger than that in the crisis of 2009, with a sharp annual fall in gross domestic product being recorded in all leading global economies except China (Figure 1.1). Although the economies compensated a part of the losses generated in the first half of the previous year, economic developments in the euro area and other major trading partners of Croatia in the immediate vicinity were extremely unfavourable, particularly in countries with a high share of service activities in the economy (Figure 1.2).

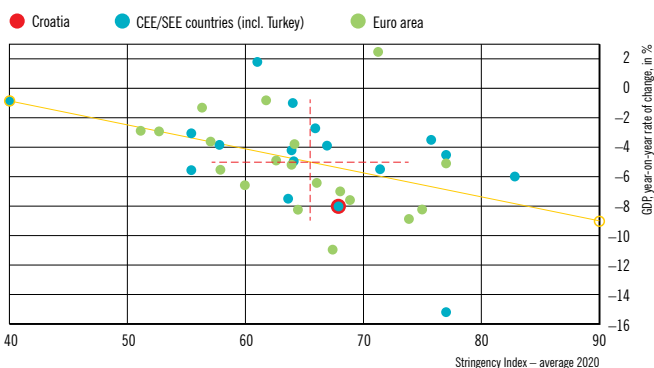
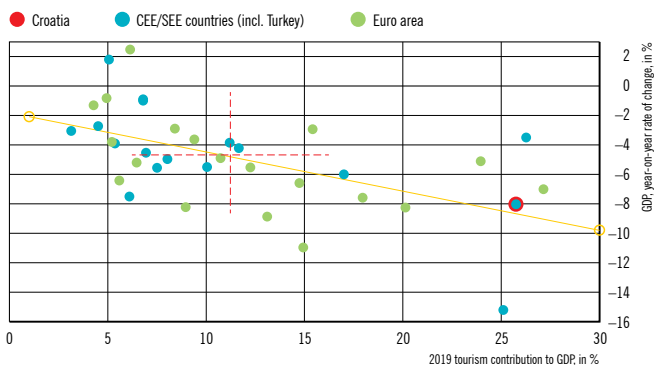
The increase in the number of newly infected cases, accompanied by an extension of restrictive epidemiological measures

Figure 1.1 The contraction of global economic activity caused by the pandemic was stronger than that in the 2009 crisis



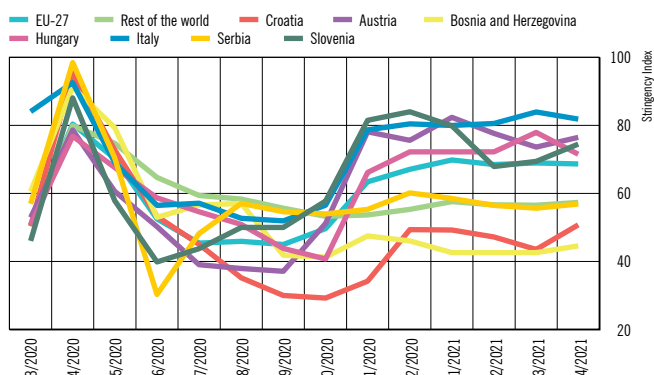
* Forecast.
Note: Columns show the annual rate of change in gross domestic product.
Source: IMF (WEO, April 2021).

Figure 1.2 The intensity of the fall in economic activity in Europe in the previous year depended partly on the structure of individual economies



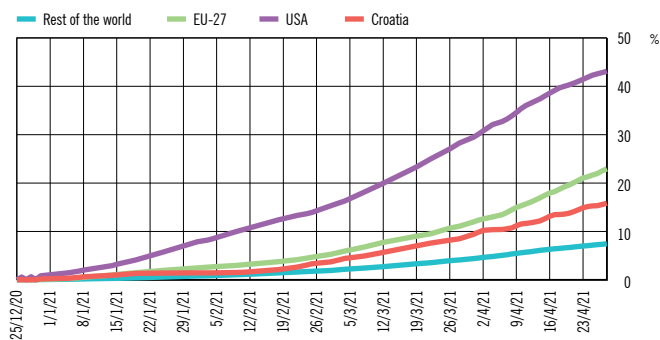
Sources: IMF (WEO, April 2021), CBS, World Bank and Oxford COVID-19 Government Response Tracker.

Figure 1.3 Restrictive epidemiological measures largely extended into the current year

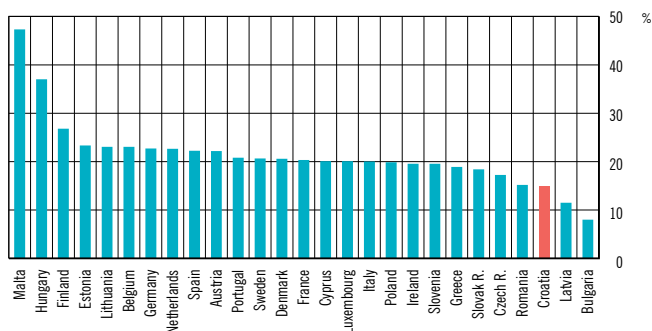


Source: Oxford COVID-19 Government Response Tracker.

Figure 1.4 Uneven speed and scope of vaccination in different countries



Note: The figure shows the share of population that received at least one vaccine dose in total population.



Note: The figure shows the share of population that received at least one vaccine dose in total population in EU member states as at 23 April 2021. Source: www.ourworldindata.org.

in the second and third wave of the pandemic, again spiralled uncertainties. Faced with a growing number of confirmed cases of coronavirus infections, EU member states, as well as the neighbouring countries, largely extended restrictive epidemiological measures introduced in autumn last year (Figure 1.3). There is also the issue of the uneven speed and scope of vaccination of the population in different countries (Figure 1.4), exposing the expected economic recovery to significant risks and uncertainties. Acceleration of economic activity is not expected before the second half of the year, with a gradual relaxation of epidemiological measures and stabilisation of the epidemiological situation by early 2022, with great differences in the economic recovery profiles of individual countries, depending on the structure of their economies.

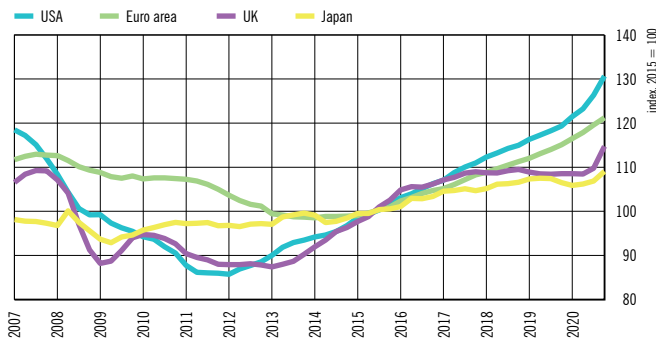
Following the initial shock and a sharp rise in volatility, developments in the global financial markets soon stabilised. Influenced by the extremely accommodative monetary policy of leading central banks, which will continue into the next period (Figure 1.5), financing conditions in the global financial markets remained relatively favourable. Major global stock indices very soon compensated for the losses generated following the outbreak of the pandemic and continued to grow in 2021 (Figure 1.9). Amid low interest rates, housing prices also continued to rise in leading global economies (Figure 1.6). Such developments increased concerns regarding overvalued

Figure 1.5 Leading central banks will continue to pursue an expansionary monetary policy



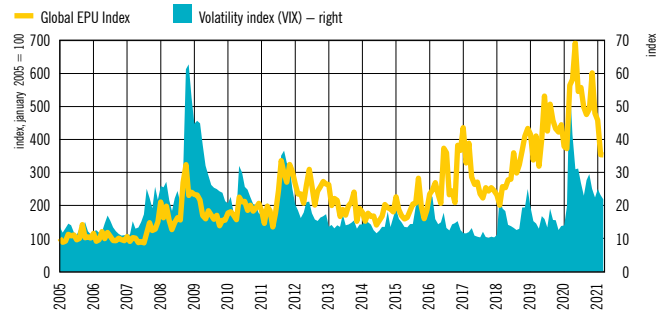
Notes: The figure shows Fed and ECB benchmark interest rates. The dashed lines in the forecast represent market expectations from March 2021, while dots represent FOMC expectations from the meeting held on 17 March 2021. Sources: Fed and ECB (actual rates) and Bloomberg (forecast).

Figure 1.6 Housing prices continued to grow



Note: The figure shows the index of real residential real estate prices. Source: OECD.

Figure 1.7 The peak of economic and political uncertainty and a temporary rise in capital market volatility were observed in the first half of last year



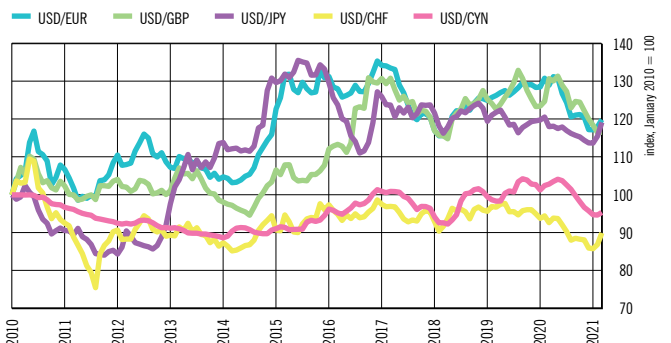
Notes: VIX is a measure of expected implicit fluctuations in the S&P500 options, calculated and published by the Chicago Board Options Exchange (CBOE). The global Economic Policy Uncertainty Index (EPU) is an index that shows uncertainty in the future policy-related economic issues and it is weighted using the PPP-adjusted GDP of the included countries. Sources: Bloomberg and Policyuncertainty.com.

housing prices and growing mismatches between these types of assets and economic fundamentals, with rising risk of repricing in the future.

Economic and political uncertainty diminished considerably from the peak in May 2020 (Figure 1.7). Even before the outbreak of the pandemic, economic and political uncertainty was elevated due to a number of adverse factors, particularly trade tensions between the USA and China and the heightening of trade protectionism, uncertainty regarding the exit of the United Kingdom from the European Union and growing instabilities in some developing countries. Although the emergence and fast spread of the pandemic had an unfavourable impact in the first half of the previous year, and the uncertainty surrounding presidential elections in the USA in the second half of the year, prompt measures taken to mitigate the economic impacts of the crisis, coupled with the completion of US elections, eased economic and political uncertainty, returning them to the pre-pandemic level. The agreed trade deal between the UK and the EU, a political agreement reached between EU member states on the terms of use of EU budget funds and adjustment of the global economy to the pandemic, also helped ease these uncertainties.

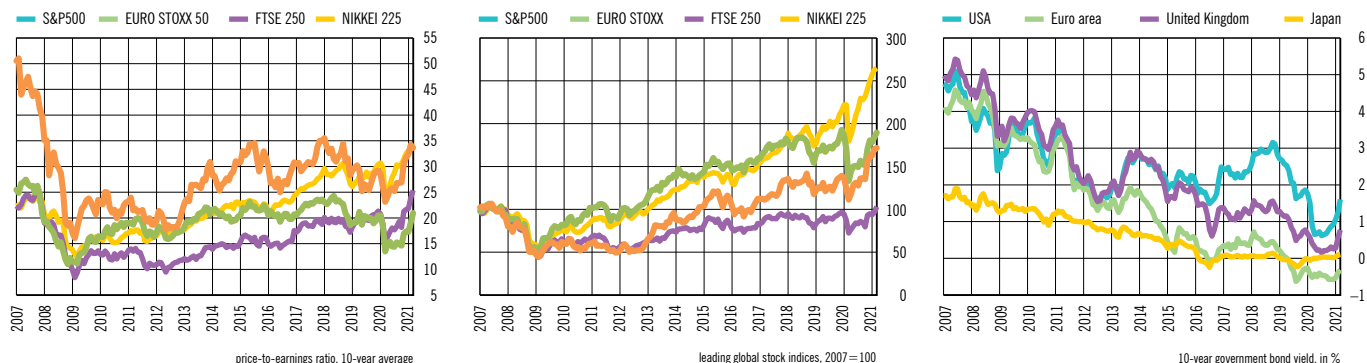
The exchange rate of the US dollar ended last year in a considerable fall, having weakened against other major currencies (Figure 1.8). This was largely the result of the easing of restrictive measures and the announced economic recovery during the summer months, which improved investor optimism around the world and reduced the demand for “safe havens” following the initial shock in the first months of the pandemic. The fall in the demand for the US dollar in 2020 was also the result of other factors that increased dollar liquidity on the global level such as the expansionary monetary policy pursued by the Fed and currency swap agreements entered into with a large number of central banks. The dollar is not expected to

Figure 1.8 The year 2020 was marked by weakening of the dollar against leading global currencies



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

Figure 1.9 Financial markets also responded strongly to the pandemic, but they stabilised soon



Source: Bloomberg.

strengthen in the forthcoming period, primarily due to a wide fiscal and trade deficit of the USA, further accommodative monetary policy pursued by the Fed and growing optimism regarding economic recovery on the global level. This has helped diminish the concerns of many countries with emerging market economies regarding debt servicing.

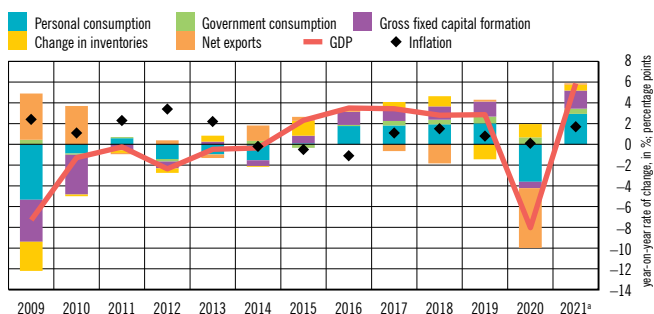
Domestic environment

Following a sharp fall in the second quarter of the previous year, the domestic economy recovered only partially, with real economic activity still standing below the pre-crisis level. Economic activity contraction last year was mostly due to the falls in the exports of services and in personal consumption, while goods exports and investments proved to be relatively resilient (Figure 1.10). To mitigate the unfavourable effects on

the economy, the Government of the Republic of Croatia, the Croatian National Bank and the Croatian Financial Services Supervisory Agency promptly took a number of coordinated support measures (see Box 1, Financial Stability, No. 21), thus indirectly also contributing to the maintenance of financial system stability.

Consumer and business confidence are still below the pre-pandemic level. Following a sharp fall in the second quarter of last year, the indicators of economic confidence improved only slightly (Figure 1.11), with lingering uncertainty regarding the trajectory of the pandemic and the accompanying epidemiological measures. Systemic vulnerabilities in the private sector also rose, particularly in non-financial corporations that observed a sharp fall in business activity and had rising debts, while household sector vulnerabilities were less pronounced, largely owing to government support measures that contributed to job and income preservation, which also led to only a moderate fall in employment (see chapter 3 Household sector and chapter 5 Non-financial corporate sector). The second half of the year could see rising optimism and economic activity recovery, under the assumption of a successful continuation of the vaccination roll-out and stabilisation of the epidemiological situation. Also, the entry of Croatia into the European Exchange Rate Mechanism (ERM II) in the middle of last year and the progress achieved in the process of the introduction of the euro will provide a further boost to maintaining financial stability in the future.

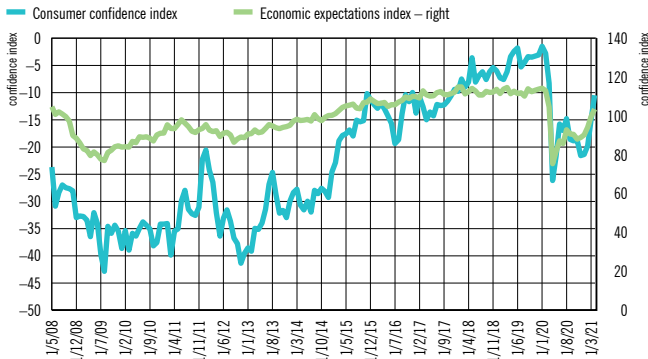
Figure 1.10 Growth in personal consumption, exports and investments should contribute to economic activity recovery this year



^a Forecast.
 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 April 2021 CNB projection.

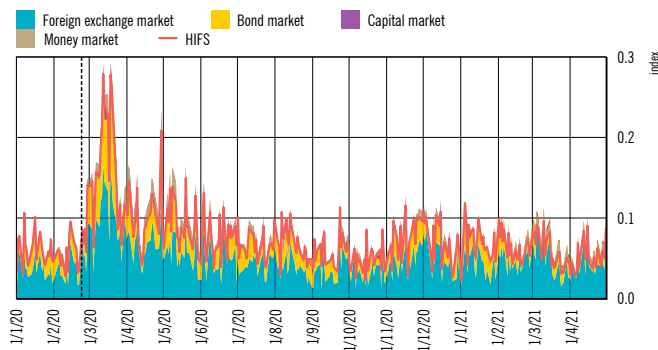
A further increase in the prices of residential real estate widened the gap between prices and economic fundamentals, with rising risks arising from developments in this market. Although at a slower pace than last year, residential real estate prices continued to rise (see chapter 4 Real estate) despite a fall in consumer optimism, poorer tourist activity, the devastating earthquakes in March and December 2020 that hit Zagreb and central Croatia, and a smaller number of transactions on the domestic real estate market. Such developments were mostly due to the continued governmental housing loan subsidy programme and favourable financing conditions.

Figure 1.11 Economic confidence is still below the pre-pandemic level



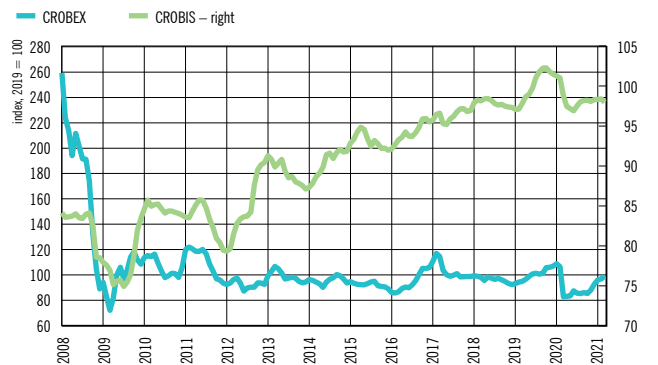
Source: European Commission.

Figure 1.12 Domestic financial market volatility stabilised at the usual pre-crisis level



Notes: The dotted line marks the first recorded case of coronavirus disease in the RC (25 February 2020). Data shown are data available as at 30 April 2021.
Sources: Bloomberg and CNB calculations.

Figure 1.13 CROBEX and CROBIS values plummeted in 2020

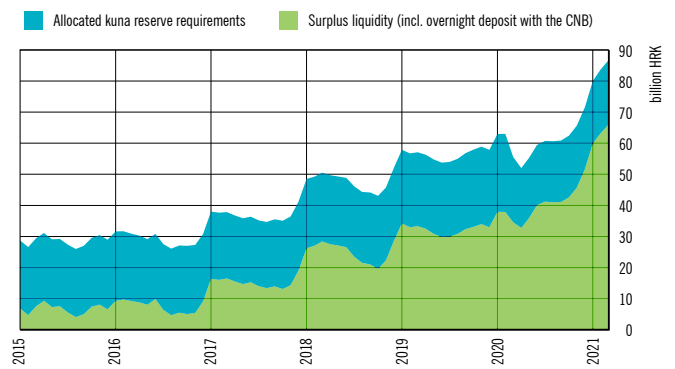


Source: Zagreb Stock Exchange.

The Croatian financial stress index soon stabilised at the usual pre-crisis level (Figure 1.12). This was largely due to prompt and decisive measures taken by the Croatian National Bank, such as the interventions in the foreign exchange market that eased depreciation pressures and stabilised the exchange rate. In addition, for the first time the Croatian National Bank initiated the direct purchase of government bonds from a broader spectrum of financial institutions, thus preserving stability in the government securities market and maintaining favourable financing conditions for all sectors of the economy.

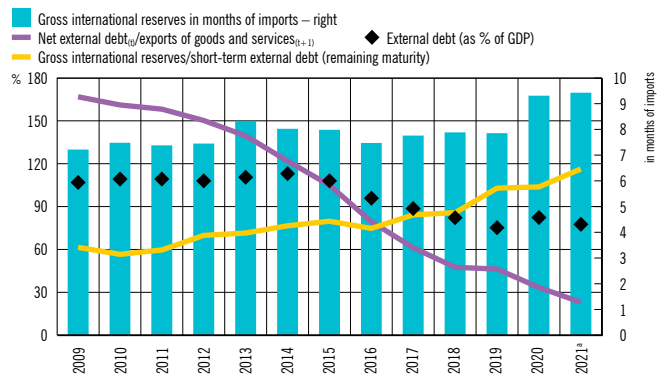
Amid the highly expansionary monetary policy, kuna liquidity of the domestic banking market continued to reach historically high levels. Thus, surplus liquidity rose by over 50% last year from the year before, with the sharp rise continuing into the first quarter of this year when the surplus reached over HRK 66bn (Figure 1.14). Due to ample kuna liquidity, there

Figure 1.14 Kuna liquidity of the domestic banking market continued to reach historical highs



Source: CNB.

Figure 1.15 External debt increase notwithstanding, the risks to the government's external position are moderate



Source: CNB.

has been no turnover in the domestic interbank overnight market since April of the previous year.

As regards structural imbalances, it should be noted that the external debt situation deteriorated driven by external budget deficit financing and strong economic activity contraction (Figure 1.15). The current and capital account balance also deteriorated but nevertheless held steady in positive territory after its decline. As regards other vulnerabilities, fiscal imbalances rose sharply, spurred by increased pandemic-related expenditures, fall in revenues and increased financing needs (see chapter 2 Government sector). The expected continuation of economic recovery should have a favourable impact on the reduction of external and internal imbalances over the medium term.

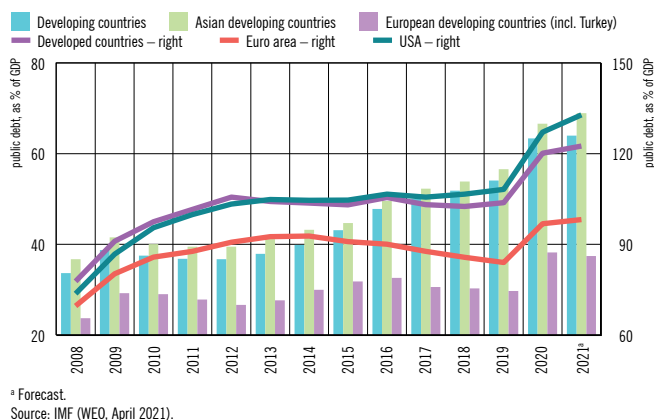
Current risks in the international and domestic environment

Great uncertainty and unpredictability regarding the developments in the pandemic continue to pose the greatest risk to global financial stability. Slow rollout of vaccination of the population and the possible emergence of new, more contagious strains of the coronavirus that are also more resistant to vaccine could have an adverse impact on the level of economic optimism, prolong the implementation of restrictive epidemiological measures and postpone the beginning of the expected economic recovery. A prolonged period of subdued economic activity would have an unfavourable impact on corporate sector solvency and worsen developments in the labour market, thus diminishing the private sector's debt repayment ability and additionally worsen public finances around the world.

The COVID-19 pandemic brought about an extension of the accommodative monetary policy and low interest rates. Such developments increased concerns regarding the overvaluation of some forms of assets, primarily shares and real estate, which increases the repricing risk over a medium term. Also, increased inflationary pressures in some developed countries seen from the beginning of this year could, provided they persist, worsen financing conditions and thus negatively affect the expected recovery of the global economy. This would in particular affect emerging market economies, particularly those with pronounced fiscal imbalances and greater financing needs.

Although ample fiscal support mitigated the impact of the disturbances on the economy and prevented any significant materialisation of risks to financial stability, they increased concerns regarding public debt sustainability. The worsening of economic conditions and extensive use of measures to mitigate the impacts of the crisis fuelled fiscal imbalances around the world, with public debt levels rising considerably (Figure 1.16). Amid such conditions, stronger ties between the government and the banks led to an increase in risks to financial stability. Also, it is certain that many countries with pronounced

Figure 1.16 Public debt level around the world has risen considerably



fiscal vulnerabilities will soon withdraw support and make additional fiscal adjustments, which could have an unfavourable impact on economic recovery dynamics over a medium term.

A premature withdrawal of measures of support to the economy might lead to a considerable increase in the number of companies going bankrupt. This risk is particularly high in EU member states that provided ample fiscal and monetary support and greatly mitigated the impacts of the crisis. As a result, the number of companies in bankruptcy proceedings held steady at very low levels last year, despite the significant worsening of economic conditions. A premature withdrawal of support might quickly reverse this trend, which would have an adverse impact on employment, and, through the channel of credit portfolio quality deterioration, on the banking sector as well. Conversely, a too lengthy use of support measures would have an additional adverse impact on public finances sustainability and further discourage the exit from the market of companies with unsustainable business models (the so-called zombie firms). Namely, indiscriminate support has led to an increase in the number of such companies, which could over the medium term have an unfavourable impact on productivity and potential growth in many countries, Croatia included (see Box 4 The survival of zombie firms and risks to financial stability).

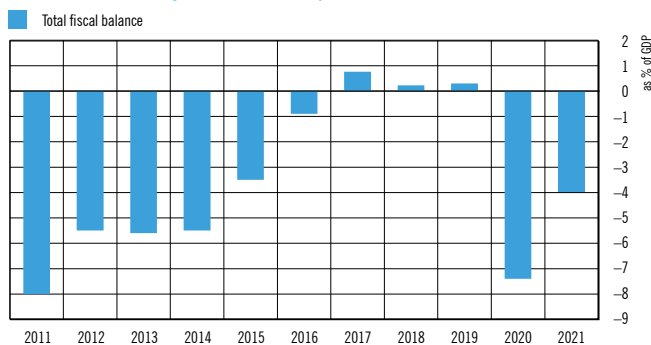
Rising indebtedness of the global corporate sector might additionally slow down investment consumption once the crisis is over. High indebtedness of non-financial corporations posed a high structural risk even before the crisis, while deteriorating economic developments further increased this sector's vulnerabilities during the pandemic. Depending on the activity and size, the increased indebtedness and diminished possibility for generating operating income have already had an unfavourable impact on the balance sheets of many companies and their debt servicing ability. In addition to increasing the risk to company solvency, such developments might threaten investment consumption and slow down employment at the time crucial for global economy recovery.

As regards the domestic environment, the most significant risk lies in the uncertainty regarding the future trajectory of the pandemic. The worsening of the epidemiological situation along with extended restrictive epidemiological measures and restricted cross-border movement of people would lead to a further erosion of business and consumer confidence and revenues from tourism, which would have an unfavourable impact on overall economic activity in the country and government debt, which had posed a significant structural risk even before the pandemic and has substantially risen in 2020.

Other risks in the domestic environment present before the outbreak of the pandemic will persist over a medium and long term. Of these risks, the most significant are those related to a great labour outflow, unfavourable demographic trends and low labour activity of the population, as well as other risks arising from the international environment such as those relating to possible increases in geopolitical tensions and trade protectionism.

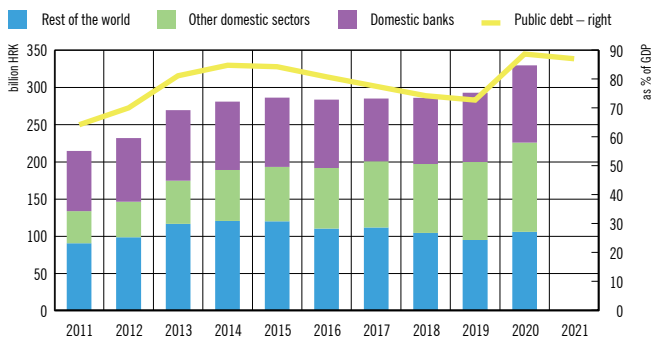
2 Government sector

Figure 2.1 Measures to contain the impact of the COVID-19 pandemic on economic developments and contraction of economic activity led to a sharp increase in the fiscal deficit...



Note: Projection for 2021 based on the Excessive Deficit Procedure Report, Republic of Croatia, April 2021.
Source: Eurostat.

Figure 2.2 ... and the public debt to GDP ratio in 2020

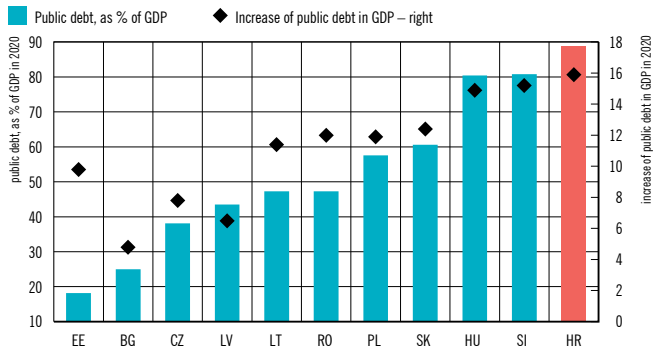


Note: Projection for 2021 based on the Excessive Deficit Procedure Report, Republic of Croatia, April 2021.
Sources: Eurostat and CNB.

Unfavourable impacts of the pandemic and the measures introduced to mitigate them led to a considerable deterioration in fiscal developments in 2020. A sharp fall in total revenues and an increase in expenditures of the consolidated general government led to a deficit of 7.4% of GDP, while the public debt to GDP ratio rose sharply and stood at 88.7% at the end of 2020. The financial position of the government was somewhat alleviated by the EU funds that are used to finance the bulk of the measures of support to the economy. Economic recovery is expected to bring the share of public debt back on a downward trajectory, although the budget deficit might remain elevated. Such developments, coupled with a strong and growing sovereign-bank-nexus in the RC, increase potential risks to the overall financial system stability.

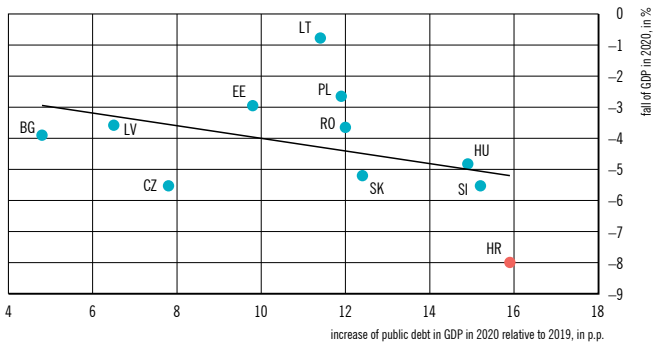
Public finances deteriorated strongly in 2020 as a result of the coronavirus pandemic. The pandemic and social distancing measures led to a sharp fall in economic activity and worsening of almost all macroeconomic indicators (see chapter 1 Macroeconomic environment). The fall in economic activity automatically led to a fall in revenues and an increase in the expenditures of the general government. The expenditure side of the budget also recorded an additional increase as a result of fiscal stimuli introduced by the Government of the RC to contain the impacts of the pandemic on the economy, the most significant of which is job preservation support (for full overview of the measures see [Financial Stability, No. 21](#)). However, the measures of support to the economy during the pandemic were largely financed by favourable EU loans. The growth in expenditures was also fuelled by a sharp increase in government

Figure 2.3 Of all the CEE countries, Croatia had the highest level and the fastest growth of the public debt to GDP ratio in 2020



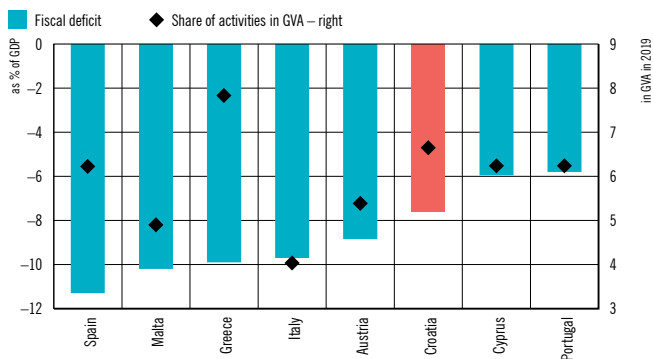
Source: Eurostat.

Figure 2.4 The increase in fiscal imbalances in CEE countries is in line with the intensity of the fall in economic activity



Source: Eurostat.

Figure 2.5 The fiscal deficit to GDP ratio is comparable to that found in EU countries with a similar share of tourism-related activities in GVA



Source: Eurostat.

investments during the pandemic (partly financed from EU transfers), which contributes to a faster exit from the crisis and faster economic recovery. Such active support to the economy was made possible by relatively favourable fiscal indicators at the beginning of the crisis, with the investment grade credit rating maintained during the crisis.

In 2020, the consolidated general government deficit stood at 7.4% of GDP while the forecasts for 2021 point to a still considerable deficit, although it is estimated to fall by one half (Figure 2.1), as suggested by the Excessive Deficit Procedure Report, Republic of Croatia, April 2021. The projected fall in the deficit in 2021 to 3.9% of GDP reflects the effects of the expected recovery of economic activity and growth in tax revenues¹ and the expiry of the bulk of fiscal stimuli. However, expenditures for investments will grow, mostly due to earthquake related reconstruction, which, along with the 4% increase in public sector wages, is expected to result in somewhat greater expenditures. The described projections² are based on the assumption of stabilisation of the pandemic by mid-2021 and further recovery in economic activity and are therefore subject to great uncertainty and negative risks to their actual materialisation.

The public debt to GDP ratio rose by a high 16 percentage points, reaching 88.7% of GDP at the end of 2020, (Figure 2.2) thus far the highest public debt to GDP ratio in Croatia. In 2021, in the conditions of economic recovery, the public debt is expected to return to a downward trajectory, and to fall by approximately 2 percentage points, according to fiscal notification in the context of the Excessive Deficit Procedure Report.

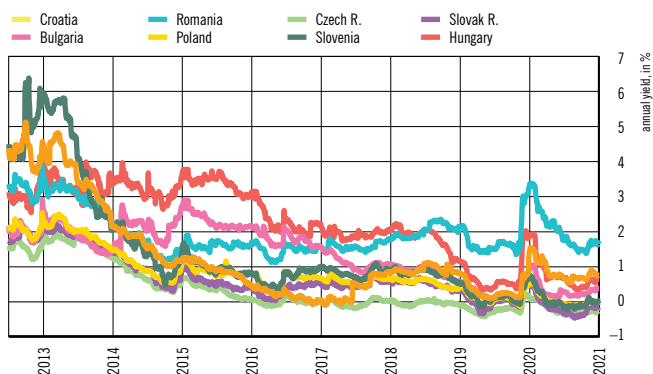
Croatia stands out in terms of the level of public debt in GDP in comparison to other CEE countries (Figure 2.3). Even before the outbreak of the pandemic Croatia had the highest level of public debt in GDP of all CEE countries,³ with this gap widening further during the pandemic. Not only is this the biggest increase in the public debt to GDP ratio of all CEE countries, it also mirrors the strongest contraction of economic activity of all the countries in the group, which is not surprising given the economic importance of hotels and restaurants and tourism, the activities most severely affected by social distancing measures (Figure 2.4). The negative impacts of the pandemic and social distancing measures on employment in tourism (and other vulnerable sectors) were mitigated by a range of government measures, and international comparison shows that total fiscal support paid out in Croatia was the most ample of all CEE

1 Profit and income tax reforms will have a reverse impact on revenues.

2 The developments in revenue and expenditure components are based on the Guidelines for the preparation of the state budget for 2021 and projections for 2022 and 2023.

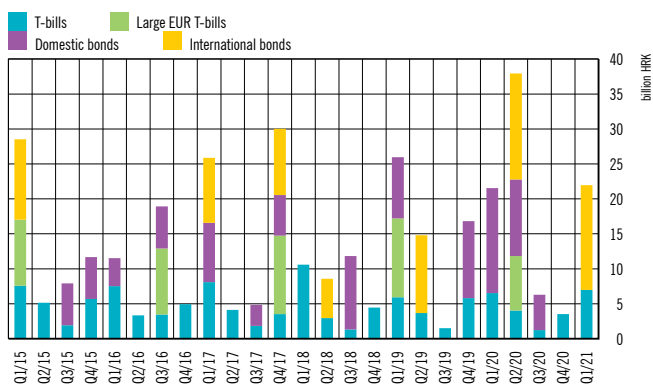
3 Croatia has a wide public sector coverage and has also frontloaded the costs of pension reform and the separation of the second pension pillar from the pension system based on intergenerational solidarity (see [Financial Stability, No. 20](#)).

Figure 2.6 Despite the worsening of fiscal indicators, yields on generic bonds remained stable



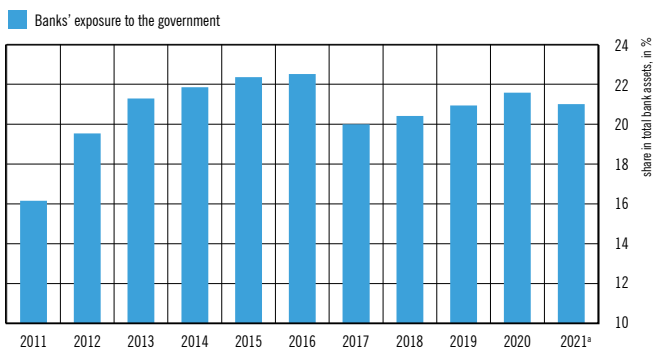
Source: BoA Merrill Lynch, data for 2021 available as at 20 April.

Figure 2.7 The government continued to finance itself on the domestic and international markets without difficulty



Sources: CNB and MoF.

Figure 2.8 The sovereign-bank-nexus continues to be strong



* Refers to the first quarter of 2021.
Source: CNB.

countries.⁴ In this context, fiscal developments in Croatia are comparable to those in EU member states with a similar share of accommodation and food service activities in gross value added (Figure 2.5).

Yields on government bonds following the outbreak of the pandemic remained almost unchanged (Figure 2.6). The low level of yields on government bonds mirrors an exceptionally expansionary monetary policy in Europe and the USA. The liquidity in the domestic financial system was also exceptionally high, driven by the expansionary monetary policy of the CNB, which launched a government securities repurchase programme for the first time since the outbreak of the pandemic.

Croatia maintained the investment grade credit rating with stable outlook from the major credit rating agencies (Fitch, Moody's and S&P), despite the unfavourable impact of the pandemic. In November 2020, Moody's upgraded Croatia's credit rating from Ba2 to Ba1 owing to the country's successful preparations for entry into the ERM II.

Stable sovereign risk premium and credit rating facilitated government borrowing in 2020 and in early 2021. Following the outbreak of the pandemic, Croatia borrowed on many occasions in the domestic and international markets to meet its large financing needs in the pandemic year (Figure 2.7). A part of the financing in 2020 was ensured through loans under SURE, the European Commission programme for job preservation and World Bank and Council of Europe Development Bank loans, and further partial financing of the expenditures associated with the impacts of the pandemic is also expected in the forthcoming years.

The government continues to rely the most on domestic sources of financing, maintaining a strong sovereign-bank-nexus. Thus in March 2021, 21% of total bank assets were accounted for by placements to the government (Figure 2.8, see chapter 6 Credit institutions). The dominance of domestic financing is mirrored in the structure of public debt with 68% of the total public debt at the end of 2020 being issued in the domestic and 32% in the foreign financial market.

Currency risk continues to make the government and overall financial system vulnerable to domestic currency depreciation, given the fact that at the end of 2020, 71% of public debt was denominated in euro. Following depreciation pressures that emerged on the foreign exchange market with the outbreak of the pandemic and were soon eliminated by strong CNB response, in the remaining part of 2020 and in early 2021, the exchange rate was very stable, with only smaller fluctuations and occasional foreign exchange interventions taking place, despite the fact that the CNB purchased from the government ample amounts of foreign exchange. The stability of the domestic currency was also boosted by a swap line agreement between the

⁴ Data on paid fiscal support are taken from the February 2021 ESRB report and relate to direct support paid to companies and tax deferrals and write-offs as at September 2021.

CNB and the European Central Bank. In July 2020, Croatia entered the European Exchange Rate Mechanism (ERM II), a key step in the process of the introduction of the euro that will generally eliminate currency risk. In addition, public debt management is facilitated by its stable maturity structure, with the average remaining maturity standing at 5.8 years.

Current risks to financial stability in the government sector

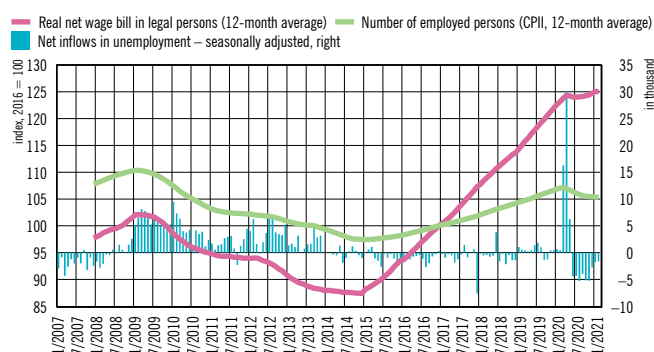
Still prevailing are unfavourable risks to fiscal developments, which depend primarily on the epidemiological situation and future developments in the pandemic. Even though the new waves of the pandemic in the second part of 2020 and in early 2021 were marked by much less restrictive measures relating to business and generated more moderate expenditures for the fiscal policy, each further unfavourable development in the

pandemic, including any delays in vaccination rollout, vaccine distrust or virus mutation may lead to additional unplanned expenditures for the general government and further public debt growth. The unfavourable development of the pandemic might lead to an additional rise in health care expenditures due to rising costs of physicians' labour, which may again exacerbate the issue of further accumulation of arrears in the health sector.

The reconstruction of areas affected by the March and December 2020 earthquake in Zagreb and central Croatia also poses certain negative risks for the expenditure side of the budget and so does the unfavourable impact of the risks present for some time, such as the international arbitration initiated by MOL. In contrast, the Government of the RC reached an agreement in early 2021 with six out of eight banks relating to litigation in connection with the conversion of loans denominated in Swiss francs, thus reducing greatly the potential cost arising from an unfavourable outcome of the law suits concerned.

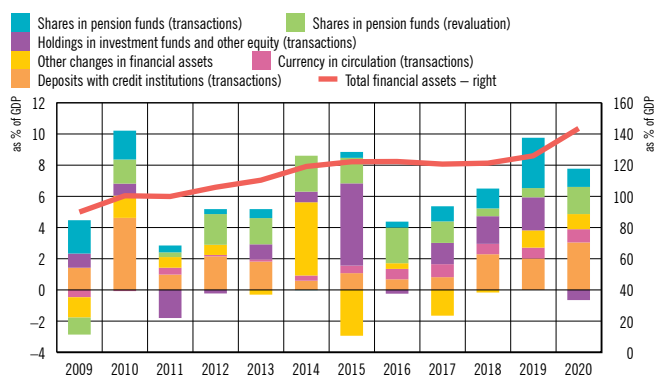
3 Household sector

Figure 3.1 The large unemployment inflow in spring 2020 was short-lived



Note: Net inflows from employment are calculated as the difference between inflows to registered unemployment based on termination of employment and outflows from registered unemployment based on the beginning of employment. Sources: CPII, CES and CNB.

Figure 3.2 Financial assets of household rose in 2020



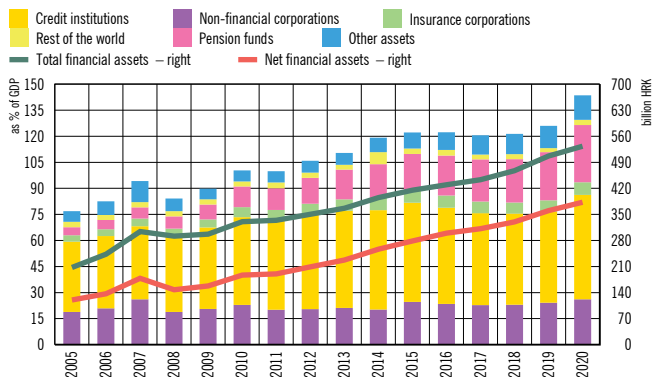
Note: The figure shows the most significant types of changes in financial assets of households, with the category "Other changes in financial assets" including all changes not shown separately. Source: CNB.

The slowdown in the global and domestic economy caused by the COVID-19 pandemic as well as the activities aimed at containing the spread of the coronavirus led to an increase in systemic vulnerabilities of the household sector. However, both fiscal support aimed at job preservation and a faster recovery of economic activities than initially expected helped maintain the disposable income of most households and mitigated further increase in systemic risks and their materialisation. A fall in consumption, coupled with the relatively stable disposable income of households fuelled an increase in the savings rate as households channelled their disposable income into the most liquid forms of assets, primarily deposits with credit institutions.

The fall in employment brought about by the COVID-19 pandemic was much smaller than the contraction in overall economic activity, which helped preserve household sector income. Despite big initial unemployment inflows (Figure 3.1), fiscal support aimed at job preservation and the gradual opening of the economy towards the end of spring 2020, kick-started recovery in the labour market. As a result, employment (measured by the number of persons registered with the CPII) fell by only 1.2% in 2020. At the same time, the increase in the average net wage of 2.5% contributed to a small increase in the total wage bill.

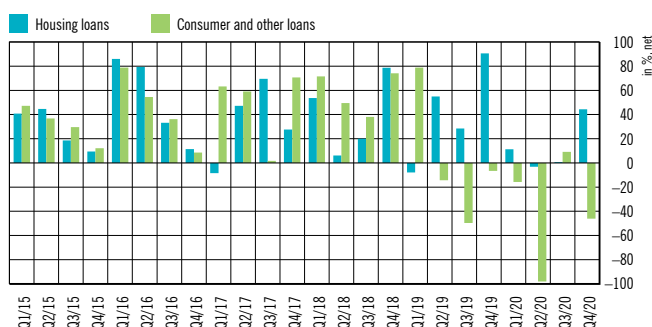
The fall in domestic consumption was much faster than the fall in the wage bill and according to available estimates, faster than the fall in the disposable income of households, strongly fuelling savings. Consumption fell due to physical restrictions in the consumption of certain goods and, particularly,

Figure 3.3 Deposits and pension fund shares spurred further growth in the financial assets of households



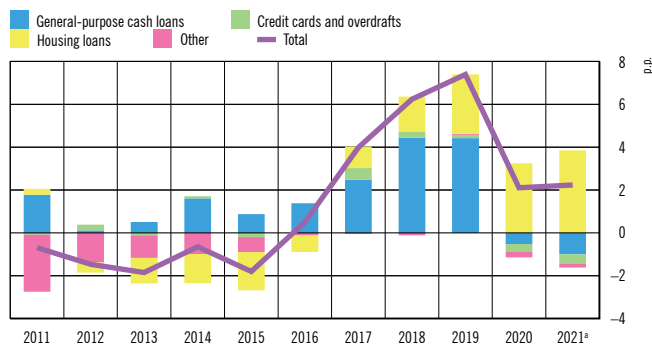
Source: CNB.

Figure 3.4 The demand for housing loans held steady in 2020 while consumer loans fell



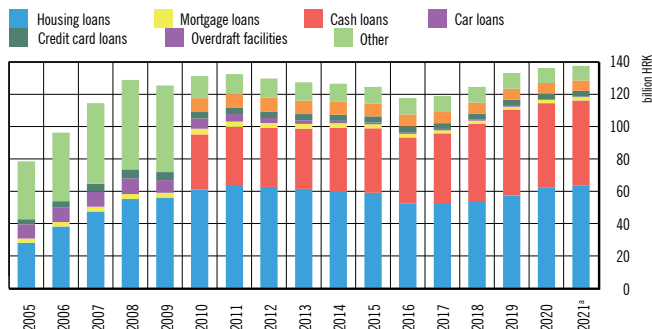
Notes: The figure shows the reported change in household demand for loans in the quarter. A positive value indicates an increase and a negative value indicates a decrease in demand.
Source: CNB (Bank lending survey).

Figure 3.5 The fall in general-purpose cash loans led to a considerable slowdown in total household lending in 2020



* Twelve-month period ending 31 March 2021.
Note: The figure shows the transaction-based change in debt, which excludes exchange rate, price and other changes.
Source: CNB.

Figure 3.6 The stock of loans to households rises, fuelled by housing lending



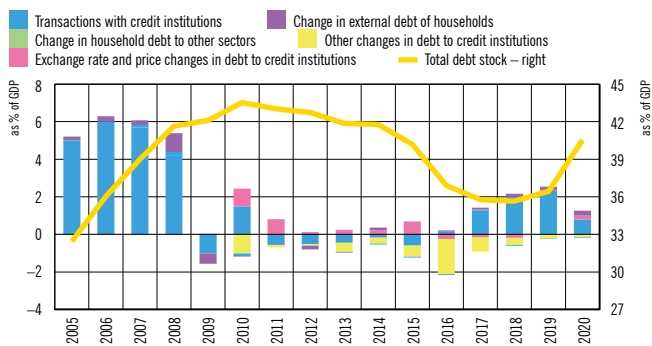
* Balance as at 31 March 2021.
Note: Cash loans and overdraft facilities have been excluded from the category of other household loans since the end of 2010 because they have become new categories.
Source: CNB.

services, and growing uncertainty, while the consumer confidence index, after falling sharply in spring 2020, recovered gradually, holding steady at relatively low levels (see chapter 1 Figure 1.11). The rise in savings mostly contributed to the growth in deposits with credit institutions, which rose from HRK 8bn in 2019 to 11.3bn in 2020, based on transactions (Figure 3.2). The value of shares in pension funds also continued to grow while the growth of investment funds holdings, faced with large outflows at the time of the outbreak of the pandemic, slowed down considerably. As a result, the total financial assets nominally rose slower than in the previous years, while net financial assets continued to grow, having risen by 6.2%, or 13.5% of GDP (Figure 3.3).

While consumer loans fell amid a contraction in personal consumption, the doubling of the volume of the government subsidy programme in 2020 spurred further growth of housing loans. Very soon after the outbreak of the pandemic, credit institutions recorded a sharp fall in demand for consumer loans while the demand for housing loans strengthened particularly in the last quarter of 2020 (Figure 3.4). A sharp fall in consumer confidence in spring 2020 was accompanied by a sharp fall in cash loans. By contrast, in the context of the two cycles of housing loan subsidy programmes that were implemented in 2020 (see chapter 4, Figure 4.5), the volume of available funds almost doubled, leading to further acceleration in housing loans growth. The growth in total loans to households shrank considerably as a result of the described developments; from 7.4% in 2019 to 2.1% in 2020 (Figure 3.5) with the same trend continuing into early 2021.

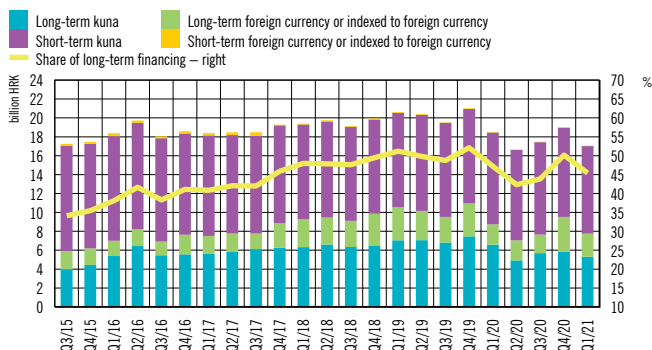
The total household debt rose only slightly in 2020, mainly driven by growth in housing loans, which increased household debt to credit institutions (Figure 3.6). Although the growth in total household debt slowed down strongly, the relative indicator of indebtedness jumped considerably as a result of a fall in economic activities, reaching a little over 40% of GDP (Figure 3.7). The expected recovery in economic activity should thus reduce average household indebtedness in 2021.

Figure 3.7 The contraction of economic activity in 2020 led to an increase in the household debt to GDP ratio



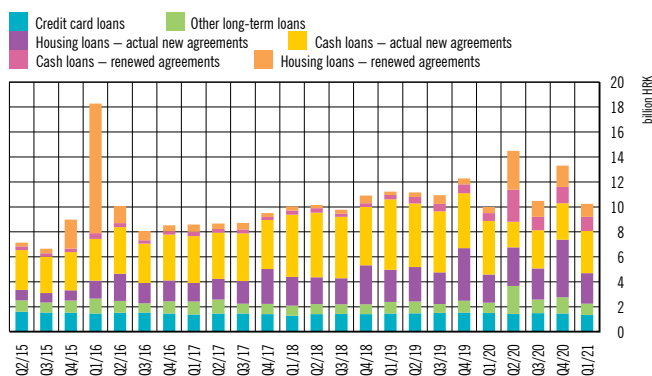
Note: Changes in debt to other sectors and the rest of the world are shown as the difference between the end of the previous year and relativised share in GDP.
Source: CNB.

Figure 3.8 The trend of growth in the share of new long-term household financing came to a halt in 2020



Notes: Overdraft facilities and credit card loans are included for the last month in the quarter. Renewed agreements are excluded.
Source: CNB.

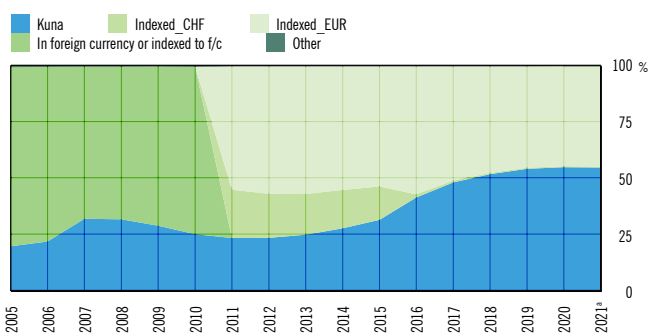
Figure 3.9 Renewed agreements grew in 2020



Note: Credit card loans are included for the last month in the quarter.
Source: CNB.

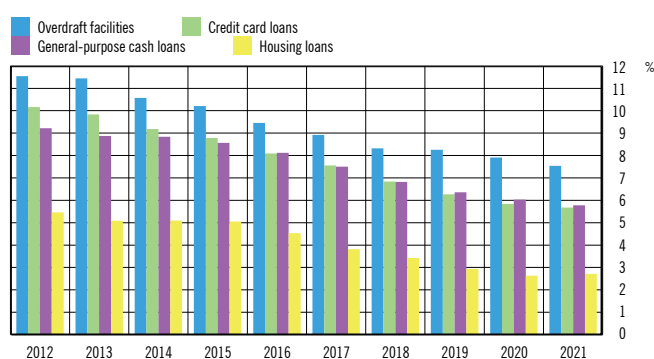
The COVID-19 pandemic led to a fall in the share of long-term financing in newly-granted household loans (Figure 3.8). Such developments were mainly the result of a fall in newly granted cash loans mostly granted in the preceding years with relatively long maturities. By contrast, influenced by the government subsidy programme, the volume of newly-granted housing loans was slightly bigger than in the previous year. In 2020, consumers increasingly renewed agreements with credit institutions (Figure 3.9), mostly on deferrals of debt repayment and extension of loan maturities. These agreements involved almost equally both housing and cash loans. According to data provided by credit institutions, in 2020, households negotiated moratoriums worth a total of HRK 11bn, i.e. a little less than 10% of the total stock of loans. Most of these moratoriums expired by end March 2021, with HRK 2.3bn worth of active moratorium agreements outstanding, which account for approximately 2% of the total stock of household loans.

Figure 3.10 Kuna loans account for over one half of the stock of household loans



* Balance as at 31 March 2021.
Note: Since the end of 2010, the category of foreign currency loans or foreign currency-indexed loans has been divided into two subcategories: euro-indexed and Swiss franc-indexed loans.
Source: CNB.

Figure 3.11 Interest rates on newly-granted household loans continued to fall in 2020



Notes: Renewed agreements are excluded for housing loans and cash loans from 2015 onwards. Data for 2021 are data available until March.
Source: CNB.

The downward trend in the currency-induced credit risk relating to household debt slowed down (Figure 3.10). The share of kuna loans to households rose by approximately only half a percentage point in 2020, which is associated with the growth in housing loans, most of which are still linked to the euro, while cash loans, mostly granted in kuna, shrank. Croatia thus continues to be a country with the largest [share of loans denominated in foreign currency, of all EU countries](#), which makes domestic households vulnerable to any weakening of the domestic currency. Thus the stability of the exchange rate of the kuna against the euro, supported by entry into the European Exchange Rate Mechanism in mid-2020, is one of the major factors helping to mitigate credit risk in the household sector.

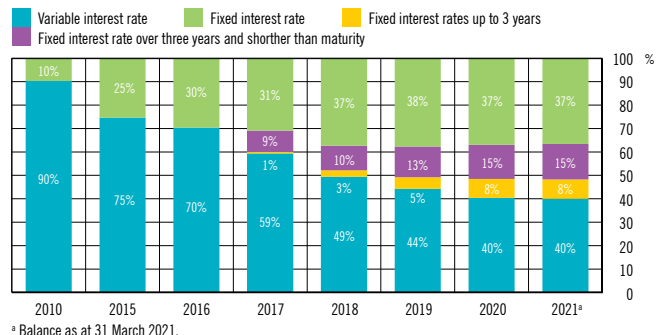
Interest rates on newly granted household loans continued to fall in 2020 (Figure 3.11). The interest rates on actually newly-granted housing loans in 2020 stood at 2.63%, and with further implementation of the government subsidy programme in 2021, they are expected to fall further. In addition, the interest rates on other forms of consumer lending also fell, with the interest rates on newly-granted cash loans and credit cards in the first quarter of 2021 standing at around half a percentage point below their level in 2019. Continued favourable financing conditions on the European money market and surplus liquidity in the domestic banking system might contribute to a further fall in interest rates in 2021.

The share of the stock of loans agreed at variable interest rates continued to fall in 2020 (Figure 3.12). Despite stagnation in the share of fixed rate loans in the total stock of household loans, the share of loans with fixed rates shorter than maturity grew. This provides some of the debtors with protection from a possible increase in interest rates over a medium term. Debtors are also protected from interest rate risk by the expectation that interest rates in the domestic and international environment will remain low, which includes the national reference rate (NRR) as the most widely used benchmark to which interest rates on household loans are tied (Figure 3.13).

The household sector debt repayment burden held steady at moderate levels compared to historical developments (Figure 3.14). The trend of fall in interest rates, a small increase in average loan maturity and the relatively stable disposable income of the household sector prevented the growth in the debt service-to-income ratio, despite a small increase in debt (Figure 3.7 and Figure 3.15). Although for a precise assessment of developments in the systemic risk in household lending it is necessary to observe the developments in the distribution of the said indicator (see Box 1 A new source of data on consumer lending standards), its stability on an aggregate level suggests that only a small number of debtors struggle with debt servicing.

Debt burden and indicators of household sector systemic vulnerability rose slightly in 2020. (Figures 3.15 and 3.16). The increase in household sector debt burden is seen in the rise in the ratio of debt to disposable income, while the cost of interest paid remained at historical lows. As a result, the risk of debt servicing rose slightly, and the risk of a snowball effect moved

Figure 3.12 The share of the stock of loans agreed at variable interest rates continued to fall in 2020

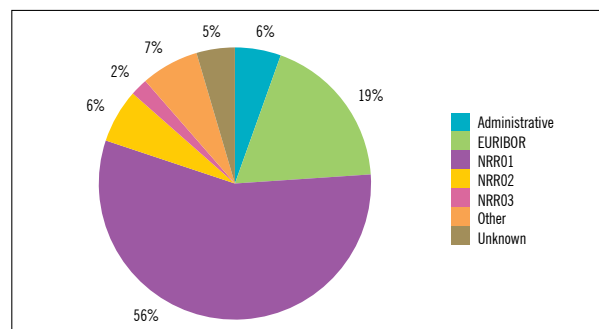


* Balance as at 31 March 2021.

Notes: Credit card debt and overdraft facilities are excluded. Since 2017, two additional categories have been excluded from the category of loans with variable interest rates, depending on the remaining period of interest rate fixing, i.e. those to 3 years and those over 3 years.

Source: CNB.

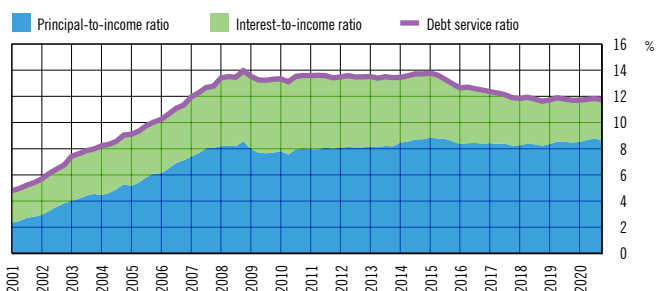
Figure 3.13 Variable interest rates are mostly tied to the NRR



Note: The figure shows the structure of the stock of loans on 31 December 2020 according to the reference parameter to which the change in the variable interest rate is linked, i.e. to which the change in interest rates will be linked after the expiry of the initial period of interest rate fixing.

Source: CNB.

Figure 3.14 Household sector debt repayment burden held steady at moderate levels



Notes: A description of the calculation of debt servicing ratio is given in the Analytical overview: How much are Croatian households burdened with debt repayments?, chapter 3, Financial Stability, No. 20. Data on the disposable income are revised and calculated by disaggregating the annual series of disposable income using the indicator of the series of compensation of employees and gross operating surplus and mixed income.

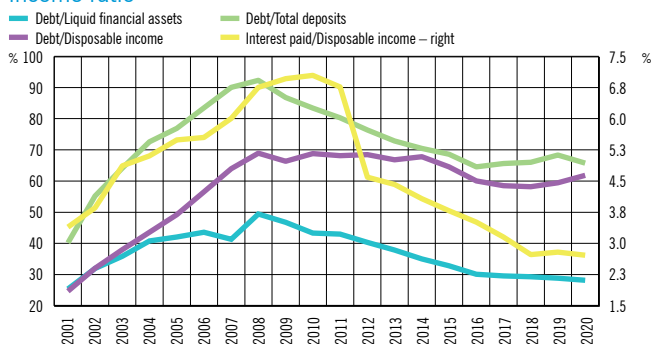
Source: CNB.

in the same direction since implied interest rates on household debt currently exceed income increase, which probably slowed down slightly in 2020. However, the expected economic recovery should again reduce the snowball effect risk indicator.

Current risks associated with the household sector

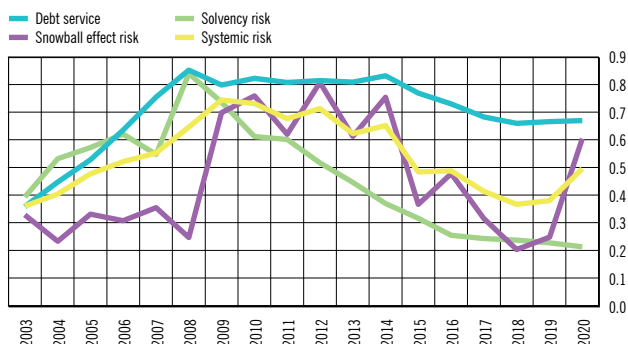
The COVID-19 pandemic has led to a moderate increase in systemic vulnerabilities of the household sector. Despite a significant fall in economic activity, disposable income fell only slightly, owing to fiscal stimuli support for job preservation and a relatively small fall in employment, which stabilised the indicators of vulnerabilities of the household sector. However, the planned withdrawal of the measures of support to the economy in the second quarter of 2021 might lead to a systemic risk materialisation in the household sector, particularly in the case of a slowdown in economic recovery or its postponement, which largely depends on further developments in the pandemic and the achievement of herd immunity. Although some of the debtors have reached moratorium agreements, thus far only a small number of cash loan users have had difficulties with debt repayment. Also, the expected recovery and rise in employment might mitigate the materialisation of the risks accumulated in the household sector prior to and during the pandemic.

Figure 3.15 The increase in household vulnerability is suggested only by the increase in the debt to disposable income ratio



Note: Data on disposable income are revised and calculated by disaggregating the annual series of disposable income using the indicator of the series of compensation of employees and gross operating surplus and mixed income. Source: CNB.

Figure 3.16 COVID-19 pandemic has led to a moderate increase in systemic vulnerabilities⁵ of the household sector



Note: Data on the disposable income are revised and calculated by disaggregating the annual series of disposable income using the indicator of the series of compensation of employees and gross operating surplus and mixed income. Source: CNB.

⁵ Household sector vulnerability is measured by the household systemic risk. i.e. by the average of normalised (to the value range 0-1) risks measuring debt service risk (DSR), solvency risk (SR) and “snowball effect” risk (SNR), which are defined as follows:

$$DSR_t = \frac{Debt\ repayment\ cost_t}{Disposal\ income_t}, \quad SR_t = \frac{Debt_t}{Net\ financial\ assets_t}$$

$$RI_t = \frac{Interest\ paid_t}{Debt_t + Debt_{t-1} + Debt_{t-2} + Debt_{t-3}} - \left(\frac{Disposable\ income_t}{Disposable\ income_{t-4}} - 1 \right)$$

Box 1 A new source of data on consumer lending standards

Data on loans on individual loan level provide an important source of information for monitoring the development of systemic credit risk and pursuing a macroprudential policy, particularly calibration and monitoring measures aimed at debtors. The advantages of the use of granular data in comparison with aggregated data are multiple. Aggregated data show averaged amounts relating to highly heterogeneous groups of individual loans and debtors and are available only at the level of pre-defined features (for instance, loan purpose, currency, interest rate variability, etc.). This fails to capture a significant portion of information vital for understanding the development of systemic risk, which may only be interpreted correctly if observed on a granular basis. The use of granular data provides detailed information on each loan on an individual level and greater flexibility in the aggregation of data and definition of indicators, which may be adjusted to the purpose of a specific analysis.

To broaden the analytical framework for macroprudential measures formulation and implementation, in March 2020, the CNB issued a Decision on collecting data on standards on lending to consumers¹, thus setting up a system for collecting granular data on standards of lending to consumers². The newly collected granular data are particularly important for calibrating the macroprudential policy measures aimed at loan users, which may contain systemic risks associated with excessive lending and the residential real estate market³.

Starting in September 2020, the CNB has collected on a monthly basis data from credit institutions on each newly-granted individual loan disbursed within a reporting period, data that contain information on loan features (loan purpose and amount, currency, level and type of interest rate, maturity, whether it is a renewed agreement or a new transaction, risk category as well as indications of any subsidy and if so the amount), characteristics of consumers, i.e. loan users (income level, total indebtedness) and characteristics of loan collateral (type and value of the instrument of collateral, payment sequence, geographical location of the pledged real estate). Also annually collected are data on the stock of all individual loans to consumers on the balance sheets of credit institutions, although these data are of a narrower scope than those provided in the monthly report.

Based on the data collected on loans disbursed from September 2020 to January 2021, presented below are the key indicators on the loan granting standards for two major groups; housing and mortgage and consumer cash loans⁴. The stress is on indicators describing consumers'

1 OG 36/2020.

2 One of the reasons that triggered the collection of these data was European Systemic Risk Board recommendations on closing real estate data gaps (ESRB/2016/14 and ESRB/2019/3), in the part that related to debt financing of residential real estate.

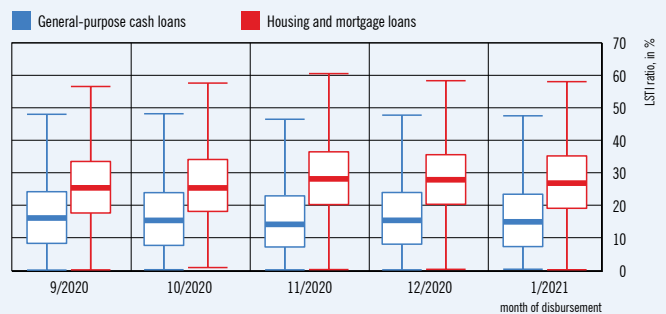
3 See *MPD, No. 10*, February 2020, Box 1 Borrower-based macroprudential measures and *Financial Stability, No. 19*, May 2018, Box 3 Application of macroprudential measures related to the residential real estate market in the EU and EEA.

4 The principal of the said loan groups accounts for a little over 90% of the total stock and actual newly-granted loans to households, excluding credit card debt and overdrafts.

ability to meet their loan obligations on time and on those describing the possibility for credit institutions to collect using the instruments of collateral in the case of non-performing loans.

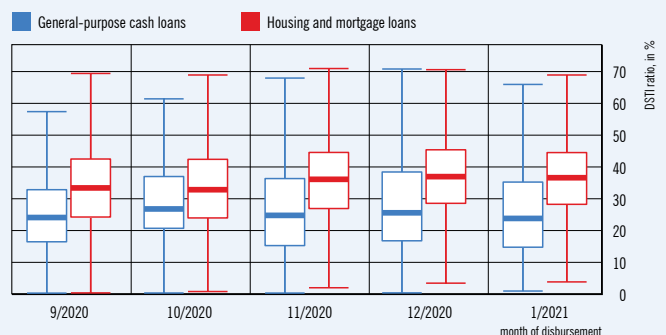
The key indicator of the loan repayment burden is the ratio of the monthly loan service cost to consumer's monthly income at the moment of loan origination (LSTI)⁵. The median value of that ratio is slightly higher than one fourth of consumer income and is relatively stable in the first five months of data collection (distribution by individual loans is presented in Figure 1). The loan repayment to income ratio is lower in cash than in housing loans and stands at the level of approximately one fifth of consumer income, which is in line with the substantially lower

Figure 1 Distribution of the loan repayment to income ratio (LSTI)



Notes: The figure shows the first and the third quartile, the median and the smallest and the largest piece of data within the interquartile range, looking from the lower or the upper quartile, respectively. The number of excluded observations with atypical or missing values stands at approximately 2% of the total number of individual loans. Verification of these data is still ongoing.
Source: CNB.

Figure 2 Distribution of the total debt service to income ratio (DSTI)



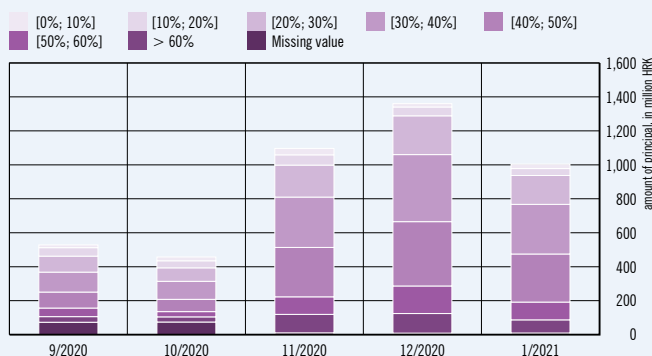
Notes: The number of excluded observations with atypical or missing values accounts for approximately 25% of the total number of individual loans. Verification of these data is still ongoing.
Source: CNB.

5 Loan repayments include debt principal repayment and interest payments. The LSTI ratio is calculated using the information on the amount of principal, remaining maturity, effective interest rate and consumer income and at the time of disbursement represents the average LSTI for loan user during the period of loan repayment. For the formula used, see for example *Drehmann, Juselius (2012): Do debt service costs affect macroeconomic and financial stability?*

principal amounts, while the difference in terms of repayment maturity is smaller. The average amount of principal of newly-granted cash loans is approximately HRK 54,000 while that of housing and mortgage loans is as a rule ten times bigger

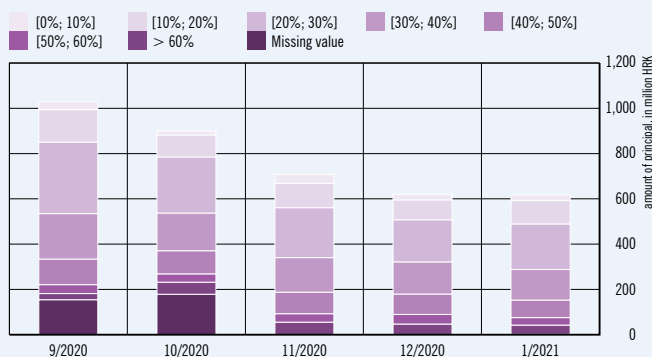
Since the consumer may take out more than one loan, the ratio of total repayments of all loans and consumer income is taken into account (DSTI ratio, Figure 2). However, in that case, data may be missing on total debt repayment burden for a large number of consumers, or atypical values may sometimes be obtained. The level of this indicator is slightly higher than the LSTI ratio (because in addition to the repayment of the newly-granted loan, it includes the costs of repayment of already existing financial obligations). The differences in these ratios are similar for all cash and housing loans. The median of the DSTI ratio mostly ranges around the level of approximately 35% for newly-granted housing loans and around 25% for cash loans.

Figure 3 Distribution of the principal of newly-granted housing loans according to the DSTI ratio classes



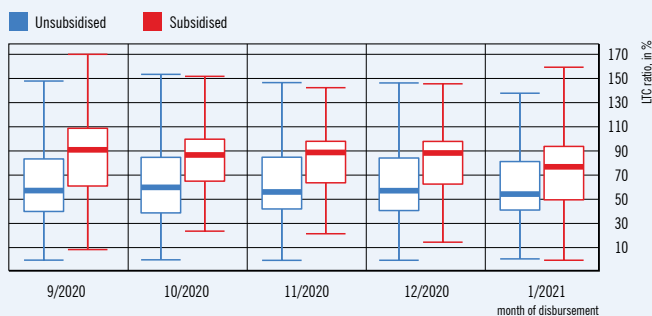
Note: Excluding observations with DSTI > 1 (95% recorded at the beginning of data collection, in September and October). Source: CNB.

Figure 4 Distribution of the principal of newly-granted cash loans according to the DSTI ratio classes



Note: Excluding observations with DSTI > 1 (95% recorded at the beginning of data collection, in September and October). Source: CNB.

Figure 5 Distribution of the LTC ratio of newly-granted housing loans



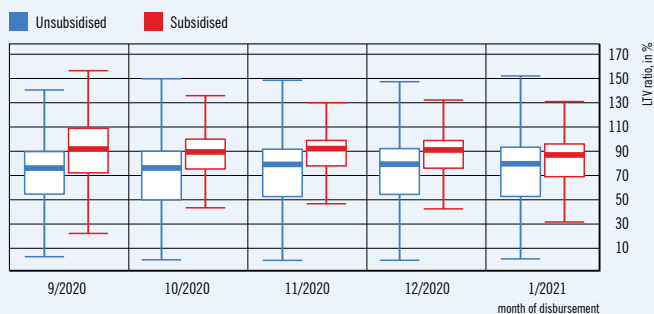
Note: For the purposes of comparison, the figure shows housing loans with real estate as collateral, which account for two thirds of the total number of individual loans of actually newly-granted housing loans, or 75% of the principal. Source: CNB.

To get a preliminary insight into credit risk on the banks' balance sheets associated with debt repayment income burden, the distribution of the value of principal (i.e. the total amount of loans disbursed in one month) according to DSTI ratio classes can be taken into account (Figures 3 and 4). In the previous three months, a little over 50% of the principal of housing loans disbursed involved loans with the DSTI ratio ranging between 30% and 50%. The share of newly-granted loans that might be considered more risky as their DSTI ratio exceeds 50%, is about 20%. Conversely, the share of cash loans with high DSTI ratios (>50%) is lower, at approximately 10%, while approximately 35% of the value of the principal of these loans is granted with a DSTI ranging between 30% and 50%.

The second important group of systemic risk indicators in consumer lending relates to the capacities of banks to absorb losses on non-performing loans by using instruments of collateral. Key indicators in this group are the ratio of the newly-disbursed loan and the value of the pledged real estate (LTV ratio) and the ratio of the newly-disbursed loan and total collateral value (LTC), which in addition to the real estate also include the value of other types of instruments of collateral. Figures 5 and 6 show the distribution of these indicators for housing loans, further divided into government-subsidised loans and other loans⁶. Both indicators suggest that subsidised loans have less collateral coverage (higher level of indicators). The amount of loan in that group is smaller than the value of collateral (LTV and LTC < 100%) in 85% of the newly-disbursed subsidised individual loans, in contrast with 92% in the case of other loans.

⁶ The number of subsidised loans for which these indicators can be credibly calculated stands at approximately 2,750, with the value of the principal standing at approximately HRK 1.6bn, accounting for approximately two thirds of subsidised loans granted in the fifth wave (autumn and winter 2020). The total number of government-subsidised housing loans disbursed thus far is unknown, however publicly available data provided by the competent ministry indicate that approximately 4,500 loan applications were granted in the fifth wave, which, given the average loan amount of approximately HRK 520,000 gives the principal of HRK 2.34bn.

Figure 6 Distribution of the LTV ratio of newly-granted housing loans



Note: For the purposes of comparison, the figure shows housing loans having real estate as the instrument of collateral, which account for two thirds of the total number of individual loans of actually newly-granted housing loans, or 75% of the principal.
Source: CNB.

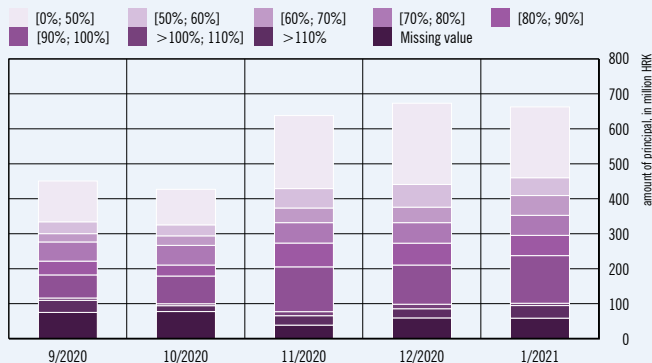
Also, it follows from the definition of the two indicators that for an individual loan, the LTC ratio is always lower than or equal to the LTV ratio. However, the difference between the LTC and LTV ratio is present exclusively in unsubsidised loans, which is associated with the fact that users of these loans usually do not have other assets to use as collateral⁷. Also, the magnitude of possible losses of credit institutions in the case of a failure to meet loan obligations may be estimated based on the distribution of the value of the principal of newly-granted housing loans according to the LTC ratio classes (Figures 7 and 8). Unsubsidised loans are as a rule granted with lower LTC ratios so that most of the principal (approximately 70% or more) of these loans is distributed into groups with the LTC ratio below 90%, while the share of those with the LTC ratio between 90% and 100% stands at approximately 20%. Conversely, subsidised loans are often granted with LTC ratios between 90% and 100% (approximately 40% – 50% of the total amount of principal) with the share of principal of subsidised loans with the LTC ratio below 90% being lower as a result. The share of principal of subsidised loans granted with the LTC ratio above 100% is very low and stands at about 5%.

Regular data monitoring will provide a clearer insight into changes in loan granting standards and the evolution of risks to the banking sector during business and financial cycles. For instance, in the phase of real estate price growth, loans are often granted at high LTV ratios, which fuels further price growth and accumulation of vulnerabilities, while in the phase of falling real estate prices, banks tend to tighten these ratios. In so doing, credit institutions may increase fluctuations in the real estate market and build up further risks at the time of expansion.

To ensure a comprehensive monitoring of the development of systemic risks associated with consumer lending, it is vital that loans be monitored through time – from the moment they are disbursed and entered on the banks' balance sheets to their repayment, delays and liquidation, sale or write-off. In the downward phase of the cycle, it is exactly the

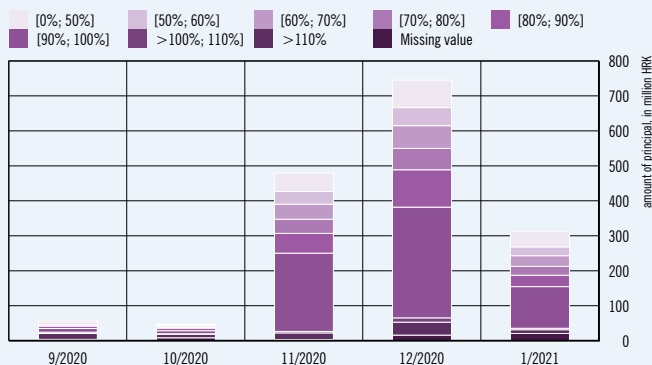
⁷ The average weighted annual income of users (and any co-debtors) of subsidised loans in the observed sample stood at approximately HRK 130,000 (median HRK 100,000) while for unsubsidised loans it stood at approximately 200,000 HRK (median HRK 120,000).

Figure 7 Distribution of the principal of unsubsidised housing loans by the LTC ratio classes



Source: CNB.

Figure 8 Distribution of the principal of subsidised housing loans according to the LTC ratio classes

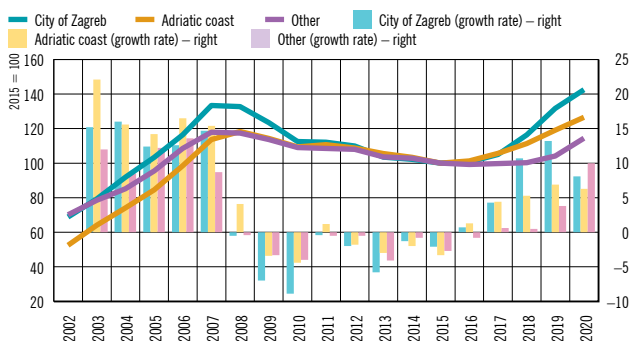


Source: CNB.

disproportion between the standards for granting new loans (low DSTI, low LTV) and the standards under which loans were granted earlier (high DSTI, high LTV) that points to accumulated vulnerabilities on the banks' balance sheets and in the economy. Keeping information on income and the value of collateral up to date poses an additional challenge in the assessment of systemic vulnerabilities associated with consumer lending, as such information is crucial for the assessment of developments in the debt burden of loan users. It is also important to continue developing “physical” indicators of the real estate market (prices, rent, yield, real estate available) so as to monitor developments in the value of individual segments (for instance geographical) and estimate any possible changes in the measured LTV ratios.

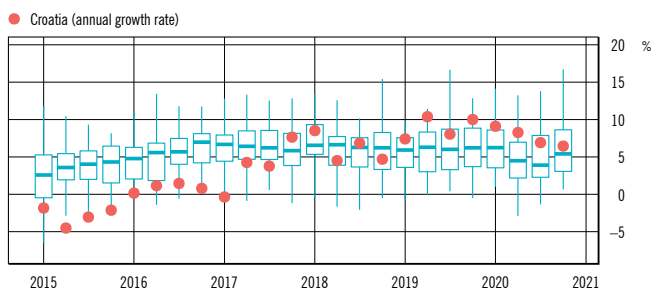
4 Real estate

Figure 4.1 Growth in residential real estate prices slowed down in Zagreb and on the Adriatic coast and picked up in the rest of Croatia



Note: The Adriatic Coast region is defined as consisting of 139 municipalities/cities (for more details, see Kunovac and Kotarac (2019): Residential Property Prices in Croatia). Source: CBS.

Figure 4.2 Growth in real estate prices in Croatia above the European average



Notes: The boxplot diagram in the figure shows the distribution of annual rates of change in real estate prices in the EU. Characteristic elements are given for each period: the median, the lower and upper quartile, and the lowest and highest datum within 1.5 fold the interquartile range from the lower or upper quartile. Outliers outside the interval are not given. Source: Eurostat.

While the residential real estate market showed resilience to the current crisis in 2020, financial stability risks associated with this market might increase in the forthcoming period. Regardless of unfavourable economic developments, earthquakes and uncertainty surrounding the pandemic, residential real estate prices continued to trend up, housing loans picked up pace and the construction sector expanded further, while the total number of purchase and sale transactions decreased mildly. As many indicators suggest that current real estate prices are above the equilibrium level, the continued sharp increase in prices might exacerbate the risks associated with their fall and the decrease in real estate market liquidity, as well as the decline in the value of collateral held in banks' balance sheets.

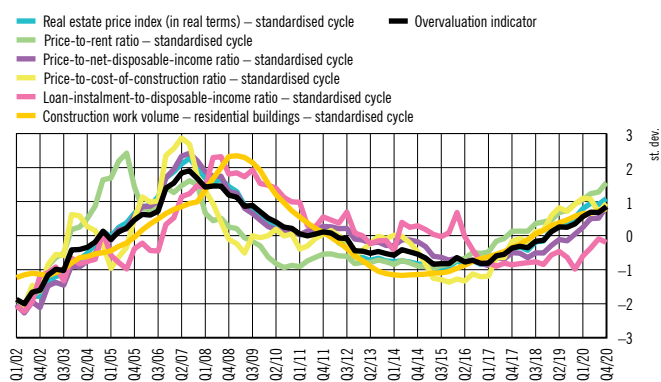
Residential real estate market – prices and number of transactions

The upward trend in residential real estate prices continued in 2020, the year marked by the pandemic, earthquakes and the sharp economic contraction. The annual increase in residential real estate prices of 7.7% was only marginally lower than the 9% growth seen in 2019. The residential real estate price index for Croatia as a whole exceeded in 2020 the levels seen before the 2008 global financial crisis and hit a record high. Despite unfavourable current trends and great uncertainty regarding the speed of recovery, prices in the City of Zagreb and on the Adriatic coast grew steadily, albeit at somewhat lower rates than in the previous years, while the rise in prices of residential real estate in the rest of Croatia even gained momentum

(Figure 4.1). This can be partly attributed to the fact that prices in the latter area started to grow only in 2019, after the long-lasting decrease following the global financial crisis and two years of stagnation.

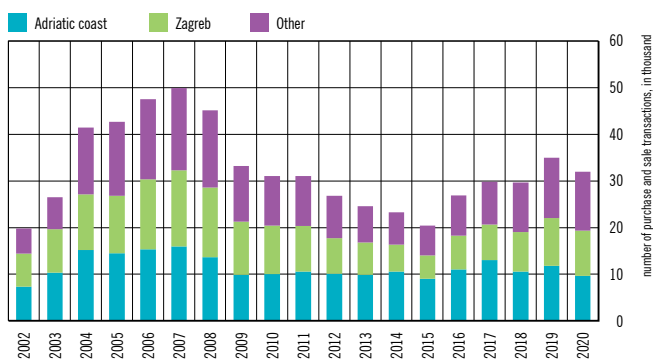
The recent growth in real estate prices was driven by exceptionally favourable financing conditions, continuance of the housing loans subsidy programme and stability of jobs and incomes, as well as the growth in household savings, some of which probably went towards real estate in view of the low yields on financial assets. In addition, the resilience of residential property prices during the pandemic crisis, that is, the sellers' reluctance to reduce prices, reflects the perception that the current crisis is of short duration. It is likely that significant price corrections will be seen if the current macroeconomic situation continues for a long time. Finally, the boost to demand also came from new pandemic-driven lifestyle trends, such as

Figure 4.3 Real estate prices above the level based on fundamentals



Note: A composite index of divergence is obtained as the first main component of the six indicators given in the figure. Sources: CBS and CNB calculations.

Figure 4.4 Number of transactions in residential real estate decreased moderately in 2020



Source: Tax Administration database.

working from home and physical distancing, which prompted households to favour living outside the city centre and to purchase larger housing units. Developments in residential property prices in Croatia in the pandemic year 2020 are comparable to those in the rest of the EU, where the upward price trends seen in the pre-pandemic period continued at a pace slightly slower than in Croatia (Figure 4.2).

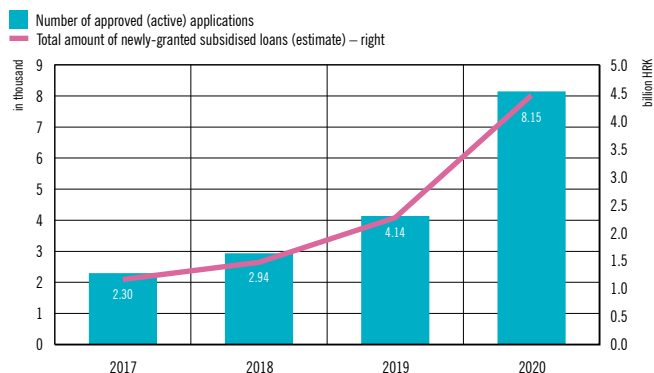
A composite index of real estate price “divergence” from the estimated equilibrium level suggests a slight real estate overvaluation (Figure 4.3). All individual indices used in index calculation, with the exception of the loan-installment-to-disposable-income ratio, were above their long-term trend, which, taking into account unfavourable economic trends, may point to a growing discrepancy between real estate prices and the macroeconomic variables on which they should be based.

The number of purchase and sale transactions in residential real estate dropped by 8.6% in 2020, after the several-year upward trend that started in 2016 and stagnation in 2018. This drop was only moderate if one takes into account pandemic-related circumstances such as epidemiological measures of social distancing, which hampered the usual property purchase and sale procedure, and uncertainties related to labour market developments. The sharpest fall in the number of transactions, of almost one fifth, was recorded on the Adriatic coast, which was exacerbated by the uncertainty related with developments in the tourism sector and profitability of real estate investments for tourist rentals. Foreign demand for real estate in coastal counties remained strong last year and the share of foreigners in the total number of transactions was similar to that in 2019, averaging one quarter of all transactions on the Adriatic coast or even more – in Istria, around 40% of all transactions (see Box 2 Regional differences in real estate demand). The fall in the total number of market transactions, coupled with the rise in prices, shows that sellers were more ready to postpone the sale in the absence of buyers' interest (“wait and see”) than to lower the price.

Last year's earthquakes, which mostly hit the centre of Zagreb and the Sisak-Moslavina County, severely damaged the housing stock in these regions. Though the earthquakes had a strong impact on purchase and sale dynamics in these regions, the areas most affected by the devastating earthquakes account for a relatively small share in the usual structure of transactions, of around 3% in Croatia as a whole, so that price trends in these areas have little effect on aggregate price movements.

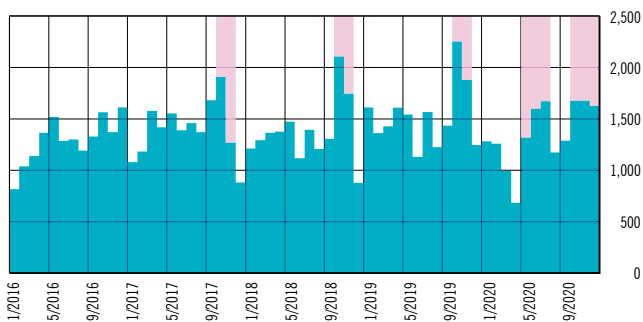
The number of approved applications for housing loans subsidised through APN was much higher than in the previous years (Figure 4.5). The number of subsidised loans almost doubled, reaching 8,150, which indicates the growing popularity of this manner of purchasing residential property (see Figure 3 in Box 2 Regional differences in real estate demand), with an estimated one quarter of total residential property transactions in 2020 being realised within the APN's programme. Introduction of the second cycle of housing loan subsidies (cycles took place

Figure 4.5 Number of approved applications for subsidised housing loans was much higher in 2020 than in the previous years



Sources: APN and CNB calculations.

Figure 4.6 Introduction of two subsidy cycles per year equalised the intra-year dynamics of the number of transactions



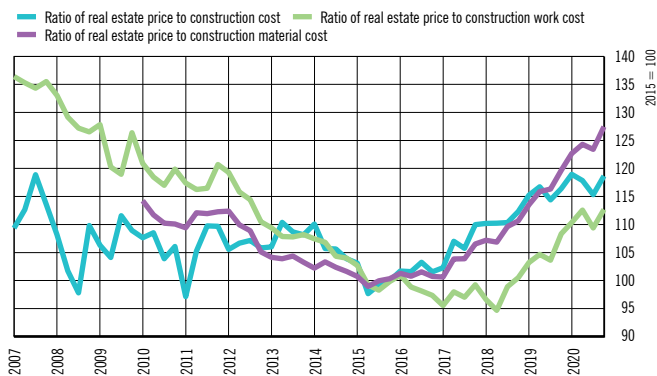
Note: Months when the transactions within the APN's subsidy programme were realised are shaded.
Sources: Tax Administration database and CNB calculations.

in March and September 2020) resulted in a much smaller variability in the number of transactions over the year, which used to be concentrated in a very short interval in the previous years (Figure 4.6). Subsidy rules for 2021 have been changed so that this year's subsidy application cycle began on 29 March and is due to last until the planned amount of HRK 50m is used.

Construction sector

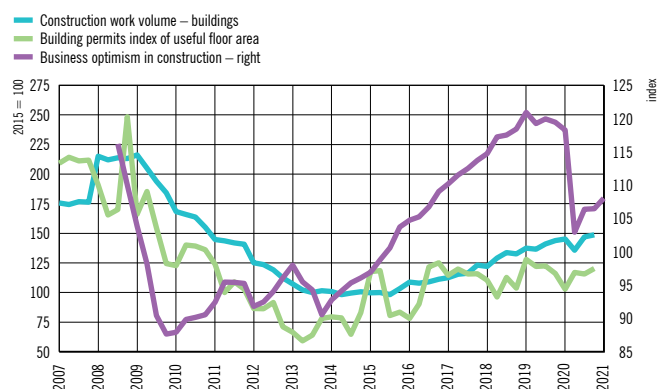
Following a brief interruption in early 2020, the growth in the volume of construction works on buildings resumed. This year's growth will be spurred by the reconstruction of flats and houses damaged by the earthquakes as well as the realisation of infrastructural projects spurred by even larger inflows of European funds. Labour shortages might restrain the growth intensity, while the employment of resources for reconstruction of existing buildings might somewhat narrow the supply of new residential premises.

Figure 4.7 Residential real estate prices grew faster than construction costs



Sources: CBS and Eurostat.

Figure 4.8 After plummeting, business optimism in construction started to grow



Sources: CBS and CNB.

Pandemic-related uncertainty led to a slight decrease in the number of building permits issued last year and plummeting optimism in the construction sector (Figure 4.8). Available data for early 2021 on business optimism in construction and the number of issued building permits point to a gradual recovery in confidence.

Construction costs continued to grow slower than real estate prices last year (Figure 4.7), with labour costs growing faster than the costs of construction materials. Costs of materials are expected to grow sharply in 2021, driven by the rise in the global prices of iron and larger domestic demand associated with the reconstruction of damage caused by the earthquakes in Zagreb and Pokuplje. These factors might also exert upward pressures on the prices of new flats, and indirectly the prices of existing housing units, which account for the bulk of market transactions.

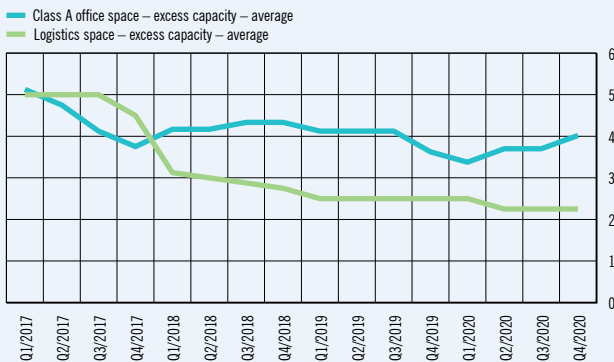
Analytical annex: Commercial real estate market

The pandemic has had a significant impact on the commercial real estate sector, with a very heterogeneous impact on various market segments. Excess capacities in the office space market increased, whereas availability of logistics space decreased slightly. As with residential real estate, this market was less active than in the pre-pandemic period, which may be largely attributed to the major decrease in the hotel segment, while transactions in retail and office space increased.

From 2017 to the first quarter of 2020, the share of available class A office space stabilised at a low level of 3% of total office space available for rent. However, the mild increase to 4% seen in late 2020 (Figure 1) might be the outcome of people more frequently working from home, which was not common in the pre-pandemic period, and the segmentation of demand for office space following the Zagreb earthquake. After growing in the past, rental prices for office space stabilised, both in the class A (EUR 14 per square meter) and in the class B (EUR 10.5 per square meter) segment, with available data on the returns on investment in class A office space pointing to their gradual decrease.

After the pandemic outbreak in spring 2020, availability of logistics space further decreased from already very low levels (around 2%). The occupancy rate is high due to a limited supply of new projects and the fact that supply mostly consists of older buildings, with rental prices and returns, which held steady in 2020, being higher than in peer countries.

Figure 1 Office and logistics space availability

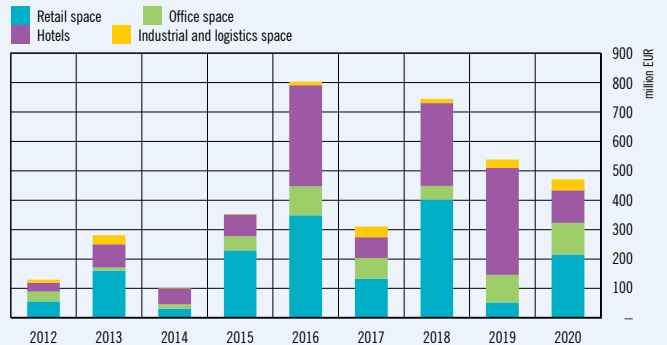


Note: Data refer to the City of Zagreb and its surroundings.
Sources: CBRE, Colliers, CW CBS International and Spiller Farmer nekretnine.

In the retail space segment, divergent movements were seen in the class A and class B market segments. Availability of rental space, which steadily declined from 2015, continued to decrease in the class B segment, falling to 9% in 2020. At the same time, availability of rental space in the A-segment market edged up during the pandemic year, but remained relatively low (4%). Returns for the A-segment almost held steady in that period, at around 7%, with relatively stable rental prices, while rental prices in the B-segment market decreased.

According to data of a private agency, activity in the commercial property sector measured by purchase and sale transactions picked up in recent years, particularly in the hotel segment (the largest values in both absolute and relative terms), whereas the values of transactions in the office and retail space segment fluctuated. The turnover in the market for retail and office space increased from the pre-crisis year 2019 to 2020, while transactions in the hotel segment dropped significantly (Figure 2). Also, in response to the lack of opportunity to travel and the severe impact of the pandemic on the tourism sector, increased caution of investors in hotels and similar facilities resulted in a fall in new building permits. Transactions in the segment of industrial and logistics centres accounted for the smallest share in the period under review owing to the lack of supply. Although there is strong interest in the segment of logistics space, due to a limited supply of existing space, most investments are made through construction of new facilities. It may be concluded that despite the pandemic conditions, online sale has not yet redirected demand from retail space towards logistics centres.

Figure 2 Assessment of annual purchase and sale transactions shows a larger demand in the retail space segment



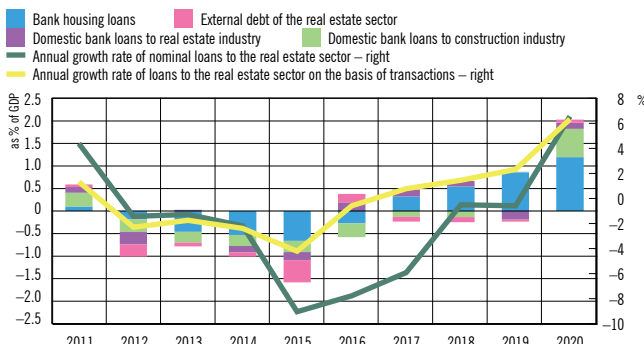
Notes: The assessment does not cover total transactions but only investment deals recorded in the market. It also does not include investments in construction.
Source: Colliers.

Real estate market financing

Debt related to the real estate sector continued to increase in 2020. The growth was mostly driven by the increase in the volume of housing loans, of 1.1 percentage points of GDP, and loans to construction companies, of 0.6 percentage points of GDP, which was largely the outcome of domestic refinancing of some maturing foreign debt of one company and not of the shift in the borrowing trends of the entire sector (Figure 4.9). The increase in the volume of housing loans was spurred by historically low interest rates on loans (Figure 4.10), loan subsidies and stability of incomes and jobs, which supported the steady downward trend in the ratio of loan payment to household disposable income (Figures 4.11 and 4.12).

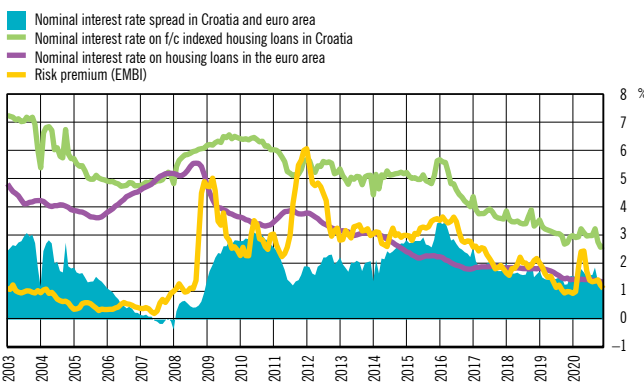
The pick-up in housing loans (see chapter 3 Household sector) was greatly supported by the new cycle of the APN's subsidy

Figure 4.9 Growth in housing loans continued into 2020



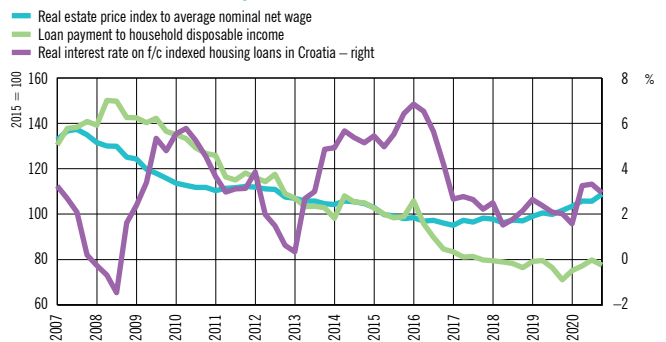
Notes: Changes in domestic debt by components were calculated on the basis of transaction data. External debt includes the debt of the real estate and construction industries.
Source: CNB calculations.

Figure 4.10 Interest rates on housing loans hit record lows



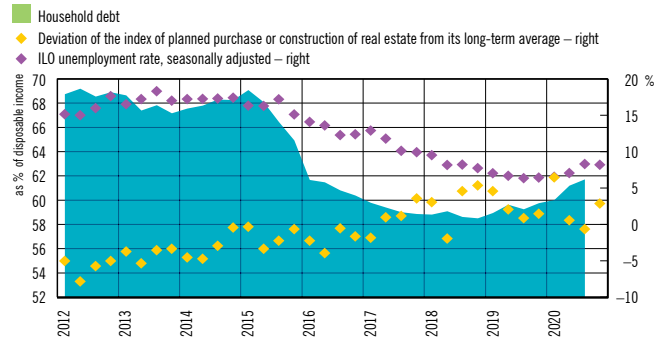
Sources: ECB, Bloomberg and CNB.

Figure 4.11 Net wages grew slower than real estate prices, while the decrease in the loan-installment-to-disposable-income ratio was backed by low interest rates



Note: Loan instalment refers to an average housing loan with the interest rate given in Figure 4.10 for the purchase of residential property of 50 square meters at the price relevant in the reference period.
Sources: CBS and CNB calculations.

Figure 4.12 Consumer optimism and a marginal increase in unemployment gave a boost to real estate demand



Note: Index of planning the purchase or construction of real estate was calculated according to consumers' answers to the question on plans regarding the purchase or construction of real estate in the next 12 months from the CNB's Consumer Confidence Survey.
Source: CNB.

programme, with the share of APN-subsidised loans in new loans reaching about one third, after being below 20% in the previous years. An analysis of granular data on consumer lending standards (see Box 1 A new source of data on consumer lending standards) does not indicate significant risks associated with the lending standards for housing loans, but one should not lose sight of their vulnerability should there be a sharp fall in real estate prices.

Current risks in the real estate market

Residential real estate supply and demand in the forthcoming period will depend on the pace and intensity of recovery. Sellers have so far been ready to postpone the sale of a property when they fail to get the asking price. However, asking prices would have to be reduced if recovery is slower and weaker than expected, particularly if sellers are not ready to wait for buyers for a long time. Also, a slower rebound of tourism activity might affect investors in tourist real estate. Some investors who financed investments by borrowing might face difficulties

in debt servicing, which, in turn, might expand supply in the real estate market. On the other hand, a slower recovery and possible bankruptcies of enterprises coupled with unemployment growth after the withdrawal of support measures might reduce demand for residential real estate. Some debtors whose income depends on the activities most affected might also face repayment difficulties.

Though housing loan subsidising schemes may have a stabilising effect on the real estate market in crisis conditions, their intensification might increase the divergence of real estate prices from their estimated equilibrium levels. The APN's subsidy programme will this year again add to demand

for housing loans, but to a somewhat smaller extent than in 2020 due to limits on the total amount of funds available for subsidies.

The risks of poor market liquidity and decline in the value of collateral might materialise in the event of a major slump in demand for real estate and a sharp fall in prices. However, such risks will be relatively low in the near future because of the mentioned factors that spur real estate demand and exert downward pressures on prices. Nevertheless, these risks are much more likely to materialise in the medium term if the strong increase in prices continues.

Box 2 Regional differences in real estate demand

Analysis of risks to financial stability associated with the trends in the residential real estate market is based mostly on observation of aggregate indicators and the indicators derived from them. However, a correct risk estimate also requires a good understanding of specific features of real estate demand at regional levels. Regional markets for residential real estate in Croatia may be particularly influenced by real estate purchases by non-residents and by the housing loan subsidy programme. Also, the purchase for investment purposes of real estate in other counties, as illustrated by the “urban myth” that inhabitants of coastal regions purchase large numbers of real properties in Zagreb following a good tourist season, may also be important for some regional markets, creating additional upward pressure on real estate prices.

Number of transactions in residential real estate by regions

To observe regional differences in the number of transactions in residential real estate, Croatian counties were divided into three characteristic groups, reflecting differences in the structure of demand and the purpose for which properties are purchased in each region. The first group

comprises the City of Zagreb and the County of Zagreb, the second includes the coastal counties, and all other counties are in the third group.

Table 1 shows the data for each of the three groups of counties in the previous two years on the number of transactions and relative importance.

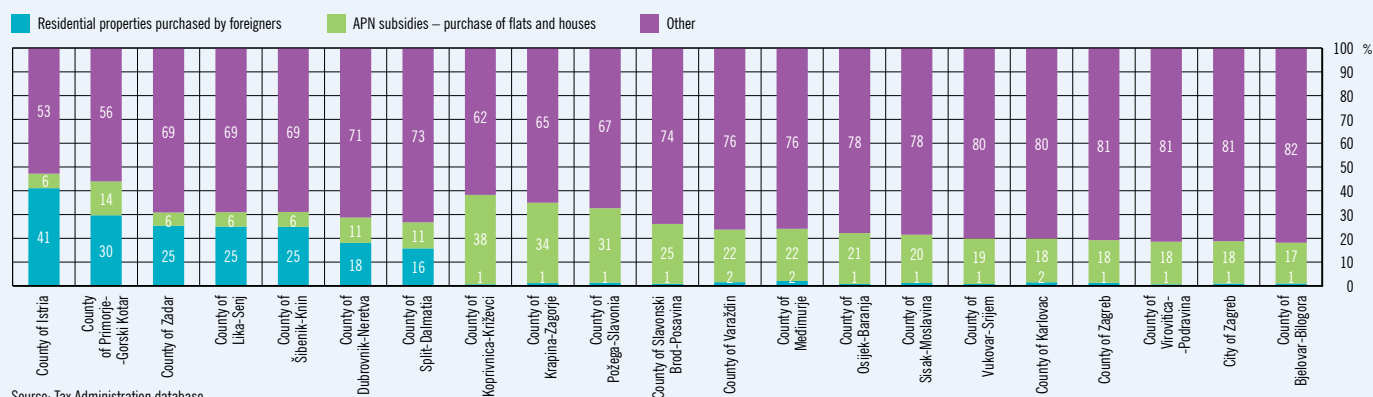
After several years of falling prices following the global financial crisis in 2008, a rebound began in the real estate market for all three groups of counties in 2015. However, the pace and intensity of recovery significantly differed across these groups – while the number of transactions in the coastal counties grew only moderately (around 10%), the number of transactions in the City of Zagreb and the County of Zagreb and other counties approximately doubled in the same period (Table 1). As a result, the importance of the Zagreb market and the market of “other counties” increased, whereas the share of coastal counties decreased over the last six years. For example, as much as 38% of all residential property purchase and sale transactions in 2020 was accounted for by the two Zagreb counties, as opposed to less than 30% in 2015. In the same period, the share of transactions in the coastal counties dropped sharply, from 46% in 2015 to 33% of all transactions in the country in 2020. Finally, the share of transactions in other counties grew steadily, reaching 29% of all transactions last year.

Table 1 Number, relative importance and rates of change in transactions

	Number of transactions			Share of transactions			Growth rate	
	2015	2019	2020	2015	2019	2020	2020/2015	2020/2019
Zagreb and County of Zagreb	6,067	12,710	12,140	29.7	36.4	38.0	100.1	-4.5
Adriatic counties	9,500	12,696	10,440	46.5	36.3	32.7	9.9	-17.8
Other counties	4,884	9,547	9,353	23.9	27.3	29.3	91.5	-2.0
Total	20,451	34,953	31,933	100	100	100	56.1	-8.6

Note: The table is based on Tax Administration data on realised purchase and sale transactions in residential property and property with residential premises. Source: CNB.

Figure 1 Structure of residential properties sold in the period from 2017 to 2020 purchased by non-residents and residents with housing loan subsidies, by counties



Source: Tax Administration database.

The 8.6% decrease in the total number of transactions in the last two years, driven by the pandemic and the earthquakes, was not equally distributed across the regions. The fall was relatively steep in the coastal counties, at 17.8%, it was 4.5% in the Zagreb region and only 2% in other counties.

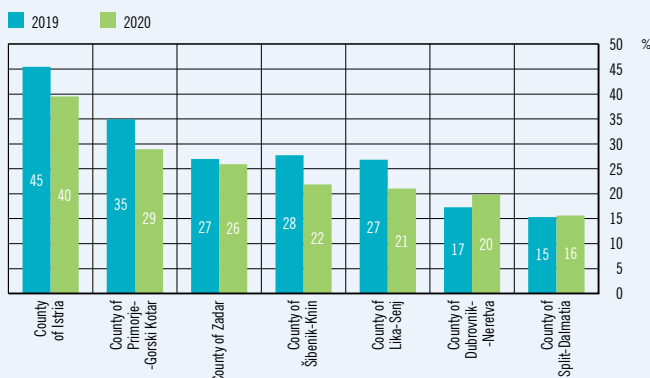
What is the importance of foreign nationals and subsidised loans for real estate demand?

Demand for residential property in Croatia is strongly driven by historically low interest rates, and the effective rates for many buyers are reduced by fiscal subsidies for housing loans. Even the relatively unfavourable consumer expectations regarding future macroeconomic developments did not substantially curb demand, while the pandemic did have some impact on the demand structure, diminishing the attractiveness of urban centres. Finally, real estate purchased by foreign nationals

further added to demand and exerted upward pressures on prices. Some of these factors are relevant for the country as a whole, while some are not equally important for all parts of Croatia. In coastal counties where tourist activity is of major importance, foreigners buy more real estate than in the rest of the country, whereas in continental Croatia, where real estate is mostly purchased to meet housing needs, demand is more influenced by housing loan subsidies.

Foreign demand for residential property is almost exclusively concentrated in coastal counties, where it accounts for about one quarter of all transactions, with even larger shares in the Northern coastal counties (Figure 1). Most properties are bought by Germans, Austrians and Slovenes, with their share in the total number of transactions being much larger in the part of the Adriatic coast that is geographically closer to their countries and can be reached relatively quickly by car. The share of foreign nationals in residential property transactions did not change much in the observed period, not even in the pandemic 2020, when it decreased relatively slightly, from 28% to 25% (Figure 2).

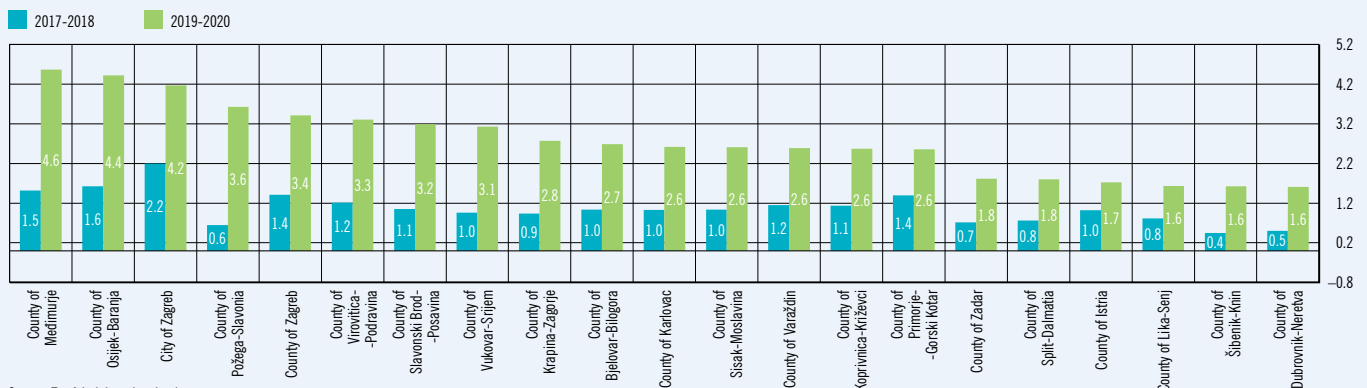
Figure 2 Share of residential properties purchased by foreigners in 2019 and 2020



Source: Tax Administration database.

The share of residential property purchases aided by the APN's subsidy programme was the largest in continental counties, where approximately 20% of all real properties were purchased within the programme (Figure 1). The conclusion about the importance of transactions under the loan subsidy programme for continental counties holds even if the number of transactions by type is put into correlation with the number of inhabitants in each county (Figure 3). The smaller popularity of subsidised housing loans in the coastal counties is probably due to the rules of the APN's programme that requires that subsidy recipients do not own another real property (or have inadequate property that has to be sold) and must register their place of residence at the address of the purchased flat or house. For example, the purchase of additional real property for tourist rentals does not meet the above criteria. Finally, the popularity of subsidised loans was much stronger in all counties in the last two years than in the first two years of programme implementation.¹

Figure 3 Number of APN housing loan subsidies per 1000 inhabitants



Source: Tax Administration database.

¹ For a detailed analysis of APN subsidies by counties in the first two years of the implementation of the programme, see Box 4 in Financial Stability, No. 20.

Do Croatian citizens purchase real estate outside their county of residence?

Finally, demand for real estate may also be influenced by investment purchases, which are often related to cross-county transactions, such as the purchase of real estate in Zagreb by inhabitants of the coastal counties in order to diversify income sources or the purchase of holiday houses in Lika and Gorski Kotar during the pandemic by inhabitants of other counties.

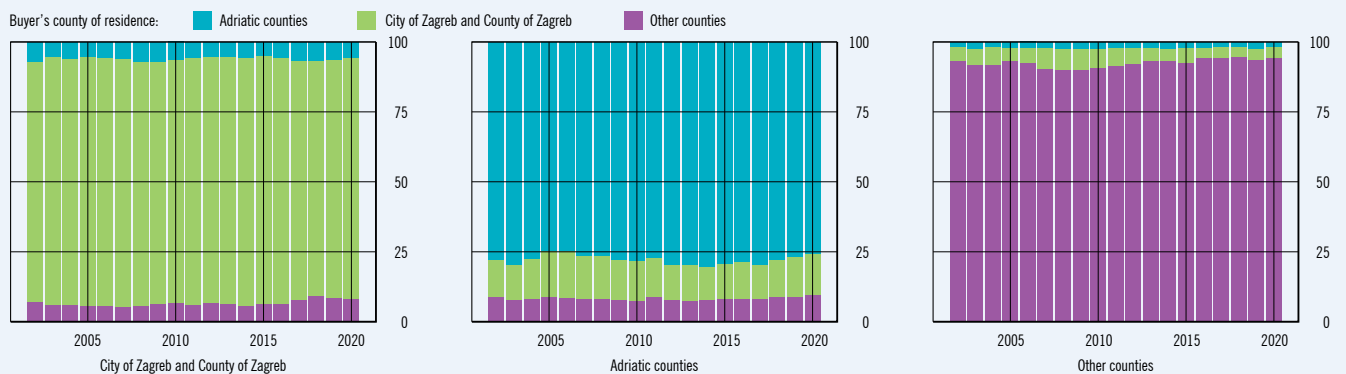
Buyers with a place of residence in that same region predominate in all three groups of counties (Figure 4a).² In addition to the dominant “local” buyers, on average, around 6% of buyers with residence on the Adriatic coast and the same percentage of buyers with residence in other counties purchase real estate in the Zagreb region. On the other hand, around 15% of real properties in the coastal counties are purchased by people from the Zagreb region and around 8% by inhabitants

of other regions. Finally, in the region of other counties transactions by buyers from the same region predominate, with a negligible share of buyers from the coastal counties and a relatively small share of buyers from the Zagreb region. The described pattern of transactions did not change much during the pandemic, that is, inhabitants of the Zagreb and coastal counties did not start to make large purchases of real estate in the rest of Croatia.

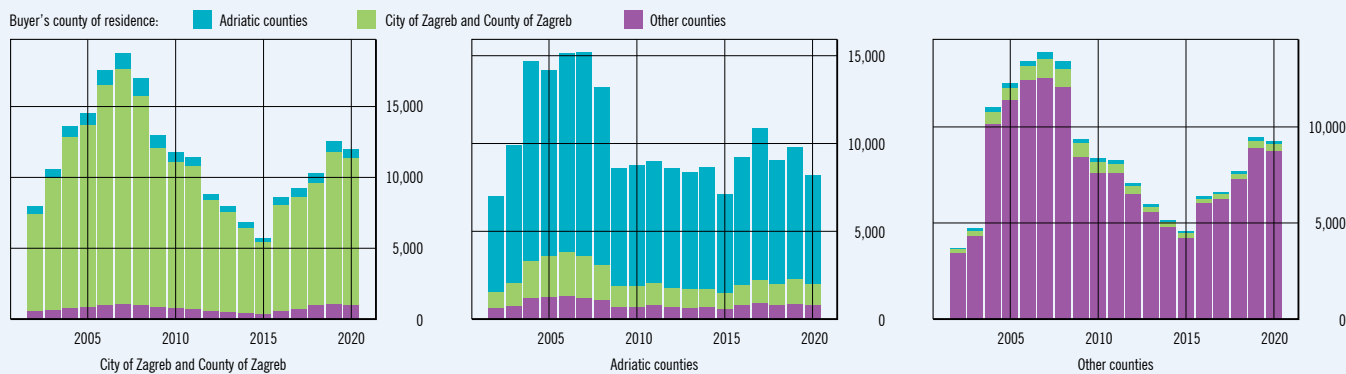
The analysis indicates major differences in the sources of demand for residential real estate in particular parts of Croatia. Real estate demand remained relatively high in the pandemic year of 2020 – it was supported by the subsidy programme in continental Croatia and the very stable demand by foreign nationals in the coastal region. While both these factors may maintain demand for real estate during the crisis, should the crisis be prolonged, excessive demand may result in further departure of prices from their equilibrium levels, increasing risks to financial stability.

Figure 4 Structure of buyers according to residence in all residential property transactions, by counties

a) Share in total transactions



b) Number of transactions

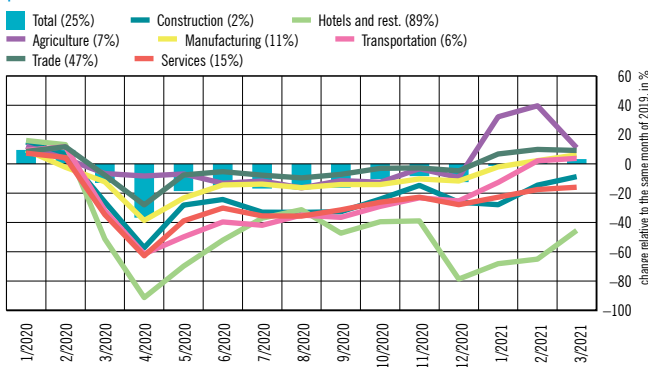


Note: Analysis excludes the real estate purchased by foreigners.
Source: Tax Administration database.

² Analysis of more disaggregated data shows that a large majority of buyers come from the same place of residence.

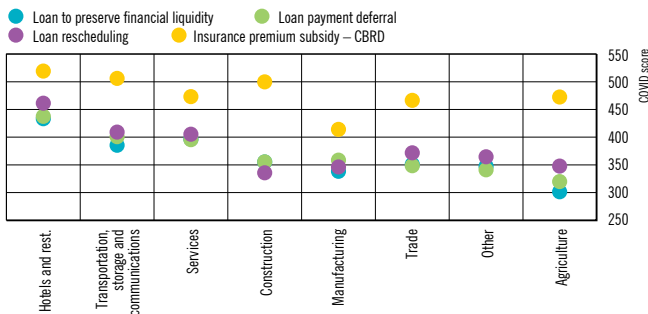
5 Non-financial corporate sector

Figure 5.1 Continuance of lower business activity due to the pandemic



Notes: The figure shows a change in the total amount of fiscalised receipts relative to the same month of 2019. Numbers in brackets refer to the shares of fiscalised receipts in total revenue for 2019.
Source: Tax Administration.

Figure 5.2 COVID score for enterprises that applied for support measures through FINA, by activities



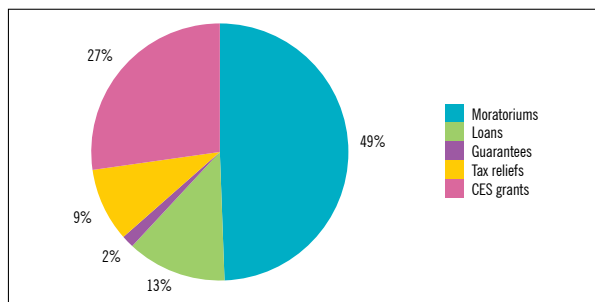
Notes: The total score is based on assessment of the threat to the dominant activity of an enterprise, its credit rating, job preservation criteria, fall in business revenue (current and estimated), and assessment of future liquidity, bearing in mind the actual fall in business outflows and inflows. A higher score represents a higher potential threat to operations due to the COVID-19 pandemic.
Source: FINA.

The economy has been slowly adjusting to functioning in pandemic conditions and recovery has been steady since mid-2020, but risks to the sustainability of corporations most vulnerable to social distancing measures have grown substantially in the second year of the pandemic. Lending to non-financial corporations grew moderately, while indicators of their relative indebtedness rose primarily due to the fall in income. A premature withdrawal of support to enterprises affected by the COVID-19 pandemic would pose a significant risk to their viability, but risks associated with support to unviable firms have also increased.

Though activity reached pre-crisis levels in a large part of the economy, some activities continue to be strongly affected. Corporations in accommodation and food service activities were the most vulnerable as their revenues halved on average in the period from March 2020 to March 2021. They were followed by transportation, storage and communications and other service activities, whose revenues dropped by one third (Figure 5.1). However, a mild increase was seen in February and March 2021, compared with the same months of 2019, in agriculture, trade, manufacturing, and transportation, storage and communications, mostly owing to the IT sector. The COVID score, which FINA uses to assess the threat to business entities that applied for support measures, was the highest for enterprises associated with tourist services, followed by other service activities, construction, manufacturing and trade (Figure 5.2).

Non-financial corporations used substantial support to withstand the crisis, predominantly loan and leasing payment moratoriums, job preservation grants in the form of wage subsidies

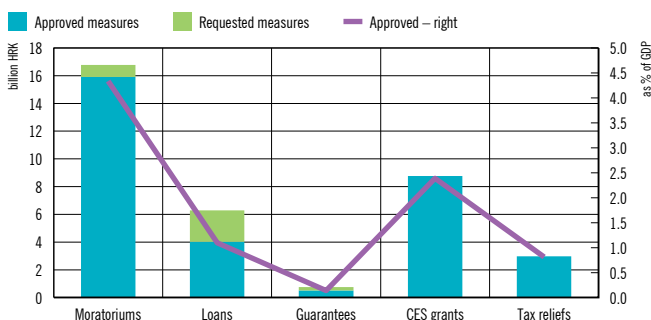
Figure 5.3 Loan and leasing payment deferrals (moratoriums), job preservation grants and tax exemptions account for around 90% of the amount of COVID-19 measures



Note: Moratoriums, loans and guarantees show the total balance of placements covered by measures at the end of period (31 March 2021), while CES grants and tax exemptions show the cumulative amount of used measures (15 March 2020 to 31 March 2021).

Sources: Tax Administration, CES, CBRD, HAMAG-BICRO and CNB.

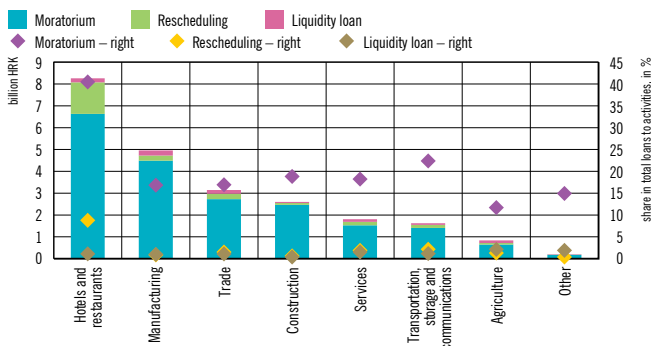
Figure 5.4 Moratoriums predominate in requested and granted measures to support corporations



Note: Moratoriums, loans and guarantees show the total balance of placements covered by measures at the end of period (31 March 2021), while CES grants and tax exemptions show the cumulative amount of measures used (15 March 2020 to 31 March 2021).

Sources: Tax Administration, CES, CBRD, HAMAG-BICRO and CNB.

Figure 5.5 Tourism activity predominates in requested and granted moratoriums and rescheduling of existing obligations



Note: Shares in the loans to activities are the ratios of loan amounts associated with measures to the loan balance as at 31 March 2021.

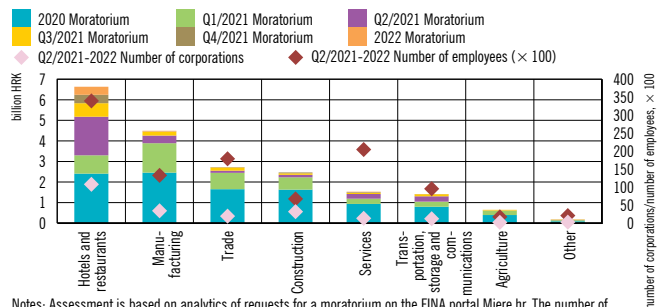
Sources: FINA and CNB.

to persons employed with pandemic-affected companies and tax deferrals⁶ and reliefs, while less used were liquidity financing loans, guarantee schemes and, from December 2020 on, subsidies for fixed operating costs. Moratoriums, loans for maintaining liquidity and issued guarantees amounted to more than HRK 20bn in the first quarter of 2021, while close to HRK 12bn was used for job preservation grants, subsidies for fixed costs and tax exemptions from the beginning of the pandemic, which means that a total of HRK 32bn (around 9% of GDP) was spent to support the economy in dealing with the consequences of the pandemic (Figures 5.3 and 5.4).

Most loan moratoriums were used by hotel and food service activities, followed by manufacturing and transportation, storage and communications (Figure 5.5). Though tourist season results surpassed expectations, corporations associated with the tourism industry suffered the most in 2020. After the sharp investment growth in the pre-crisis years, they postponed more than 40% of loan payments and restructured almost 9% of loans during the pandemic. A substantial share of moratoriums was still effective at the end of the first quarter of 2021. However, large amounts of debt will mature as moratoriums expire, so that by the end of the year corporations will have to settle HRK 5bn of loans (that is more than 5% of total corporate loans, granted to 1,000 enterprises with more than 22,000 employees (Figure 5.6)).

Fiscal support and activities taken by enterprises to preserve and strengthen liquidity reduced demand for loans among creditworthy corporations after the first quarter of 2020 (Figure 5.8). A large number of enterprises used some form of measures to help the economy, partly compensating for the drop in operating income. However, even with support, enterprises in the hardest hit activities recorded losses in 2020, which, together with uncertain business prospects, made access to new borrowing more difficult. Thanks to measures to

Figure 5.6 More than HRK 5bn of moratoriums falls due in the last three quarters of 2021

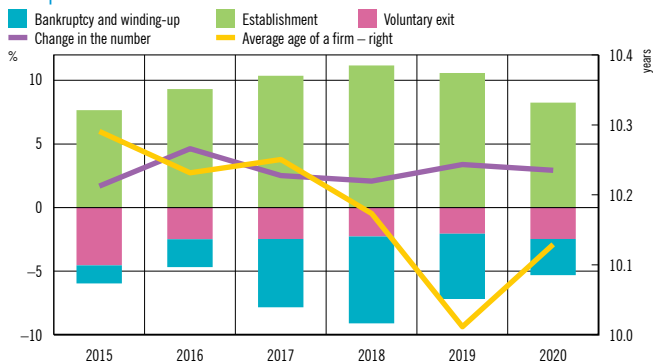


Notes: Assessment is based on analytics of requests for a moratorium on the FINA portal Mjere.hr. The number of employees in corporations is divided by 100 to facilitate its presentation on the same scale as the number of corporations. Values on the right-hand scale have to be multiplied by 100 to obtain the number of employees per activity; e.g. Hotels and restaurants: $108 \times 100 = 10,800$ persons employed. Moratoriums show the total balance of loans for which deferral measures have expired or will expire in the given period, while the numbers of corporations and employees are presented according to moratorium maturity buckets.

Sources: FINA and CNB.

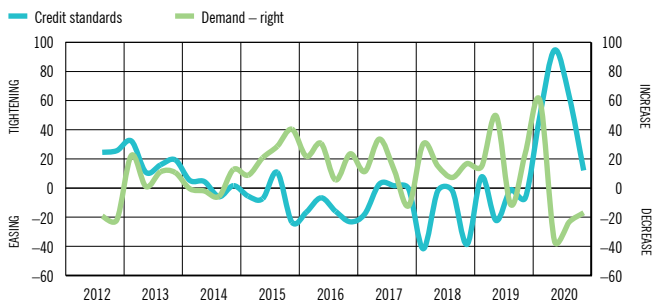
⁶ The data refers only to the period of the first wave of the pandemic. Deferred tax amounts came due in late third quarter of 2020 and deferrals are no longer granted.

Figure 5.7 The number of firms that ceased operations and the number of newly established firms both decreased during the pandemic



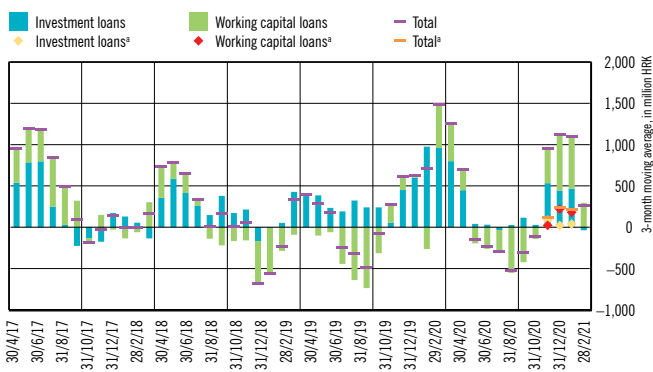
Source: FINA.

Figure 5.8 The pandemic has been characterised by a fall in credit demand and the tightening of credit standards



Notes: Positive values show an increase in demand and the tightening of credit standards, whereas negative values show a decrease in demand and the easing of standards. Data show the net percentage of banks weighted by the share in total corporate loans.
Source: CNB.

Figure 5.9 New lending was weaker and mostly related to working capital financing



Note: The figure shows the moving average of net transactions, and * denotes net transactions without one-off effects.
Source: CNB.

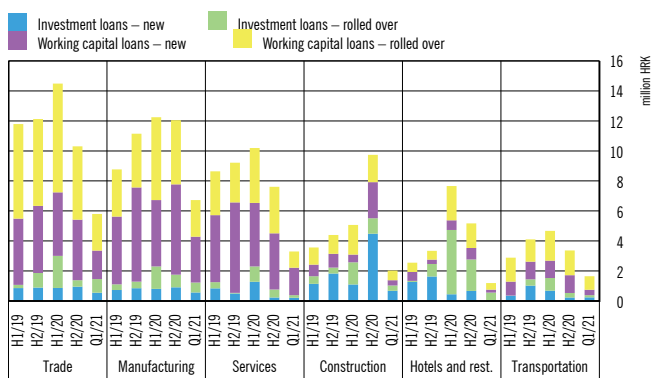
help the economy, the temporary suspension of the initiation of bankruptcy proceedings during the pandemic and, in part, to the shorter office hours of competent authorities due to the lockdown and the earthquake that hit Zagreb early in the year, there were not many exits from the market in 2020, particularly not as a result of bankruptcy and winding-up proceedings (Figure 5.7). The number of newly established corporations was also smaller for similar reasons, so that the “rejuvenation” trend in the non-financial corporate sector came to a halt, which also raised the risks associated with survival of unviable firms (see Box 4 The survival of zombie firms and risks to financial stability).

Net transactions in loans grew in 2020 on account of one-off effects (Figure 5.9), precautionary financing immediately before the crisis and a single large transaction involving partial refinancing of external debt by domestic debt in December 2020. Loans to non-financial corporations rose by 5.5% in 2020 based on transactions, while excluding the mentioned refinancing of a large firm, the growth rate was around 2.1%. Negative amounts of net transactions from the end of the second quarter to the end of the fourth quarter 2020 were the outcome of lower new borrowing due to uncertainty about the duration of the pandemic. Liquidity-financing loans were not much used due to the pandemic, with enterprises relying more on loan payment deferrals and the use of fiscal support. The sharpest reduction in net transactions was seen in the portfolio of investment loans, whereas new working capital loans started to recover only in the first quarter of 2021.

The pandemic-induced uncertainty and threat to business had a major impact on the structure of lending activity. Non-financial corporations reduced their demand for new loans for investment projects in 2020. Exceptions were the construction industry, whose activity picked up owing to extensive public investments, the stronger residential real estate market and the need to address the consequences of the earthquake, and manufacturing, which successfully adjusted to functioning in pandemic conditions (Figure 5.10). Corporations engaged in other activities mostly used new loans to finance working capital, predominantly in trade, manufacturing and other service activities. Renewed loan agreements (mostly moratoriums) accounted for a significant share of new loans to industries mostly affected by the pandemic, within which investment loans predominated in the first half of 2020, while working capital loans were more evenly distributed throughout the year. The majority of rolled-over investment loans in the first half of 2020 were used by tourism enterprises.

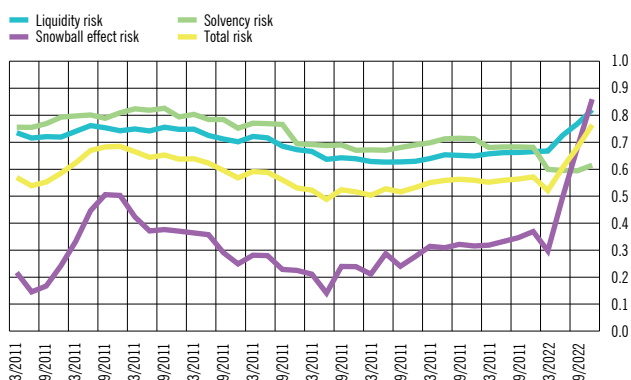
The total indebtedness of the non-financial corporate sector grew sharply, reaching 98.8% of GDP at the end of 2020 (Figure 5.12). It rose by a total of 10 basis points from the end of 2019, largely due to the slump in GDP and, to a lesser extent, to new corporate loans granted in 2020, mostly by domestic credit institutions. Indebtedness of public corporations steadily decreased, standing at below 6% of GDP at end-2020. External debt decreased by around 1.7% in nominal terms, whereas debt to domestic credit institutions rose by almost 5.5% in 2020.

Figure 5.10 Moratoriums and other types of agreement renewal accounted for the bulk of lending activity



Source: CNB.

Figure 5.11 Substantial fall in gross operating surplus exacerbated the vulnerability of the non-financial corporate sector



Notes: Vulnerability indicators of the non-financial corporate sector. The vulnerability of the non-financial corporate sector was estimated by three indicators. The liquidity risk indicator was calculated as the ratio of the total debt amount and interest payments of the sector to gross operating surplus (GOS), i.e.

$$LR_t = 0.5 \cdot \frac{\text{Debt}_t}{\text{GOS}_t} + 0.5 \cdot \frac{\text{Interest payments}_t}{\text{GOS}_t}$$

The solvency indicator was calculated as the debt-to-equity ratio:

$$SR_t = \frac{\text{Debt}_t}{\text{Equity}_t}$$

The snowball effect indicator is based on the ratio of debt servicing burden $b_{t-1} = \text{debt}_{t-1} / \text{GOS}_{t-1}$, adjusted by implicit interest rates i_t and growth rates of gross operating surplus g_t :

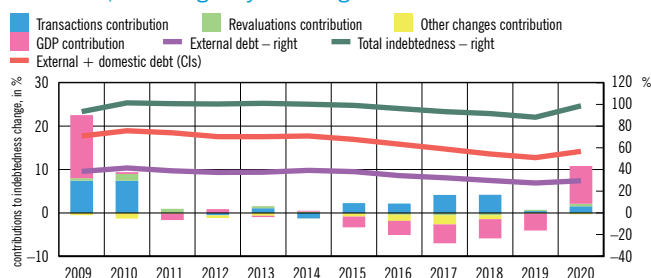
$$SNR_t = \frac{i_t - g_t}{1 + g_t} b_{t-1}$$

These indicators were normalised to the value range 0 – 1 and the total risk was calculated as the average of the three mentioned normalised indicators:

$$TR_t = \frac{LR'_t + SR'_t + SNR'_t}{3}$$

Sources: FINA and CNB.

Figure 5.12 With the sharp GDP contraction and marginal debt growth in 2020, indebtedness of the corporate sector increased, breaking its years-long downward trend



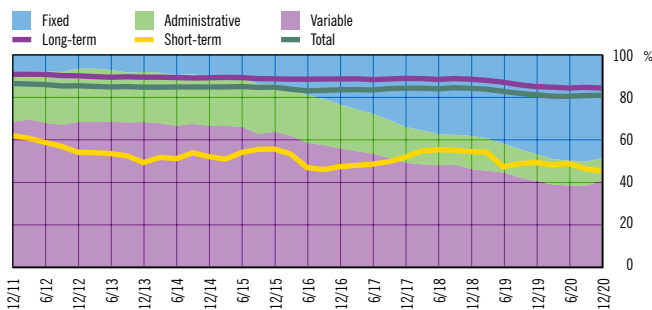
Notes: The figure shows the decomposition of changes in indebtedness (unconsolidated debt/GDP) at an annual level. Revaluation includes foreign exchange differences and price changes, while other changes include sector reclassifications, write-offs, etc. The lines show the unconsolidated debt of non-financial corporations. The difference between total unconsolidated debt and the sum of external debt and debt to domestic credit institutions is the debt to domestic leasing companies, insurance and other financial institutions and non-financial corporations. Sources: FINA, HANFA and CNB.

The vulnerability of the non-financial corporate sector has been growing from the onset of the pandemic. The growth was mostly driven by the sharp drop in gross operating surplus (Figure 5.11), which much exceeded the fall in the implicit interest rate, fuelling also the rapid increase in snowball effect risk. The implicit interest rate edged down as enterprises made less use of the new, more favourable COVID-19 loans.⁷ The substantial drop in business activity caused by the pandemic and the sharp decrease in income reduced gross operating surplus (according to current estimates, by around 12% a year), also pushing liquidity risk to a high level. The solvency risk indicator stagnated at low levels thanks to favourable performance in 2019 and earlier years, which enabled the growth of corporate capital. However, this indicator is not likely to remain low in view of the ongoing uncertainty regarding the duration of the pandemic and the possible continuation of weak business results. Its current low level is the outcome of support measures, primarily moratoriums. Once these measures are lifted, the liquidity risk might deteriorate further and the credit risk of creditors might materialise. To cover losses accumulated in 2020 as a result of sluggish business activity (reflected in the fall of fiscalised receipts), enterprises will first use previous years' retained earnings and capital, the decrease of which directly fuels the rise in insolvency risk and total risk.

Currency risk of the corporate sector edged down in 2020 but as much as 80% of loans to non-financial corporations remained denominated in foreign currency (Figure 5.13). The share of loans indexed to foreign currency continued to decrease mildly, mostly in the segment of short-term loans, so that almost 55% of them were in domestic currency in late 2020, while exposure to currency risk associated with long-term loans stayed at high levels. The decline in foreign currency revenues, particularly revenues from exports of travel services which more

⁷ Loan deferrals and other measures affecting cash flows (loan payment moratoriums, tax relief measures, wage subsidies) have no effect on the implicit interest rate and total borrowing.

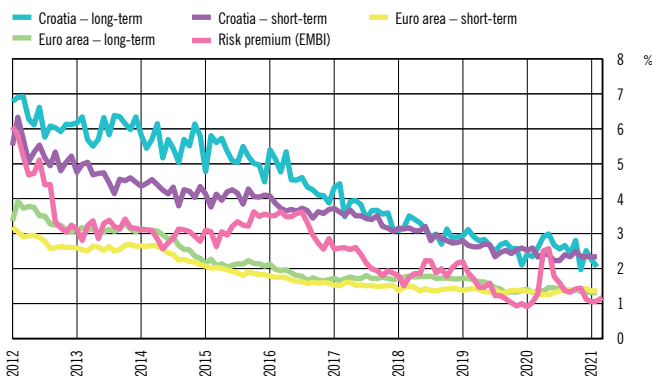
Figure 5.13. Large share of total corporate debt in foreign currency held steady while interest rate risk edged up



Notes: The figure shows the share of foreign currency loans (lines) in total corporate debt (by maturity). It is assumed that total external debt is denominated in foreign currencies. Debt indexed to foreign currencies (a foreign currency clause) is also included. Interest rate risk is shown by areas and relates to a breakdown of bank loans to non-financial corporations by interest rate variability.

Source: CNB.

Figure 5.14 Interest rates on corporate loans in Croatia and in the euro area were stagnant for most of 2020



Sources: ECB, Bloomberg and CNB.

than halved in 2020, raised corporate exposure to currency risk regardless of the slightly smaller share of foreign currency debt⁸. Croatia joined the European Exchange Rate Mechanism (ERM II) on 10 July 2020. In the short run, this will not affect monetary and exchange rate policy, which is based on the maintenance of stability of the kuna against the euro, but it is a crucial formal step towards euro adoption, which will almost eliminate any currency risk in the near future.

As domestic banks' interest rates on corporate loans continued to hold steady in 2020, except for a short period of fluctuations following the outbreak of the pandemic, interest

rate risk did not change much. Fluctuations in the implicit interest rate on new (and rolled-over) long-term loans were mostly influenced by renewed agreements for “old” loans in response to the COVID-19 pandemic, initially granted at interest rates higher than those currently prevailing for new loans (Figure 5.13). Short-term corporate financing costs in Croatia remained at around 2.3% in 2020, while the price of long-term financing remained slightly higher on average (Figure 5.14) and then fell to record lows of around 2% in early 2021. The short-lasting increase in the risk premium in the second quarter of 2020 was not reflected in interest rates on long-term loans due to favourable financing conditions in the euro area, stable evaluations by credit rating agencies and an expansionary domestic monetary policy, which helped maintain low financing costs in Croatia. Around one third of new “COVID” loans for liquidity financing are also covered by guarantees issued by the CBRD, HAMAG and EIB, which reduces the credit risk burden for credit institutions and mitigates the upward pressure on interest rates arising from assumed risk.

Key risks linked to the non-financial corporate sector

While a significant part of the economy has successfully adjusted to functioning in the conditions of the prolonged pandemic, enterprises engaged in activities that are particularly affected by social distancing measures have been gradually exhausting financial reserves accumulated in the previous years. This increases the vulnerability and riskiness of the non-financial corporate sector. Lending activity is subdued and directed mostly towards working capital financing, while development projects in pandemic-affected activities have been postponed. Grants to the economy facilitated survival and job preservation during the slump in business activity.

If the pandemic continues for longer than expected, with slow economic recovery and another poor tourist season, the number of bankruptcies and wind-ups due to insolvency might be much higher. Additional risk for corporations is associated with a premature withdrawal of various measures, which may result in difficulties in regular repayments, impediments to regular operations and a growth in bankruptcy and winding-up cases of affected companies. This refers to fiscal support and moratorium renewal, which were the most intensively used measures to help the economy during the pandemic. On the other hand, a prolonged continuation of support measures may lead to reduced dynamics and zombification of the economy, which also creates substantial adverse risks to productivity and potential growth.

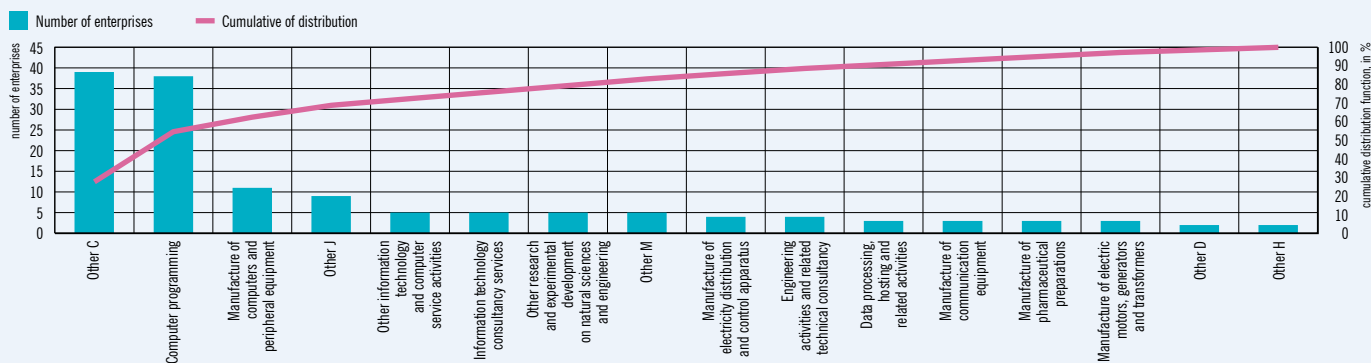
⁸ See *Macroeconomic Developments and Outlook*, CNB, December 2020.

Box 3 Croatian firms with characteristics of the fourth industrial revolution (I4.0)

Firms that are developing or applying the technology of the fourth industrial revolution (I4.0) are characterised by a higher capital-to-labour ratio, they are more competitive in the international market, recruit more qualified labour and have a much higher share of export revenues than traditional industries. Such characteristics have helped I4.0 firms to face the consequences of the pandemic, which created the foundation for new development investments in order to open new markets, raise the level of knowledge and improve profitability and efficiency in the long run. The quality of loans to I4.0 firms did not change much during the pandemic, and credit institutions continued to grant them loans.

In the survey by Hrbić and Grebenar (2021)¹, on a sample of more than 7,000 Croatian firms from five activities² accounting for around one third of total income³, a machine learning model was used to estimate a firm's readiness to strengthen its technological and innovation potential by means of introducing fourth industrial revolution technologies (I4.0), which include the use of artificial intelligence, machine learning and particularly deep learning.⁴ By means of this methodology 141 firms were identified (including the initial 58, which were definitely identified as I4.0 firms) as having I4.0 potential, accounting for 2% of the number of analysed entities, 27% of asset value and 26% of operating income of the analysed sample. The distribution of the shares of I4.0 firms across activity classes shows that firms dealing in manufacturing and computer activities, particularly in the software industry, have the largest potential as their development relies more on know-how, with small and medium-sized enterprises prevailing (Figure 1). There are

Figure 1 Distribution of I4.0 potential across activity classes



Note: The survey covers the following NACE activities: C – manufacturing, D – electricity, gas, steam and air conditioning supply, H – transportation and storage, J – information and communication, M – professional, scientific and technical activities.
Sources: FINA and CNB.

1 Hrbić, R. and T. Grebenar (2021): Procjena spremnosti hrvatskih poduzeća na uvodnje tehnologije I4.0, HNB, <https://www.hnb.hr/documents/20182/3776564/i-062.pdf>.

2 C – manufacturing, D – electricity, gas, steam and air conditioning supply, H – transportation and storage, J – information and communication, M – professional, scientific and technical activities.

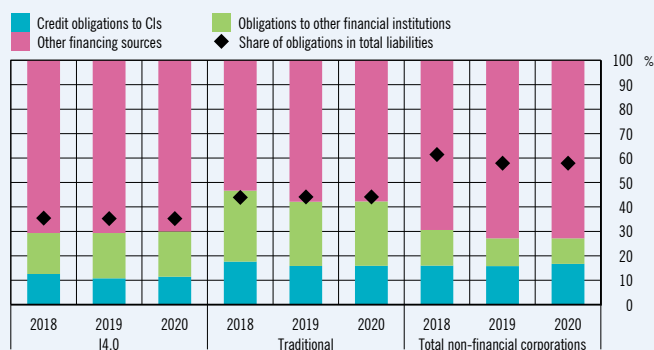
3 In the total population of enterprises.

fewer firms in other activities, but medium-sized and large enterprises with larger capital capacities predominate.

Operating characteristics of I4.0 firms

The main indicators showing differences in the potential of I4.0 firms and traditional firms are of a structural nature, for example: a larger share of intangible assets or business equipment and machinery in long-term assets, greater investment in research and development and a larger share of short-term assets in total assets. Firms with I4.0 potential also have a much higher capital-to-labour ratio (capital equipment of labour), and recruit more qualified labour (paying double the

Figure 2 Structure of total liabilities according to financing sources



Notes: Total non-financial corporations include the entire sector of non-financial corporations. Division into I4.0 and traditional firms refers to those included in the analysed sample of 7,147 firms.
Source: FINA.

4 The starting point of the survey was the identification of firms that have the potential to use the technology of the fourth industrial revolution I4.0 based on the similarity of their indicators with a sample of 58 firms that were definitely identified as users and/or producers of I4.0 technology, based on expert judgement and analysis of available information on firms. According to Boston Consulting Group (BCG), the technology of the fourth industrial revolution comprises: big data and analytics, autonomous robots, simulations, horizontal and vertical system integration, the industrial internet of things, cybersecurity, cloud technologies, 3D printing and augmented reality.

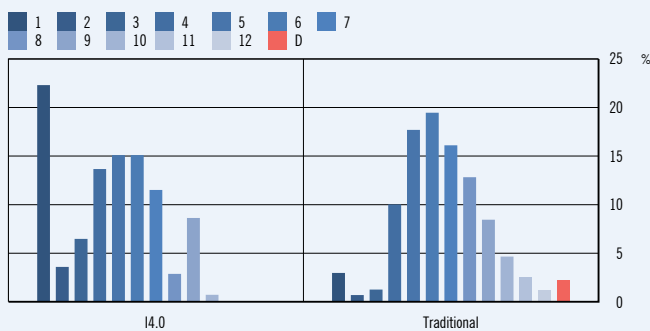
wages paid in traditional firms in the same industry). They are also more competitive in the international market (higher share of exports), while advantages and positive effects brought by development, use of high I4.0 technologies and know-how make their operations more stable than those of traditional firms, making them also less risky debtors to credit institutions.

Specifics of I4.0 firms are also reflected in their financing structure, where loans from credit institutions account for only 11% of their total liabilities. At the end of 2019, this share stood at around 16% in traditional firms included in the survey sample and it was around 17% in the entire sector of non-financial corporations (Figure 2).

Stability of operations

Distribution of I4.0 and traditional firms across FINA's rating grades shows a much larger share of I4.0 firms in better grades, particularly in

Figure 3 Distribution of proportions of firms across rating grades



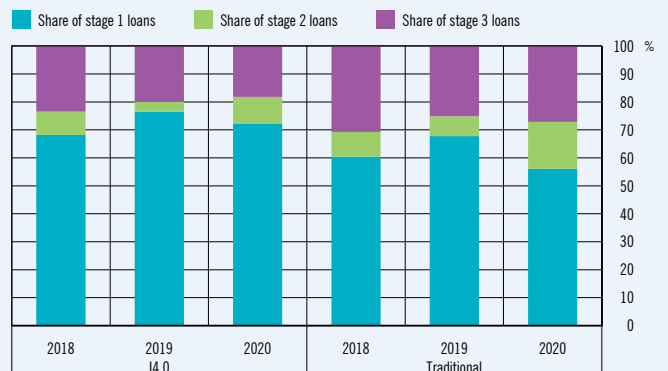
Note: "D" denotes a rating for firms in default, that is, those that are more than 90 days past due on any material obligation, while rating grades denote clusters of probability of business blockade due to failure to settle past due obligations (1 corresponds to the lowest and 12 corresponds to the highest probability (risk)). Sources: FINA and CNB.

grade 1 with the lowest degree of risk, with none of them being classified in one of the riskiest grades (grades worse than 10), including "D" (default) (Figure 3).

In addition to better ratings, I4.0 firms are characterised by much lower materialisation of credit risk during the pandemic than traditional firms engaged in the same activities. In the pre-crisis period (2018–2019), the difference in the quality of loans to I4.0 and traditional firms was not statistically relevant⁵, while during the pandemic, I4.0 firms had a much lower level of riskiness than traditional firms. The differences in the shares of loans classified depending on potential growth in credit risk are significantly more favourable to I4.0 firms: they have a much

5 Single-factor variance analysis (ANOVA) was used to assess the significance of differences in arithmetic means in terms of the variability ratio within and across groups by using the F-ratio of Fisher's distribution. The significance of deviation was evaluated by means of a p-value for confidence levels of 95% (p-value < 5%) and 90% (p-value < 10%).

Figure 4 Shares of loans classified in stages 1, 2 and 3 according to technological readiness



Source: CNB.

Table 1 Classification of loans by stages of riskiness before and during the pandemic

Stage	Period	Average: I4.0	Traditional	p-value	Sign. I4.0
S1	2018-2019	80.70%	82.38%	0.5394	
	2020-2021	74.70%	63.72%	0.0018	**
S2	2018-2019	8.71%	9.04%	0.8676	
	2020-2021	14.04%	26.11%	0.0001	***
S3	2018-2019	10.59%	8.58%	0.3279	
	2020-2021	11.26%	10.18%	0.6321	

Notes: 2021 includes January and February. The last two columns show results of ANOVA variance analysis by stages of riskiness, with the following levels of significance: *** < 0.1%; ** < 1%; * < 5%; · < 10%. Source: CNB.

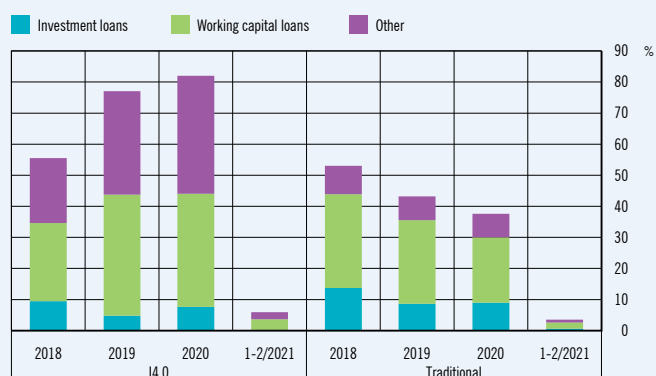
larger share of stage 1 loans and a much smaller share of stage 2 loans than traditional firms⁶ (Figure 4, Table 1).

Data on newly-granted loans by credit institutions also suggest that I4.0 firms are less affected in their operations by the consequences of the pandemic than traditional firms. The increase of new loans per unit of operating income⁷ continued in I4.0 firms and came to a stop in traditional firms.

6 The shares of stage 3 loans before and during the pandemic do not significantly differ, which is in line with a marginal increase in total corporate loans in stage 3, in line with the relaxed regulatory treatment of loans covered by COVID-19 measures.

7 Owing to the heterogeneity of firm sizes, credit transactions were relativised by a firm's operating income in a given year, up to the annual financial statements for 2019 (the latest available data).

Figure 5 Share of new loans in total loans according to the degree of technological readiness



Source: CNB.

Table 2 New credit activity before and during the pandemic per unit of operating income

Instrument	Period	Average: I4.0	Traditional	p-value	Sign. I4.0
Investment loans	2018-2019	0.0133	0.0142	0.9475	
	2020-2021	0.0058	0.0040	0.6842	
Working capital loans	2018-2019	0.0369	0.0177	0.0094	**
	2020-2021	0.0155	0.0062	0.0003	***

Notes: 2021 includes January and February. The last two columns show results of ANOVA variance analysis by stages of riskiness, with the following levels of significance: *** <0.1%; ** <1%; * <5%; · <10%. Source: CNB.

Table 3 Demand for measures to help the economy in manufacturing industry (C) per unit of operating income

Measure	Average: I4.0	Traditional	p-value	Signif. I4.0
Liquidity loans	0.00686	0.00728	0.9367	
JPG	0.00691	0.01197	0.0631	·
Moratoriums	0.03113	0.01717	0.1960	

Notes: 2021 includes January and February. The last two columns show results of ANOVA variance analysis by stages of riskiness, with the following levels of significance: *** <0.1%; ** <1%; * <5%; · <10%. Sources: FINA and CNB.

Also, the use of measures to preserve jobs and help the economy (job preservation grants in the form of wage subsidies, JPG) was much less intense in I4.0 manufacturing firms than in traditional firms, whereas other measures were equally used by both types of firms: liquidity financing loans and moratoriums on existing credit obligations (Table 3).

Conclusion

In addition to growth in efficiency, larger investment in research and development, the acquisition of new and the modernisation of existing machinery and equipment and investment in software solutions also result in a firm having a greater resilience to shocks. Only a minor reduction in portfolio quality was recorded in credit institutions' exposure to I4.0 firms, which are characterised by a high level of technological readiness. Credit institutions continued to finance I4.0 firms during the pandemic. These firms used substantially fewer subsidies for employee wages to preserve jobs.

Box 4 The survival of zombie firms and risks to financial stability¹

The expansionary monetary policy in the period following the global financial crisis ensured favourable financing conditions for enterprises. However, loan availability, low interest rates and the favourable macro-economic environment facilitated the financing and survival of firms with limited profitability and unsustainable business models, which slowed the exchange of enterprises in the market. In addition to productivity increases within existing enterprises, the exchange of enterprises is a key mechanism of economic growth as it leads to the rejuvenation of sectors, increase in competition, and growth of more productive and exit of less productive firms.

The weakening of the described mechanism of what is called creative destruction encourages discussions on the zombification² of the non-financial corporate sector and the decrease in innovation and productivity. It is important to identify zombie firms, that is, enterprises without a sustainable business model, because such firms reduce the availability of resources for healthy firms without contributing to productivity growth in an economy and also maintain obsolete technologies.³ In addition to slowing down growth, zombification may also adversely affect financial stability by worsening the quality of credit institutions' clients in the long run.

Interest in the issue of zombification of the corporate sector grew across the world in 2020, in parallel with the application of linear support measures that did not discriminate enterprises according to their prospects and contribution to economic growth. In Croatia, in conditions of the temporary suspension of foreclosures (from May to October), the generally slower work of the courts due to the pandemic and earthquakes and the great uncertainty regarding the end of the pandemic, the system of aid to companies that included linear support as well as moratoriums, led to a decrease in the numbers of companies being established but also dissolved. As a result, far fewer enterprises entered and exited the market in 2020, which is uncommon as the number of failed companies usually grows in recessions and falls at times of economic expansion.

The Jeon-Miller decomposition of market dynamics⁴ confirms that the exit of enterprises in Croatia has a positive impact on sector productivity, measured in terms of gross value added per employee, as most

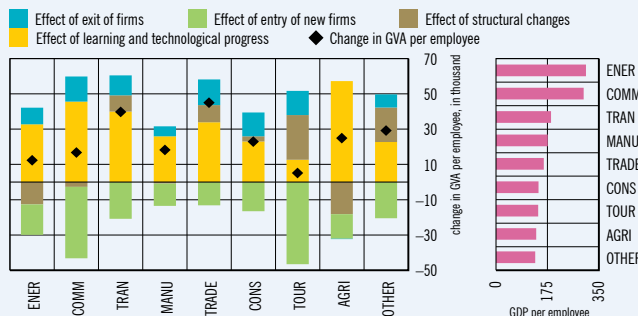
1 The following firm-level databases were used in this survey: FINA database (annual data on firms' operations), database of fiscal support recipients, database of moratorium users and the database on the status of firms in the register of companies.

2 Sometimes also used is the term "Japanification" because of the prolonged period of low interest rates as well as low economic growth and low productivity growth of Japanese firms following the 1990s.

3 At the same time, as such firms have lower values and it is much easier for their owners to give them up, the rise in the share of zombie firms raises the probability of market volatility.

4 Jeon, Y., and S. M. Miller (2002): An 'Ideal' Decomposition of Industry Dynamics: An Application to the Nationwide and State Level U.S. Banking Industry, Economics Working Papers, 2002-23. The authors decompose the change in the aggregate indicator as follows:

Figure 1 Contributions of change in aggregate labour productivity in the non-financial corporate sector in the period from 2015 to 2019 (left) and the level of GVA per employee at the end of 2019 (right)



Note: Abbreviated names for activities refer to: Communication, Other activities, Construction and real estate, Agriculture, Energy, Manufacturing, Transportation, Trade and Tourism, respectively. Source: FINA.

enterprises exiting the market are those with poorer performance. At the same time, though younger firms have faster productivity growth, their entry has a negative impact on the sector in the first year because the number of employees grows faster than gross value added. The largest and positive impact on changes in productivity of the non-financial corporate sector is made by the effects of learning and technological progress in existing enterprises, which may be viewed as productivity growth in the narrower sense. Finally, aggregate profitability of a firm is also influenced by the structure, so that the growth in the relative market share of a firm with higher productivity mostly has a positive impact on aggregate productivity (Figure 1).

The standard definition of a zombie firm in literature is based on its having insufficient operating earnings, where zombie firms are most often defined as firms that cannot cover interest expenses by their operating earnings. This approach is suitable because of the ease of calculation and it also has a theoretical background to it: the inability to cover financing costs does not only explain the quality of the firm as the credit institution's client but it also illustrates that the firm's operating business is unsuccessful and reduces the owner's wealth. As the business purpose of such a firm is questionable and the firm is on the verge between life and death, it is called a zombie firm.⁵ The first step of the survey is to identify weak firms, those that for two years in a row failed to cover their interest expenses, which are assumed to be 6%.⁶ In the next step, weak firms are divided into: newly-established, exiting and zombie firms.

$$\Delta R_t = \sum_{i=1}^{n_t} r_{i,t} \cdot \bar{\theta}_i(\text{within}) + \sum_{i=1}^{n_t} (\bar{r} - \bar{R}) \cdot \theta_{i,t}(\text{between}) + \sum_{i=1}^{n_t} (r_{i,t} - \bar{R}) \cdot (\text{entry}) - \sum_{i=1}^{n_{t-1}} (r_{i,t-1} - \bar{R}) \cdot \theta_{i,t-1}(\text{exit})$$

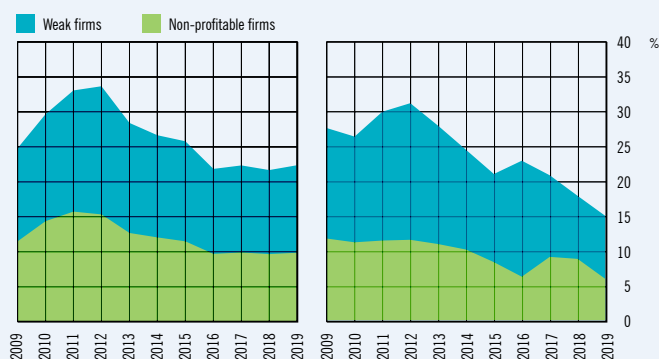
where: R_t and $r_{i,t}$ are the aggregate sector indicator and the firm-level indicator in year t , and i_t and i_{t-1} are corresponding market shares,

$$r_{i,t} = r_{i,t} - r_{i,t-1}, \quad i_{i,t} = i_{i,t} - i_{i,t-1}, \quad \bar{r}_i = \frac{i_{i,t} + i_{i,t-1}}{2}, \quad \bar{r} = \frac{r_{i,t} + r_{i,t-1}}{2}, \quad \bar{R} = \frac{R_t + R_{t-1}}{2}.$$

5 In economic terms, indebted firms belong to creditors and are "repurchased" by owners through regular debt servicing, which raises the net value of the firm.

6 Unreliable data on interest expenses prevent the use of firm-specific implicit rates. In addition, it is possible that some zombie firms pay unjustifiably low interest rates.

Figure 2 Share and structure of weak firms in the number (left) and total income (right) of firms



Source: FINA.

According to the described methodology, the share of weak firms had been steadily decreasing from 2012, when it reached the post-crisis peak. At the end of 2019, the share of weak firms stood at 22% of the number and 15% of the income of all firms. Approximately one half of weak enterprises were also non-profitable. At the end of 2019, their share in the number and turnover of the sector stood at 10% and 6% respectively.

To identify zombie firms, young firms, that is, firms existing for 1 to 3 years whose currently poor business results may improve, have to be removed from the sample. It is also necessary to remove firms undergoing procedures such as delisting, winding-up, bankruptcy, pre-bankruptcy or pre-bankruptcy settlement. Finally, weak firms that are still profitable are also removed. According to this definition, around 6% of firms were zombies at the end of 2019. Broken down by activity, the most zombie firms are engaged in transportation, agriculture and manufacturing (Figure 3).

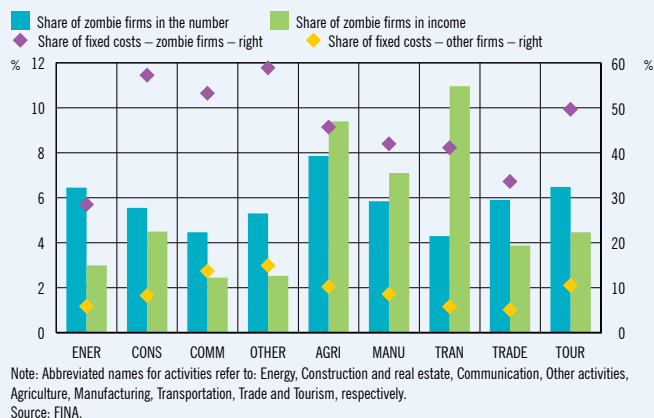
Table 1 Structure of the number of weak firms, as percentage of total, 2019

	Young		Existing		All	
	Not under procedures	Exiting	Not under procedures	Exiting	Not under procedures	Exiting
Profitable	2%	0%	7%	0%	9%	1%
Non-profitable	2%	0%	6%	1%	8%	1%

Source: FINA.

Also, as interest rates in the whole sample decreased, the use of market rates would result in a steady fall in the number of zombie firms. Furthermore, many high-tech firms rarely use loans or turn to more expensive short-term borrowing, which may result in higher implicit interest rates. The 6% interest rate was a median rate that firms paid on obligations to creditors in the period under review. In Storz, M., M. Koetter, R. Setzer, and A. Westphal (2017): Do we want these two to tango? On zombie firms and stressed banks in Europe, ECB WB, No. 2104, for similar reasons, the authors use a 5% threshold on a sample of euro area countries.

Figure 3 Share of zombie firms in the number and income of the sector, 2019



Note: Abbreviated names for activities refer to: Energy, Construction and real estate, Communication, Other activities, Agriculture, Manufacturing, Transportation, Trade and Tourism, respectively.
Source: FINA.

As expected, accounting indicators for the performance of zombie firms are worse than for healthy firms. What also significantly differs zombie firms from others is a very large share of fixed costs.⁷ Apart from making firms more vulnerable to the fall in income, a large share of fixed costs might be a result of the use of older technologies (Figure 3).

The severe shock that firms faced in 2020 due to the economic shut-down was mostly mitigated by wage subsidies and loan moratoriums. As employee support was granted in a linear fashion, without firms being discriminated according to their quality, but only according to the predefined fall in income, there are significant differences among activities in terms of support received⁸; for example, food service activities on average covered close to 20% of the employee costs of 2019. However, while there are significant differences in fiscal support received by particular activities, ranging from 1 to 18 percentage points, the differences in employee support received by zombie firms and other firms engaged in the same activity were much smaller, between 1 and 3 percentage points. Furthermore, zombie firms received slightly larger support in most activities (Figure 4).

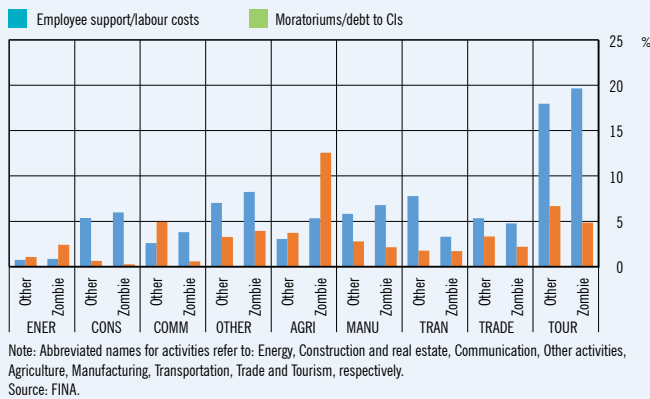
By contrast, in terms of moratoriums granted, zombie firms received smaller support in most activities. This is to be expected as regulatory relaxation of classification criteria referred only to firms that were sound in late 2019⁹. On the other hand, the fact that zombie firms have a higher percentage of approved applications for a moratorium should be attributed to the fact that such firms probably applied for moratoriums less frequently in view of their worse status with banks (Figure 4).

⁷ The share of fixed costs was estimated by means of regression of total expenses with respect to current and last year's income. Fixed costs are those that cannot be changed in the forthcoming one-year period: the sum of the constant and cost associated with last year's activity.

⁸ The FINA database used in the survey does not include all firms, instead it covers around 125,000 larger non-financial corporations at the end of 2019.

⁹ For more details on the measures to help the economy in 2020, see: Financial Stability, No. 21 (<https://www.hnb.hr/-/financijska-stabilnost-21>).

Figure 4 Use of support in 2020



In addition to fiscal reasons (smaller tax collections, cost of support in 2020), the damage caused by zombie firms arises from their daily take-up of resources, which is detrimental to the business of healthy firms. To look into this relation, we adapted a model (Shen, Chen, 2017¹⁰) under which the performance of healthy firms (total factor productivity growth) is modelled by using the share of zombie firms in a sector as an explanatory variable.

$$y_{ijt} = \alpha + \beta_1 \cdot ZR_{jt} + \beta_2 \cdot HHI_{jt} + \beta_3 \cdot F_{ijt} + u_t + \varepsilon_{ijt}$$

where:

- y – dependent variable: total factor productivity growth
- ZR – ratio of zombie firms in a sector
- HHI – concentration of firms in a sector

Table 2 Model results for the performance of healthy firms

Firms	Total productivity growth			
	Model 1	Model 2	Model 3	Model 4
Dependent (t-1)		-0.181 ***		
Share of zombie firms	-0.480 ***	-0.018 ***	-0.145 ***	-0.434 ***
HHI for sector	-0.020 *	-0.025	-0.023	-0.087 **
Age of firm	-0.005 ***	0.369 ***	-0.008 ***	-0.007 ***
Size of firm	0.007 ***	0.642 ***	0.025 ***	0.026 ***
Labour intensity	0.009 ***	-0.133 ***	0.060 ***	0.057 ***
Constant	0.095 ***	-5.025 ***	-0.227 ***	-0.181 ***
OLS	+			
AB		+		
F.E. for year			+	
F.E. for sector				+
N	423,601	244,128	423,601	423,601
R-sq	0.03		0.03	0.03

Source: CNB calculations based on FINA data.

F – firm-specific variables
i – firms, j – sector, t – year.

The model results confirm that zombie firms take away some capacity from healthy firms: a larger share of zombie firms in a sector reduces capacity utilisation and productivity of non-zombie firms.¹¹ A 1 percentage point increase in the share of zombie firms in a particular sector reduces the growth in total factor productivity by up to 0.5 percentage points (Table 2).

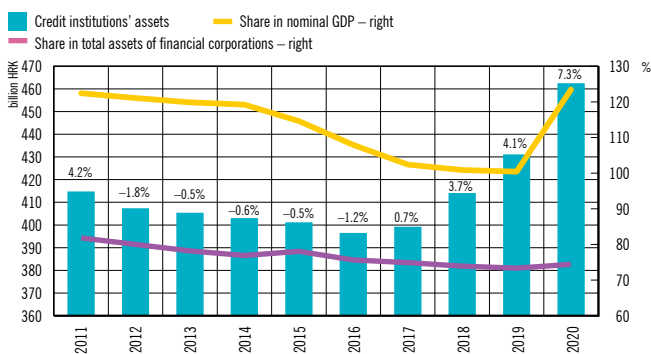
In conclusion, the sharp economic contraction in 2020 and slower exit from the market increased the number of firms with weaker performance. However, the exit of such firms from the market was also slowed down by the linear measures to help those firms. On the one hand, this prevented the shock of the termination of their business from spilling over onto overall economic developments and the living standard of households; on the other hand, support was provided to existing zombie firms and new ones were created, leading to both direct and indirect costs. Direct costs include an increase in public debt and subsequent problems with debt collection from zombie firms, while lower productivity growth of the entire sector is an indirect cost that will weigh on the non-financial corporate sector in the medium term. As support to zombie firms may freeze the existing market structure and weaken corporate demographics, when providing future support to the survival of firms after the expiry of linear measures, it will be necessary to consider targeted measures that take into account the operating success of firms as well as their investment activity, that is, the adoption of new technologies that also support the stability of a firm's operations (see Box 3 Croatian firms with characteristics of the fourth industrial revolution (I4.0)). At the same time, to speed up the currently slow exchange of firms in the market, it is necessary to strengthen the framework for the exit of firms from the market, and so reduce risks to financial stability.

10 Shen, G., and B. Chen (2017): Zombie firms and over-capacity in Chinese manufacturing, China Economic Review 44, pp. 327–342.

11 Total productivity growth was calculated by means of the cost function, and includes the scale effect (growth multiplied by the economy of scale), the effect of technological progress (marginal effect of time on costs) and change in technical efficiency.

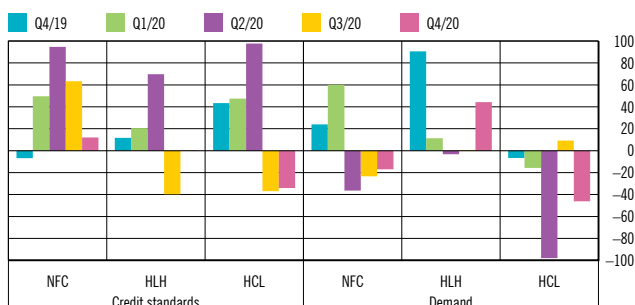
6 Credit institutions⁹

Figure 6.1 Strong annual growth in the assets of credit institutions was driven by expansionary monetary policy



Notes: The figure shows the annual rate of change in total net assets. Data on the total assets of financial corporations are available up to 31 December 2020.
Source: CNB.

Figure 6.2 Credit standards were tightened and demand decreased in 2020



Notes: Data show the net percentage of banks weighted by the share in total loans. The growth in the indicator denotes the tightening of credit standards and the rise in demand and vice versa. NFC refers to non-financial corporations, HLH to housing loans to households and HCL to household cash loans.
Source: CNB (Bank lending survey).

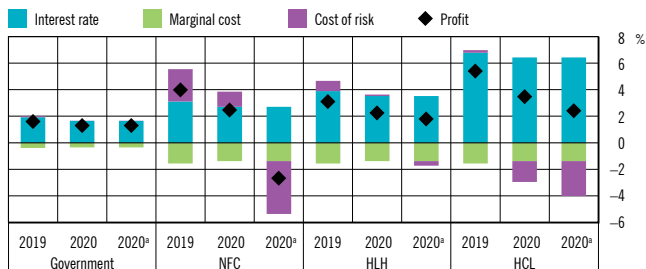
The unfavourable impact of the pandemic on credit institutions was partly postponed owing to ample support to the economy as well as to relaxed supervisory requirements. Though credit risk might materialise to a larger extent after the expiry of moratoriums and fiscal support, high liquidity and capital adequacy levels sustain the lending capacity of credit institutions, which is currently mostly oriented towards housing loans. Long-term risks to credit institutions arise from structural changes associated with the prolonged period of exceptionally low interest rates and the growth in the share of placements with low yields, increasingly large exposure to the government and the rising exposure to the real estate market as well as the danger of the spreading zombification of the non-financial corporate sector. In the process of adjusting their operations to post-pandemic conditions, credit institutions will have to step up efforts to reduce operating costs.

Short-term trends

The assets of credit institutions rose sharply in 2020 driven by an extremely expansionary monetary policy, but only a small portion of the larger credit potential was used. The growth in funds, which was mostly fuelled by resident deposits, including those of domestic financial institutions, and new

⁹ As of this issue, the chapter on the banking sector has been expanded to include all credit institutions (20 banks and three housing savings banks).

Figure 6.3 From the standpoint of credit institutions, housing loans and placements to the government became relatively more attractive

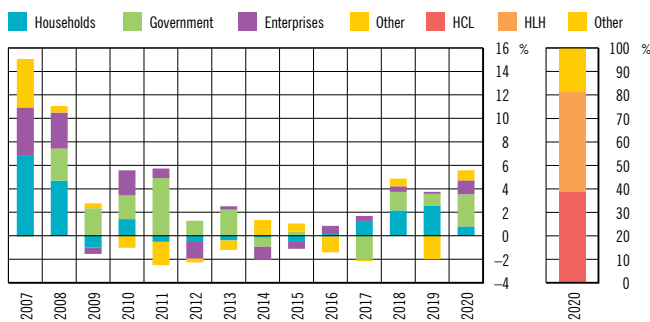


* denotes model values. NFC refers to non-financial corporations, HLH to housing loans to households and HCL to household cash loans.

Notes: The marginal cost was calculated according to Van Leuvensteijn, Kok, Bikker and Van Rixtel (2008): <https://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp885.pdf>. The marginal cost for the government was approximated as 25% of the average. The cost of credit risk is actual or model cost of value adjustments.

Source: CNB.

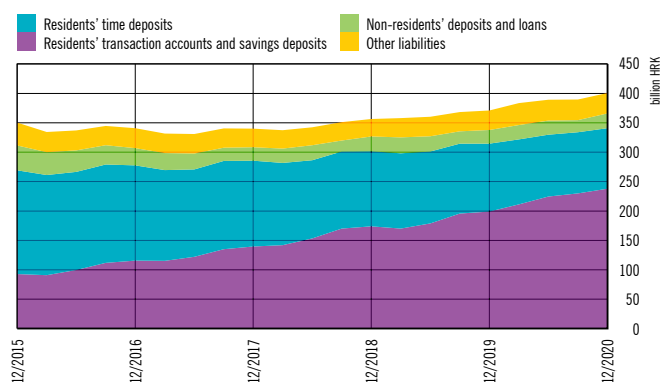
Figure 6.4 Changes in demand affected the structure of credit activity in 2020



Note: Data refer to the monthly amount of debt transactions by sector taken from the national accounts (left) and the structure of transactions for the household sector from the CNB (right); HCL refers to household cash loans and HLH refers to housing loans to households.

Source: CNB.

Figure 6.5 Share of transaction deposits increased



Source: CNB.

loans (the total volume of loans went up by around 9%), mostly went to liquid assets, predominantly the larger deposits with the CNB.

In 2020, most lending was directed to meeting the larger financing needs of the government. In fact, placements to the private sector accounted for only one quarter of the assets growth in 2020, with the bulk of that increase being accounted for by the government's housing loans subsidy programme or short-term lending to non-financial corporations, which were also the objects of several government support measures (fiscal grants, placements of credit institutions covered by guarantees, etc) (Figure 6.1).

Unfavourable economic trends and elevated uncertainty had an adverse impact on both loan supply and demand.

According to the [Bank lending survey](#), the severe tightening of credit standards seen at the onset of the pandemic was only slightly reversed by the end of 2020. At the same time, demand for loans contracted, particularly in the segments of household cash loans and loans to non-financial corporations (Figure 6.2).

The increase in risk costs had a detrimental effect on profitability with an extremely asymmetric impact across particular segments of the credit portfolio. Profitability of lending to non-financial corporations and household cash loans dropped the most, while yield on government placements continued to be low. On the other hand, the share of housing loans in the profitability of credit institutions was larger (Figure 6.3).

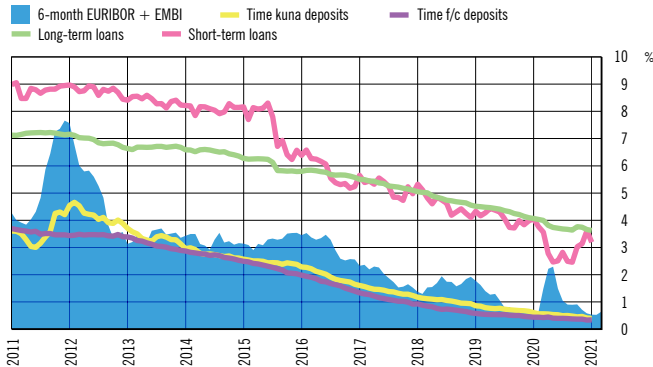
Lending continuity was strongly influenced by housing loans. In the period characterised by the fall in cash loans and sporadic lending to the government and non-financial corporations, the focus shifted to housing loans, which steadily increased (Figure 6.4).

The growth in the share of transaction deposits continued in conditions of low interest rates. Resident deposits picked up in 2020, growing at the highest rates in the last decade (8.1%). Annual growth in deposits decelerated slightly as the base effect of the transfer of funds from investment funds to credit institutions wore off in early 2021 (it was 6.5% at the beginning of 2021). Almost all sectors, and households in particular, contributed to the rise in deposits (Figure 6.5). Deposit euroisation surged briefly in March and April 2020 (foreign currency deposits of domestic sectors rose by HRK 6.6bn). However, the downward trend in the share of foreign currency deposits resumed following the CNB's intervention and the easing of the situation in the foreign exchange market.¹⁰

Abundant liquidity, which was maintained throughout 2020 thanks to the exceptionally expansionary monetary policy in

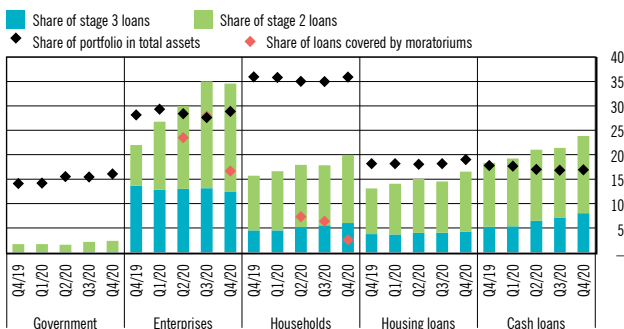
¹⁰ The increase was driven by depreciation pressures expected at the onset of the pandemic. The rise in deposit euroisation came to a halt soon after the CNB's intervention aimed at mitigating depreciation pressures in the foreign exchange market. For more details on deposit euroisation, go to <https://www.hnb.hr/en/-/euroisation-at-a-time-of-crisis>.

Figure 6.6 Continued decline in lending and deposit interest rates



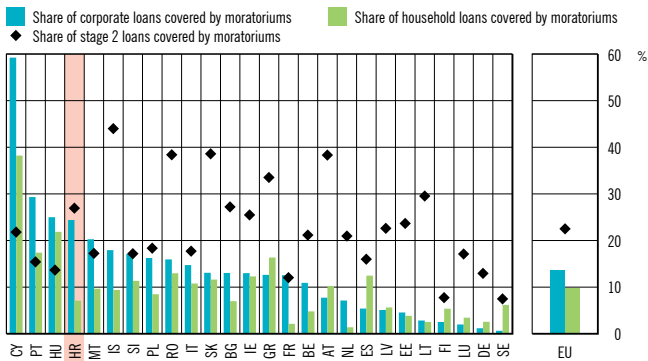
Note: The interest rates on loans and deposits refer to the stock of observed items. Sources: CNB and Bloomberg.

Figure 6.7 Relatively mild deterioration in asset quality in 2020



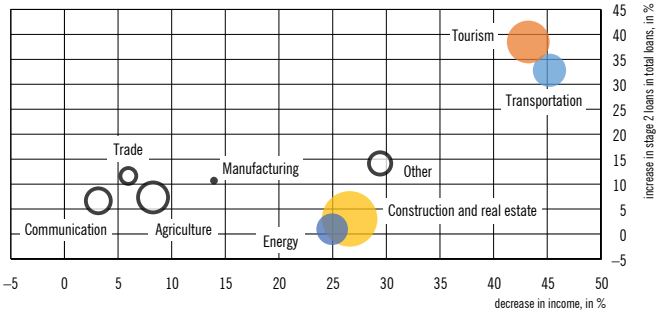
Notes: Loans in stage 2 relate to performing loans witnessing a considerable increase in credit risk and loans in stage 3 relate to non-performing loans witnessing a loss. Data on moratoriums for housing and cash loans are not available. Household loans do not include other loans. Source: CNB.

Figure 6.8 Share of moratoriums in Croatia is above average



Notes: The EU average is unweighted. Data refer to the end of June 2020. Source: EBA.

Figure 6.9 Most loans of credit institutions in 2020 went to non-financial corporations severely impacted by the crisis



Notes: The size of a bubble denotes an increase in the balance of loans to a particular activity in 2020. An empty bubble denotes negative growth. The decrease in income is approximated based on the data on fiscalised receipts. Data available on 31 December 2020. Source: CNB.

Croatia, reinforced the ongoing downward trend in interest rates. This includes a continued decrease in interest rates on sources of funds: by the end of December 2020, interest rates on kuna time deposits fell to 0.41% and those on foreign currency time deposits were 0.33%, with the result that lending interest rates also continued to decrease (Figure 6.6). Interest rates on new long-term loans, including renewed agreements on loans previously granted at higher interest rates, edged up, but interest rates on the stock of loans continued to drop due to a decrease in benchmark interest rates. The mild increase in the risk premium, suggested by a widening spread between Croatian bonds and risk-free (German) bonds, has not yet had a spillover effect on interest rate developments due to the CNB's accommodative monetary policy stance, which aided the maintenance of favourable financing conditions.

Systemic risks

Credit risk grew sharply in 2020 while other systemic risks held steady at high levels. Materialisation of credit risk was postponed by support to the economy, though risks in the segment of non-performing loans grew significantly. In addition, notwithstanding the steady decrease in recent years, currency-induced and interest rate-induced credit risk remained high.

Credit risk

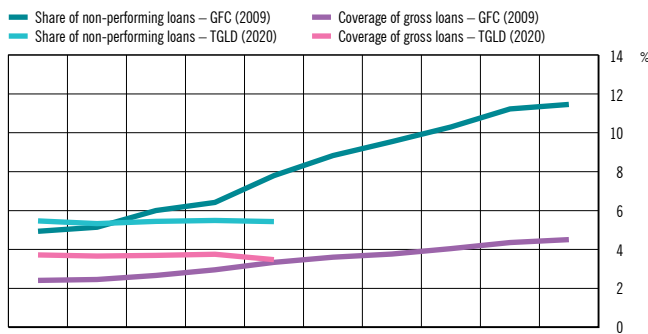
The spillover of the macroeconomic shock to the balance sheets of credit institutions was slowed down by the measures to mitigate the economic consequences of the pandemic, but the share of loans with increased credit risk (stage 2 and stage 3) went up from 14.1% to 20.0% in 2020.¹¹ The largest

¹¹ In an effort to mitigate the negative economic consequences of the pandemic on the financial positions of credit institutions' clients and institutions themselves, the CNB, under conditions of extremely heightened uncertainty, temporarily relaxed regulations on the classification of non-performing placements, while prohibiting the

contribution to credit risk materialisation came from stage 2 (performing) loans, whose share grew from 7.6% to 13.2%, mostly driven by the movements in the corporate portfolio, while the share of non-performing loans remained stagnant. The strong increase in stage 2 exposures was largely triggered by the reclassification of exposures covered by moratoriums, most of which are in the portfolio of non-financial corporate loans (Figure 6.7).

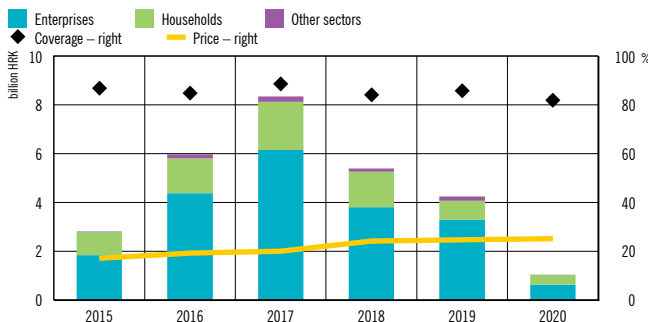
Croatia belongs to a group of EU countries with a relatively large share of loans under moratoriums. In mid-2020, moratoriums were granted for as much as 27% of non-financial corporate loans and around 7% of household loans in Croatia. Credit institutions classified slightly more than one quarter of such loans in stage 2, which is close to the EU average (Figure 6.8).

Figure 6.10 Coverage of loans was higher at the onset of the pandemic than at the beginning of the global financial crisis



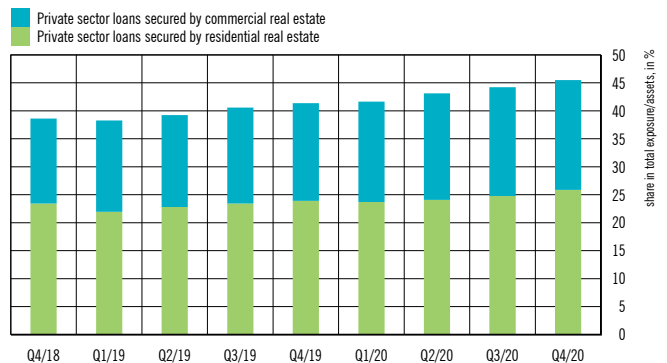
Note: The x-axis shows the quarters from the beginning of the recession. GFC refers to the global financial crisis and TGLD to the great lockdown in response to the outbreak of the coronavirus pandemic. Source: CNB.

Figure 6.11 Sale of claims dropped significantly in 2020



Notes: The figure is based on data on sold claims submitted to the CNB by credit institutions. Data on the price and coverage refer to the sales to professional NPL investors, which accounted for 38% of total sold claims in the period under review. Source: CNB.

Figure 6.12 Credit institutions' exposure to the real estate sector on the rise



Source: CNB (FINREP).

The growth in loans to more risky corporate clients resulted in higher credit risk in 2020. The major portion of demand for corporate loans in that year came from non-financial corporations engaged in activities that recorded a revenue decrease of more than 20% and had the largest needs for working capital financing. These were also the activities that saw the sharpest increase in stage 2 loans (Figure 6.9).

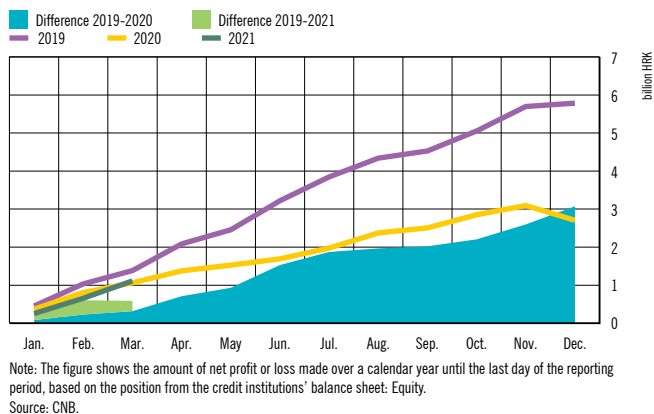
The low initial level of non-performing loans and their high pre-crisis coverage will facilitate the absorption of new non-performing loan inflows (see chapter 7 Stress testing of credit institutions). In the aftermath of the global financial crisis, credit institutions substantially reduced the share of non-performing loans and increased their coverage. As most loans with expired moratoriums had not been reclassified into the group of non-performing loans, the share of such loans in total loans remained stable, at 5.4% at the end of 2020 (Figure 6.10).

The sale of claims was a key factor in the cleaning of banks' balance sheets following the global financial crisis. Sales were much reduced in 2020 due to the impact of the pandemic and the temporary suspension of forced collection as well as the relatively low initial stock of non-performing loans (Figure 6.11).

Future trends in the quality of loans will depend on the pace and intensity of economic recovery as well as on indirect support to non-financial corporations. More rapid economic and loan growth would aid the recovery of the loan portfolio. Trends in loan portfolio quality will also depend on the timing of the withdrawal of support measures and the avoidance of cliff effects. A too sudden lifting of measures may have a damaging effect on the income of households and non-financial corporations and, in turn, on the operations of credit institutions.

payments of dividends from the previous year. This enables credit institutions, once they have deferred or restructured credit obligations of otherwise non-defaulting clients afflicted by the coronavirus pandemic, to temporarily postpone the reclassification of the part of these exposures with uncertain future quality.

Figure 6.13 Pressure on the profits of credit institutions continues into 2021

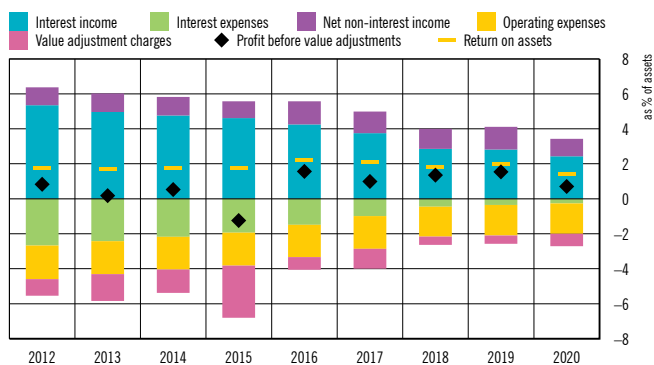


The rising share of loans secured by real estate properties elevated the risks associated with a possible fall in their prices. As around 45% of loans to the private sector are covered by real estate collateral, a possible decrease in real estate prices may raise credit risk costs (Figure 6.12). The value of collateral may also be diminished due to the materialisation of physical risks associated with climate change (see Box 5 Climate changes and their importance for credit institutions).

Profitability

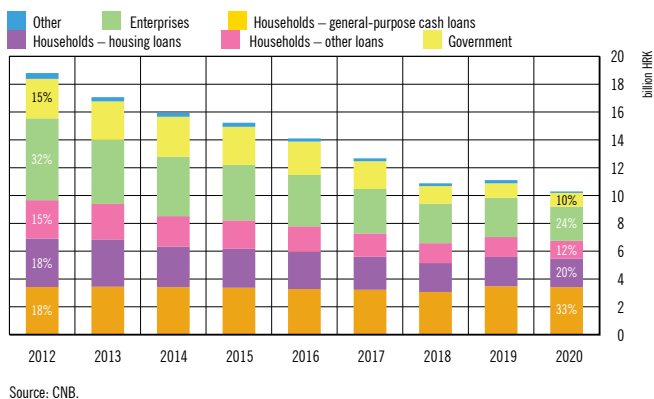
The profit of credit institutions halved in 2020 and profitability might remain subdued in the forthcoming period as well. Preliminary data suggest that profits in the first three months of 2021 remained at a level similar to that in 2020, but the growth in assets reduced the profitability of credit institutions (Figure 6.13).

Figure 6.14 Profitability was reduced due to the slump in operating income and growth in value adjustment charges



The profit of credit institutions diminished due to a drop in operating income coupled with an increase in charges for value adjustments. Operating income was smaller as a result of weaker net interest income (a fall of 5.6%) and net non-interest income (a drop in net income from fees and commissions of almost 19%)¹² in the period of slow economic activity and relatively stable operating costs. Despite ample fiscal support to the economy, charges for value adjustments spiked by around 60% due to the materialisation of credit risk associated with non-performing and performing loans. As a result, the return on average assets (ROAA) and the return on average equity (ROAE) fell to 0.6% and 4.4% respectively (Figure 6.14).

Figure 6.15 Decrease in interest income driven by the fall in interest rates and changes in the portfolio structure

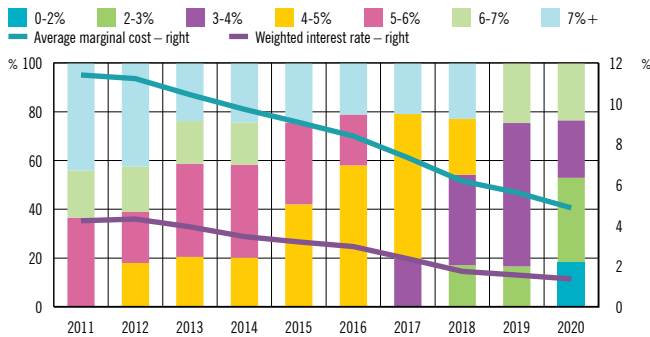


In addition to adverse economic trends and the prolonged period of low interest rates, the income of credit institutions also fell because of the changes in their balance sheet structure. The decline in household general-purpose cash loans, which are most profitable and account for a third of all interest income (and around a half of total interest income from household loans), was the major structural factor in the decline of interest income. Also, as credit risk materialisation was relatively strong in that portfolio segment, credit institutions had to allocate around one fifth of their interest income to value adjustments on these loans in 2020¹³ (Figure 6.15).

12 The slump in income from dividends may be attributed to the conservative position of subsidiaries with respect to dividend payments amid the health crisis.

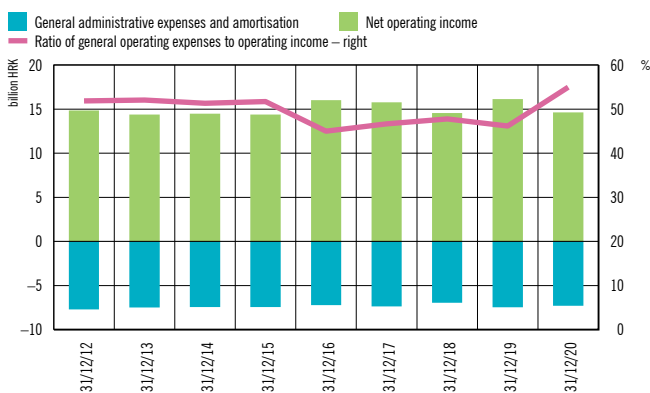
13 In the previous period these risks were also augmented by the fact that some of these loans were granted under relatively lenient criteria and without information from the Croatian Registry of Credit Obligations (HROK). HROK suspended the exchange of data on natural persons after May 2018. In August 2019, banks began exchanging data on defaulting clients through an information system on such clients (DOR system). In June 2020, data started to be processed and exchanged through the Basic Register System (OSR system). The exchange and processing of client data through the Basic Register System is based on the obligation of credit institutions under Article 321, paragraphs (2) to (5) of the Credit Institutions Act to exchange data related to their clients for the purpose of assessing creditworthiness or managing credit risk and complies with General Data Protection Regulation (GDPR) and other relevant personal data protection regulations.

Figure 6.16 Decrease in interest rates reduced the profitability of credit institutions



Notes: The columns show the structure of the loan portfolio by categories of interest rates on loan balances. The marginal cost was calculated according to Van Leuvensteijn, Kok, Bikker and Van Rixtel (2008): <https://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp885.pdf>. Source: CNB.

Figure 6.17 Fall in net income reduced the productivity of credit institutions



Source: CNB.

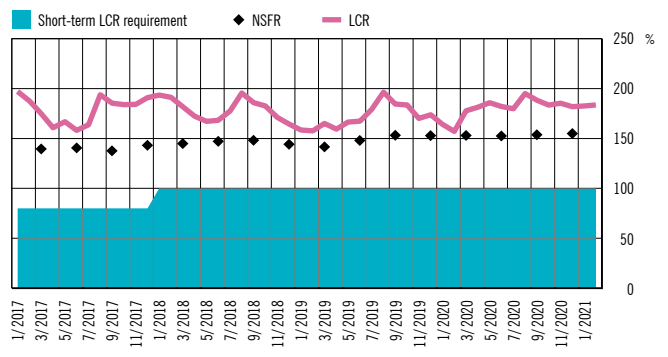
Structural changes in the balance sheets of credit institutions and the ongoing fall in interest rates had an adverse impact on the profitability of credit institutions. Credit institutions continued to reduce marginal costs largely owing to the fall in funding costs, the pace of which slowed down. However, interest rates on loans diminished more than costs thanks to structural reasons, that is, the general downward trend in interest rates, as well as to the increase in exposures to the government and larger amounts of housing loans, all of which reduced the profitability of credit institutions (Figure 6.16).

Operating costs of credit institutions did not decrease substantially. As shown by unaudited preliminary data, the productivity indicator, measured by the operating cost-to-income ratio, shows that the burden of operating costs grew, reaching 54.97% at the end of 2020 (Figure 6.17).¹⁴ Digitalisation of

business operations of credit institutions, coupled with the ongoing market consolidation, might add to the improvement of their cost efficiency, but the decrease in earnings might slow this process in the future period (see Box 4 Digital business transformation: a channel for the preservation of bank profitability in Croatia, Financial Stability, No. 21).

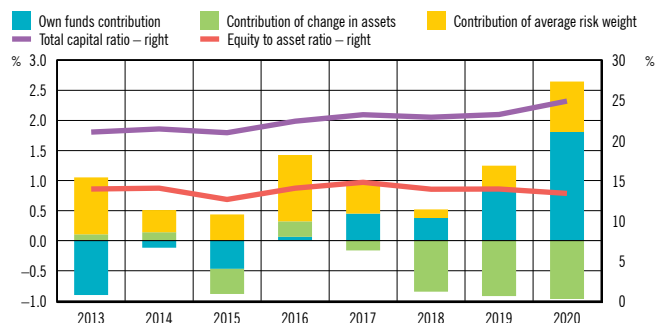
Profitability continued to be adversely affected not only by poor operating income and credit risk costs but also by the continuance of legal risks. While the growth in the number of court actions in 2019 was mostly associated with loans granted in Swiss francs, which led to a considerable increase in litigation provisions (of HRK1.2bn), expenses on provisions for litigation costs plummeted by around 82% in 2020.

Figure 6.18 High levels of liquidity and net stable funding



Note: LCR refers to the liquidity coverage ratio and NSFR refers to the net stable funding ratio. Source: CNB.

Figure 6.19 Capital adequacy increased during the crisis



Notes: A decrease in own funds (the numerator of the indicator) results in a fall in the total capital ratio and an increase in own funds in its rise. And vice versa, an increase in the risk exposure component-RWA (the denominator of the indicator) results in a fall, and its increase in a rise of the total capital ratio, and is computed as the multiple of assets and the average risk weight. Source: CNB.

14 The deterioration of indicators is associated not only with the fall in net income but also with the methodological changes in the FINREP reporting system. Effective 30 June 2020, an obligation was introduced to report as a separate category the costs of contributions to the resolution fund and costs of deposit insurance premia, which are, together with administrative and other costs, included in the denominator of the indicator.

Shock stabilisers

Credit institutions maintained abundant liquidity despite the fall in income and substantial amounts of approved moratoriums on loans. The Croatian National Bank injected additional liquidity to the financial system through a number of measures, so that the liquidity coverage ratio (LCR) hit record highs in 2020 (Figure 6.18). Credit institutions directed most of that additional liquidity to cash and reserves held with the CNB.

Credit institutions continued to rely on stable sources of funding. The net stable funding ratio (NSFR¹⁵) was 155% at end-2020 (Figure 6.18), influenced by the rise in household deposits and high capital levels.

The capital adequacy of credit institutions, which was high at the outbreak of the crisis, increased further by the end of 2020. Audited data for 2020 show that the capital adequacy ratio went up from 23.4% to 25.6% over the year owing to the lower average risk weight¹⁶ and retained earnings. However, the unweighted equity-to-assets ratio, a capitalisation indicator insensitive to changes in the weight, indicates that capitalisation of the system edged down, from 13.9% to 13.4% (Figure 6.19).

In 2021 the CNB again required banks to retain their profits from the previous year in order to strengthen their resilience and provide the smooth flow of credit to the economy. In 2020, this requirement was adopted together with relaxed regulations on the classification of non-performing placements, which alleviated the direct negative impact of the pandemic on capital. In early 2021 this requirement was extended for another year in response to heightened uncertainty regarding the impact of the crisis on the operation of credit institutions (see chapter 8 Macroprudential policy implementation). Capital was thereby strengthened by previous years' profits, which was in contrast with the past practice of paying out almost the full amount of profits (Figure 6.19).¹⁷

Risks in the forthcoming period

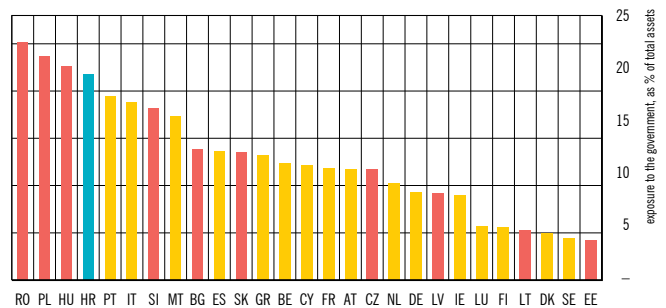
The risk of concentration in the portfolio of credit institutions increased due to the rise in exposures to the government. The

15 The obligation to comply with the net stable funding ratio (NSFR) requirement comes into effect in June 2021.

16 The CRR quick fix also reintroduced a temporary possibility to apply a 0% risk weight to euro-denominated exposures to central governments and central banks of the member states, which had a positive influence on the reduction of the average risk weight. The preferential weight for such exposures was last applied at the end of 2017; it was 25% at the end of 2019 and 50% at the end of the first quarter of 2020. The share of exposures with a 0% risk weight rose from 35.9% to 43.7% from the end of March to the end of December 2020.

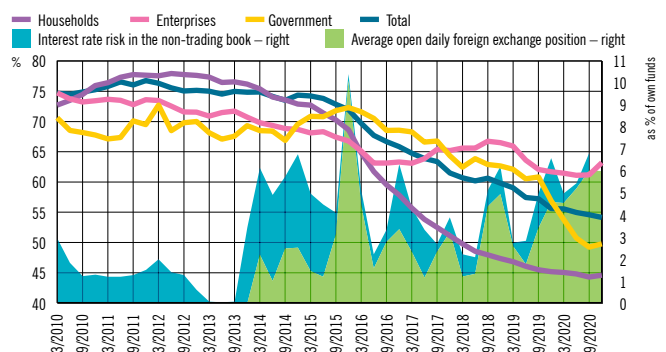
17 The ECB acted in a similar manner, adopting, in late March, a recommendation on the suspension of dividend payments and share buy-backs for 2019 and 2020 at least until the beginning of October 2020, after which the situation will be further evaluated and it will be assessed whether further suspension of dividend payments is advisable. The European Systemic Risk Board, in late May 2020, adopted Recommendation (ESRB/2020/7) to financial institutions and their supervisory authorities.

Figure 6.20 Croatia is among the EU countries with the largest government exposures of credit institutions



Notes: The height of the columns denotes the share of placements to domestic general government in total assets of credit institutions at the end of the third quarter of 2020. Blue relates to Croatia, red to CESEE countries and yellow to other EU countries.
Source: ECB.

Figure 6.21 Continued decrease in credit institutions' exposure to currency-induced credit risk



Note: The lines mark credit institutions' exposure to currency-induced credit risk, which is measured by the share of foreign currency loans in total loans, with placements shown for the government sector.
Source: CNB.

pandemic-induced increase in needs for financing further raised exposures to the government in Croatia, which had already been substantial in international terms (Figure 6.20).

The long-term effect of support to the economy on the profitability of credit institutions is uncertain. Ample support to non-financial corporations prevented deterioration in the credit portfolio quality in the short run. However, support to non-financial corporations with unsustainable business models may reduce productivity of the non-financial corporate sector in the long run, which may have a negative effect on the operation of credit institutions (see Box 4 The survival of zombie firms and risks to financial stability).

Although continuing to fall from 2015, indirect credit risks remained elevated. As the shares of loans with a variable interest rate and foreign currency loans stayed high (Figure 6.21), credit institutions continued to be indirectly (through the impact on their clients) exposed to interest rate and exchange rate risks in financial markets.

Box 5 Climate changes and their importance for credit institutions

Modern ways of production and consumption, which result in larger emissions of greenhouse gases (in particular of carbon dioxide, CO₂), have induced the process of global warming, which may lead to many catastrophic consequences. The first signs of more frequent and intense extreme weather events (storms, floods and droughts), soil erosion and sea level rise are already perceptible. Various analyses, initiatives and proposals are being made at the international level in order to halt temperature growth and to adjust the society to a warmer world.¹ All this requires substantial adjustments in human behaviour and large investments in economic restructuring, in which the financial sector will also play an important role. The coronavirus pandemic has raised awareness of both the profound consequences to the economy of sudden and severe shocks and the efforts that should be made to prepare for their materialisation. As climate changes may also trigger economic shocks, their impact should be included in the regular system of risk assessment, at the level of both individual financial institutions and the financial system. However, the monitoring of climate risks and estimating their effects is very challenging as existing climate-economic models cannot accurately predict their materialisation due to their unpredictable nature and the absence of reliable data.²

The objective of this box is to estimate the potential effects of climate changes on the banking system in Croatia through the exposure of credit institutions' clients to climate-related risks, based on the relatively small set of data on the effects these risks have on the corporate sector and, indirectly, on the banks funding them. Here we also present the results of the survey on these risks carried out by the CNB among banks in early 2021 and describes planned future actions to include climate risks in financial stability assessment.

Assessment of banks' exposure to climate risks

In analysing the impact of climate risks on financial institutions and markets it is necessary to distinguish the effects of physical and transition risks.³ *Physical risks* arise due to changes in the environment, which may be either sudden (acute), such as floods, fires, storms, or long-term (chronic), such as gradual warming and a rise in the sea level. These risks have direct negative effects and create costs for financial institutions by reducing the value of their assets, investments or collateral. *Transition risks* are associated with changes made in efforts

to adapt to a low-carbon economy and among others include shifts in fiscal policy (CO₂ taxes/excises, subsidies for electric cars), technologies applied (increased efficiency in the use of energy resources, reduction of fossil fuel dependency) as well as consumer preferences. These risks may increase depending on the size of adjustment measures as well as the uncertainty regarding the timing and pace of their implementation (e.g. the unexpected introduction of carbon taxes may not only decrease the value of high emission enterprises, but it may also affect other parts of the economy and the financial system). Both types of risks are interrelated, for example, strong but inadequate adjustment measures to mitigate physical risks may elevate transition risks, while the absence of adjustment measures may decrease transition risks but aggravate physical risks in the medium and long run.⁴

In the absence of comprehensive data, exposure of credit institutions to physical climate risks was identified through banks' exposure to Croatian economic activities that are assumed to be most affected by direct harmful effects of climate changes. Based on the [Report on climate change impact, vulnerability and risk assessment by sector](#), identified as such were energy, agriculture, fishery, forestry and tourism-related activities. Data reveal that credit institutions' exposure to enterprises engaged in these activities account for almost one third of their exposure to all non-financial corporations. As much as one fifth of all exposures is associated with enterprises engaged in tourism related activities. The exposure to physical risks was assessed through direct links with afflicted enterprises, excluding additional interdependencies in the economy and the financial system, and it amounts to 6% of the total exposure of credit institutions (Figure 1). However, in addition to the type of activity, physical risk exposure may strongly depend on the geographic location of a bank's clients or their supply chains, as well as the bank itself and assets taken as collateral⁵. There are currently no data available to enable the geographic mapping of banks' exposures to physical risks.⁶

Banks' exposures to risks arising from adjustment to a low-carbon economy (transition risks) were identified following the approach by Battiston et al.⁷, who based their classification on data at the level of four-digit NACE activities, and information on their direct and indirect contribution to greenhouse gas emissions, significance for climate-related policy and role in the energy supply chain. The activities identified were grouped into five main areas: fossil fuels, energy-intensive activities, housing, utilities and transportation. Credit institutions' exposures to enterprises engaged in these activities account for around 9% of total exposures (Figure 2). While the total relative exposure has steadily decreased over the last decade, which is attributable to the smaller

1 Parties to the [Paris Agreement](#) signed in 2015 committed themselves to take actions to limit global warming to well below 2, preferably to 1.5 degrees Celsius, compared to pre-industrial levels. The Agreement aims at adaptation to and deceleration of climate change by focusing on the reduction of CO₂ emissions, and investments in technology transition and adaptation.

2 Source: Bolton, P., M. Després, L. A. Pereira da Silva, F. Samama, and R. Svartzman (2020): The green swan: central banking and financial stability in the age of climate change, Bank for International Settlements. To explain climate changes the authors use the term "green swan risks" because they wish to point out that certain rare events may have extreme impacts, and that, although their timing is uncertain, there is a high degree of certainty that they will materialise in the future.

3 NGFS (2019): A Call for Action – Climate Change as a Source of Financial Risk, First Comprehensive Report.

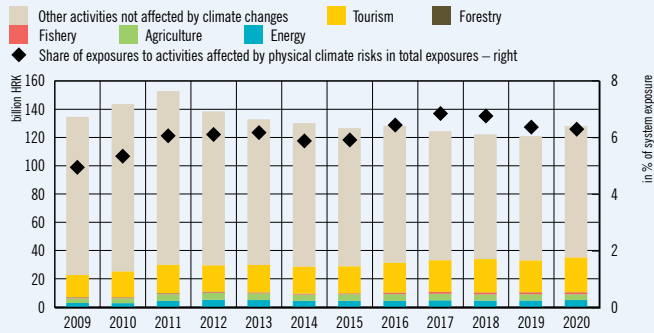
4 Vermeulen, R., E. Schets, M. Lohuis, B. Kölbl, D. J. Jansen, and W. Heeringa (2018): An energy transition risk stress test for the financial system of the Netherlands, De Nederlandsche Bank Occasional Studies, Vol. 16(7).

5 For example, it is stated in the Report on climate change impact, vulnerability and risk assessment by sector that the risk of open fires is extremely high in the counties of Split-Dalmatia, Šibenik-Knin and Zadar and slightly lower in other counties (high, moderate or low).

6 Data on banks' exposure at county levels refer to the location of the firm's head office but not the location of its business activities.

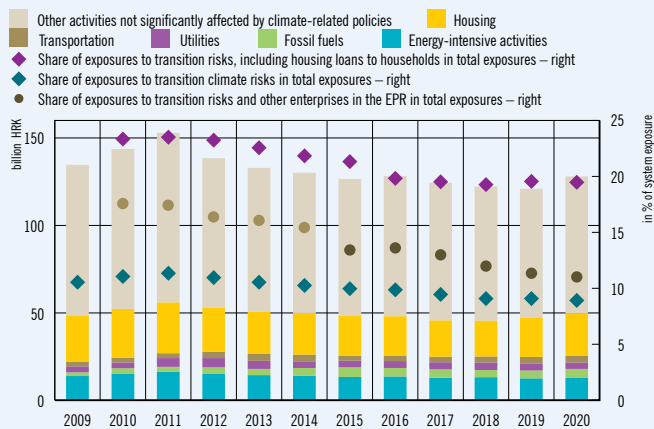
7 Battiston, S., A. Mandel, I. Monasterolo, F. Schütze, and G. Visentin (2017): A climate stress-test of the EU financial system, Nature Climate Change 7, pp. 283-288.

Figure 1 Credit institutions' exposure to physical climate risks



Note: The figure shows exposure to non-financial corporations engaged in activities presented in the Report on climate change impact, vulnerability and risk assessment by sector (2017), prepared for the Ministry of Environmental Protection and Energy.
Source: CNB.

Figure 2 Credit institutions' exposure to transition climate risks

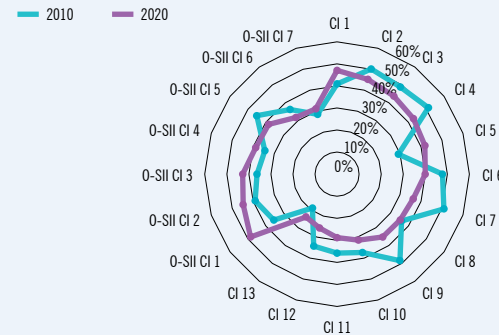


Notes: The figure shows exposure to non-financial corporations engaged in activities exposed to costs of climate policy change adaptation, defined at the level of four-digit NACE activities following the classification in Battiston et al. (2017) and grouped into five main areas. The share in total exposure was further increased by the amount of housing loans and by exposure to corporations that reported CO₂ emissions to the Environmental Pollution Register (EPR) and operate outside activities identified according to the above methodology. The threshold for reporting to the Register (EPR Ordinance) was raised from 30 to 450 tons a year as of 2015, so that data are now available for a smaller number of polluting enterprises, which also reduced the estimated relative exposure of credit institutions.
Sources: CNB and Environmental Pollution Register (<http://roo.azo.hr/>).

share of non-financial corporations in total credit activities of banks, the share of enterprises that are exposed to transition climate risk has been increasing (standing at 39% of exposure to all non-financial enterprises in 2020, up from 36% in 2010). The increase was almost entirely due to changes seen with systemically important institutions, while small credit institutions actually reduced their exposures to corporations engaged in these activities (Figure 3). As most of the risk is associated with housing activities, assuming that housing loans to households are also exposed to transition risks (through rising energy standards), it is estimated that banks' total exposure to climate transition risks has risen to 19% in 2020.

The presented exposures of credit institutions to climate-policy-relevant sectors include a relatively broad set of activities defined in an

Figure 3 Differences in exposure to transition risks across banks and time



Notes: The figure shows exposure to non-financial corporations engaged in activities defined at the level of four-digit NACE activities and classified under the methodology in Battiston et al. (2017). The credit institutions were grouped into other systemically important credit institutions (O-SIIS) and credit institutions without that status (CIs).
Source: CNB.

internationally comparable fashion; however, it should be noted that there are differences among enterprises engaged in the same activity. In particular, the individual characteristics of each enterprise, such as the production process, use of fossil fuel energy, applied technology and its modernisation may affect the intensity of CO₂ emission and other forms of negative impact on the environment.

Therefore, initial analysis of the banks' exposure to enterprises engaged in activities vulnerable to climate transition risks will be expanded to include other enterprises that are vulnerable due to their CO₂ emission but are not identified following the methodology in Battiston et al. Used for that purpose were data from the Croatian [Environmental Pollution Register](#), which comprises data on enterprises with the most significant contribution to environmental pollution, including through CO₂ emissions.⁸ Combining these data with corporate business indicators shows that the production of Croatian companies has not become any cleaner in recent years; on the contrary, the average emission of CO₂ per enterprise and unit of operating income has increased since 2015, when comparable data⁹ first became available (Table 1). As the emissions will have to be reduced in the future, this also implies higher climate adaptation costs.

A comparison of activities by corporations with registered CO₂ emissions (data from the Register) and the initially analysed list of activities that are assumed to be most affected by effects of climate change (according to Battiston et al.) shows that significant CO₂ emissions are also made by enterprises engaged in activities not identified as those most affected by climate change. Furthermore, while the pollution intensity, in terms of CO₂ emission per unit of income, is the highest in fossil production and other energy-intensive activities, its largest variation is observed in other activities, in which median pollution levels are also relatively high (Figure 4).

8 The [Report on the data from the Environmental Pollution Register for 2019](#) states that CO₂ is the most widely represented pollutant in the total volume of waste gases in Croatia.

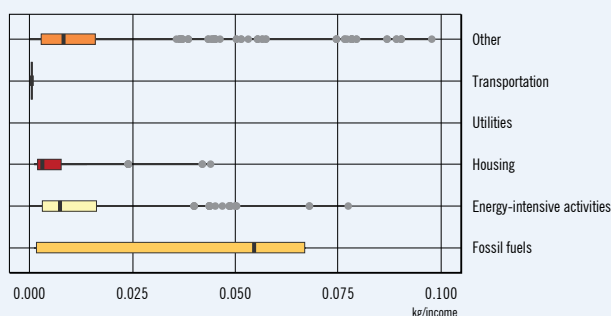
9 The threshold for reporting to the Register (EPR Ordinance, OG 87/2015) was raised from 30 to 450 tons a year as of 2015, so that from then on CO₂ emissions are reported by fewer enterprises.

Table 1 CO₂ emissions and income of enterprises in the EPR

Year	CO ₂ 1000's of tons / year	Total income	Number of enterprises	Average 1000's of tons / enterprise	kg/HRK
2010	10,445	205,811	2023	5.2	0.051
2015	9,029	134,861	833	10.8	0.067
2020	8,748	125,732	638	13.7	0.070

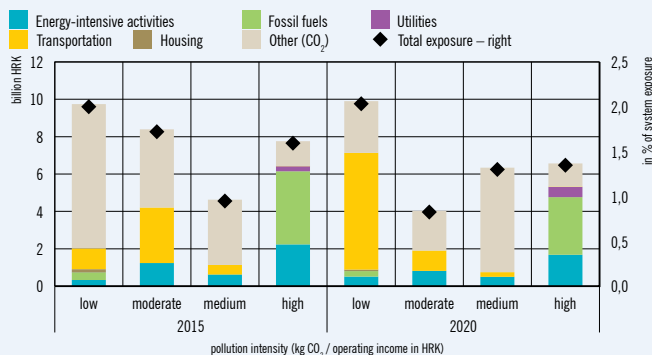
Note: The threshold for reporting to the Register (EPR Ordinance, OG 87/2015) was raised from 30 to 450 tons a year as of 2015, which reduced the number of enterprises that reported emissions.

Sources: FINA and Environmental Pollution Register (<http://roo.azo.hr/>).

Figure 4 Intensity distribution of CO₂ emission across enterprises grouped by activity

Note: The vertical axis shows activities where climate change adaptation costs arise, according to the classification in Battiston et al. (2017), and the horizontal axis shows pollution intensity (ratio of CO₂ emission and sales revenue) of Croatian enterprises reporting to the Register.

Sources: FINA and Environmental Pollution Register (<http://roo.azo.hr/>).

Figure 5 Credit institutions' exposures to enterprises with CO₂ emissions reported to EPR

Note: Pollution intensity levels: low – the 1st quartile of the annual distribution of CO₂/HRK; moderate – between the 1st quartile and median of distribution; medium – from the median to the 3rd quartile; high – above the 3rd quartile of distribution.

Sources: CNB and Environmental Pollution Register (<http://roo.azo.hr/>).

Out of all credit institutions' exposures in 2020, 6% were related to enterprises that reported CO₂ emissions, with the largest share being accounted for by those with lower pollution intensity levels (Figure 5). However, enterprises with above-median emissions per unit of sale accounted for a half of total credit institutions' exposure to emitting enterprises, which is a deterioration from 2015, when more than half

of those exposures related to enterprises with below-median pollution intensity. It is noteworthy that the shift in relative exposure of banks towards "dirtier production" occurred in the segment of other activities, which are not included in the definition by Battiston et al. (significant shifts of exposures from the first to the third quartile of pollution intensity distribution). If previous analysis of credit institutions' exposure to activities that are assumed to be most affected by effects of climate changes were expanded to include enterprises from other activities with reported CO₂ emissions, total exposures of credit institutions in 2020 would grow by an additional two percentage points, from 9% to 11% (Figure 2).

Attitude of Croatian banks towards climate and environmental risks

The need to strengthen the analytical framework and climate risk management motivated the Croatian National Bank in early 2021 to carry out a survey of all domestic credit institutions. It aimed at enquiring how aware they were about these risks, whether they included them into decision-making and risk management, with a further goal of drawing attention to the extreme importance of these sources of risks.

Responses to the survey suggest that banks evaluate their understanding of climate risks as satisfactory. However, only one O-SII estimated the impact of climate change on itself and the banking system in Croatia as significant, while half of the institutions saw that risk as moderate and others even considered it negligible. It is not surprising that only two O-SIIs partly included a comprehensive climate strategy in their business strategy, while other institutions explained their inaction by their waiting for a defined regulatory framework, the assertion that climate change should not have a major impact on their operations or unfamiliarity with the channel of impact.

The second section of the survey, covering risk management, analysis and disclosure of assessment results also showed that most institutions do not include climate risks into the categories of risk that are regularly monitored and that they do not report on such risks. In addition, only a few of the largest banks have designated organisational units responsible for climate risk management. It is interesting that none of the institutions has carried out an analysis or quantitative assessment of exposure to climate and environmental risks, which they attribute to the lack of adequate data, expertise and familiarity with the methods of risk measurement and assessment, while some of them (larger ones) state that methodology development is in progress or planned. Furthermore, although banks do not monitor their clients' exposures to physical or transition risks, most of them optimistically believe that the transition to a low-carbon economy may bring them business opportunities through the financing of climate related projects and equipment, development of new products and attraction of new clients.

As regards their own activities (sustainable financing products and carbon footprint), almost half of the banks, accounting for 90% of banking system assets, stated that they have already introduced sustainable products, mostly green loans and loans for financing renewable energy sources, with about one half of the others intending to do so. While only two O-SIIs have conducted an assessment of their own carbon footprint, made as a part of parent group activities, most banks have taken actions to reduce their environmental impact, such as providing incentive to reduce paper consumption, operating in energy efficient

premises, reducing the use of cars and their replacement with low CO₂ emission vehicles.

At the end of the survey credit institutions expressed their view that they themselves might contribute to climate change adaptation and transition to a low-carbon economy by offering more favourable financing to sustainable businesses and by their own sustainable operations. Apart from regulatory measures to encourage the development of sustainable products, credit institutions expect the central bank to develop additional guidelines, training and a partnership in the joint identification, estimation and management of sustainability and climate change risks.

Plans for the future

This analysis is the first step in assessing climate change risks for the banking system of Croatia, based on the identification of credit institutions' exposure to enterprises and activities affected by climate changes. At the same time, the survey of credit institutions shows that they have

merely begun to address this area; they have yet to assess the impact of climate risks on their own operations and they intend, together with the CNB, to contribute to the development of financial sector policies that would encourage adjustments towards a cleaner and greener economy and financial system.

In the forthcoming period the analysis of risks to financial stability should include more granular data on the factors of climate change that may be associated with bank exposures, estimation of the degree of vulnerability of particular exposures and of potential losses for individual banks and the system as a whole, all in efforts to assess the potential impact of climate changes on the financial system. For that purpose, in addition to making efforts to fill in the climate risk data gaps, the CNB will gradually incorporate climate risks into macroeconomic models and macroprudential stress testing and will continually communicate and cooperate with banks in the development of data sources and models to assess the impact of climate change.

7 Stress testing of credit institutions

Stress testing of credit institutions in 2021 was marked by the extraordinary circumstances caused by the COVID-19 pandemic. Due to strong support and prompt fiscal, monetary, macroprudential and microprudential policies, the pandemic has so far not affected the Croatian banking system. Also, the loss-absorption capacity of the banking system is now much greater than at the time of the outbreak of the 2008 crisis. The results of stress testing show that the accumulated capital surpluses in the system are sufficient to absorb unfavourable developments, even under an adverse scenario that hypothetically assumes further unfavourable economic developments. Nevertheless, the responses of credit institutions to stress conditions reveal considerable heterogeneity. Although the results of stress testing suggest the preparedness of the system to shoulder increased losses from 2021 to 2023, it should be emphasized that this year's stress testing was marked by an extremely high level of uncertainty regarding future

macroeconomic developments, under both the baseline and the adverse scenarios.

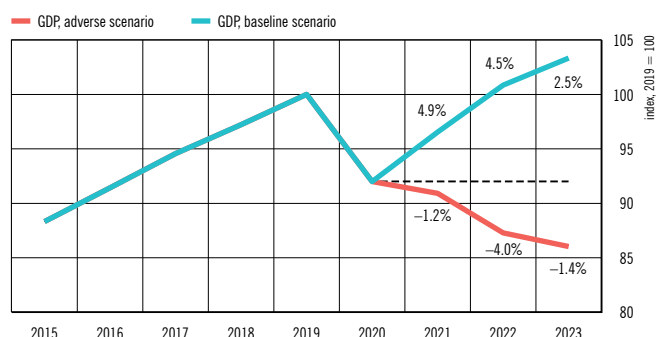
7.1 Macroeconomic scenarios for stress testing

The COVID-19 pandemic caused a global economic shock, with Croatia witnessing a sharp fall in economic activity in 2020. The unfavourable impact of the pandemic on economic developments will also be felt in the forthcoming period (see chapter 1 Macroeconomic environment). The buffers accumulated in the years before the crisis helped banks build resilience to the crisis. Together with the package of measures of support during the pandemic, including an expansionary monetary policy, fiscal support to companies and favourable regulatory treatment of the moratoriums to mitigate to an extent the problem of non-performing loans, coupled with other regulatory reliefs and the temporary restriction of distributions for banks, they alleviated the impact of the pandemic on bank operations, with overall banking system capital adequacy ratio reaching a record high at the end of 2020 (see chapter 6 Credit institutions). Nevertheless, high banking system resilience notwithstanding, there is a high level of uncertainty regarding future developments in the epidemiological situation and their impact on key macrofinancial indicators, as well as on the developments in demand for new bank placements and their future income-generating potential. The pandemic increased indebtedness and at the same time curtailed some sectors' repayment capacity, which will, once the favourable regulatory treatment of the moratoriums is over, lead to an increase in the reported credit risk in 2021.¹⁸ Such an uncertain and turbulent environment makes the assessment of financial system resilience more difficult.

Stress testing of credit institutions tests credit institutions' resilience under hypothetical, extremely unfavourable macroeconomic and financial conditions that pose highly unlikely but 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 financial system stability maintenance.

¹⁸ The stress test assumes there will be no extension of the measures of support currently in force and provided by the Government/CNB/HANFA and other institutions to counteract the pandemic, which are expected to expire by the time the stress testing takes place.

Figure 7.1 Developments in real GDP under the baseline and adverse scenario



Sources: CBS and CNB December 2020 Monetary projection for the baseline scenario and the simulation of the macroeconomic model PACMAN for the adverse scenario.

For the purposes of stress testing, two scenarios are analysed, the baseline and adverse scenario, between 2021 and 2023. Following a sharp fall in economic activity of 8.0% in 2020, the baseline scenario envisages recovery in economic activity in accordance with the developments referred to in the CNB's December 2020 Monetary projection, with the economic activity

in 2022 returning to the pre-pandemic level, rising cumulatively by 12 percentage points of GDP from 2020 to 2023.¹⁹

The hypothetical adverse scenario envisages further unfavourable developments in the pandemic from the second quarter of 2021 (virus mutation, delays and problems in vaccine delivery, anti-vaccine movement, etc.) that will lead to lower economic activity growth rates compared to the baseline scenario, and from the fourth quarter of 2021 to a further fall in economic activity. Thus, the adverse scenario envisages a hypothetical fall in economic activity of 1.2% in 2021, 4.0% in 2022 and 1.4% in 2023 (Figure 1), and a high unemployment rate throughout the observed time horizon. In addition to the assumption of difficulties and delays in global response to the pandemic, the adverse scenario also includes a materialisation of additional sources of systemic risks identified as relevant in the risk map (see Introduction). Thus the adverse scenario simulates a sharp fall in residential real estate prices and depreciation of the exchange rate that would rise to HRK 8.0/EUR following the escalation of the pandemic. As regards financing conditions, the assumed developments in interest rates are based on the current accommodative monetary policy of an extended period of low interest rates, so that the only small increase in interest rates under the adverse scenario is the result of the assumed depreciation of the exchange rate and its

Table 1 Main features of the baseline and adverse macroeconomic scenario

	Initial value	Baseline scenario				Adverse scenario		
	2020	2021	2022	2023	2021	2022	2023	
International environment								
GDP EU (annual rate of change, %)	-8.2	5.2	3.3	1.6	-1.5	-1.8	-0.2	
EURIBOR 3M, %	-0.43	-0.50	-0.50	-0.50	-0.54	-0.54	-0.54	
Macroeconomic developments								
GDP (annual rate of change, %)	-8.0	4.9	4.5	2.5	-1.2	-4.0	-1.4	
Personal consumption (annual rate of change, %)	-6.4	4.5	2.9	2.1	-1.9	-3.9	0.4	
Investments (annual rate of change, %)	-2.9	7.2	6.2	2.5	-1.3	-9.8	-7.3	
Unemployment rate (%)	7.5	7.0	6.5	6.1	7.5	8.1	7.2	
Real estate prices (annual rate of change, %)	7.6	4.9	4.9	4.8	-3.2	-5.1	-1.0	
Inflation (%)	0.2	1	1.4	1.4	2.6	3.7	0.6	
Exchange rate EUR/HRK	7.53	7.53	7.53	7.53	7.92	8.05	8.05	
Financing conditions								
Change in average bond yield, p.p.	0.0	0.2	0.3	-0.1	0.5	0.9	-0.8	
Change in average long-term interest rates, p.p.	-0.1	0.1	0.0	0.0	0.2	0.1	0.0	
Change in average short-term interest rates, p.p.	-0.2	0.2	0.2	0.2	0.5	0.6	-0.1	
Change in average interest rates on the money market, p.p.	0.2	0.2	0.0	0.0	3.5	-2.9	0.5	

Sources: CBS, CNB, EBA 2021 EU-wide stress test exercise and CNB December 2020 Monetary projection for the baseline scenario and the simulation of the macroeconomic model PACMAN for the adverse scenario.

¹⁹ Given the fall in economic activity of 8.4% in 2020, the starting point for drawing up a macroeconomic adverse scenario and carrying out the stress test is thus far the least favourable of all adverse scenarios carried out by the CNB.

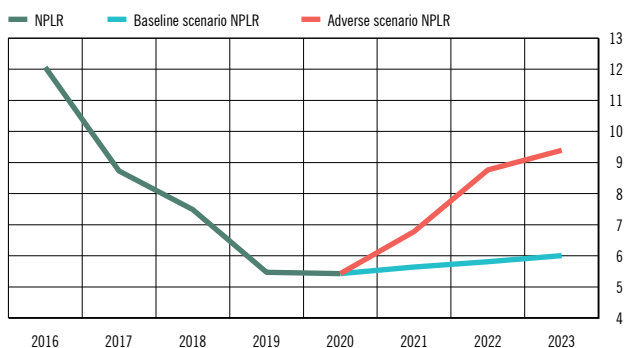
spillover to consumer price developments, as well as of a small assumed increase in the risk premium. Table 1 gives an overview of developments in the main macroeconomic indicators under the baseline and adverse scenario.

7.2 Credit risk under the baseline and adverse scenario

Banks entered the pandemic with a historically low share of non-performing loans in total loans (NPLR), which fell additionally in 2020 as a result of credit growth and the sale of non-performing receivables, even though the amount of non-performing loans rose. However, due to a large number of granted loan moratoriums, and the favourable regulatory treatment, the increase in the amount of non-performing loans was relatively modest compared to the intensity of contraction in economic activity. With gradual expiry of the moratoriums and lenient regulatory treatment, the NPLR is bound to rise.

The expected increase in the NPLR under the adverse scenario is the result of action of two groups of factors: the first group involves loans that will become non-performing once the moratorium expires and the other involves further loans that will go bad due to a further fall in economic activity projected under the adverse scenario, which are all expected to be classified as non-performing. Therefore, in the evaluation of the credit risk for credit institutions, the first step was to make a model estimate of the increase in the NPLR in 2020 that could have been expected in the absence of a favourable regulatory treatment of the moratorium (use of the macro model for forecasting non-performing loans, see Box 6). The model-simulated increase in the NPLR in 2020 was then distributed equally and added to the simulated level of the NPLR for 2021 and the first half of 2022 under the baseline and adverse scenario, obtained by means of the macro model for forecasting the NPLR.

Figure 7.2 Developments in total NPLR under the baseline and adverse scenario



Source: CNB.

The obtained developments in the NPLR under the baseline and adverse scenario are shown in Figure 2.

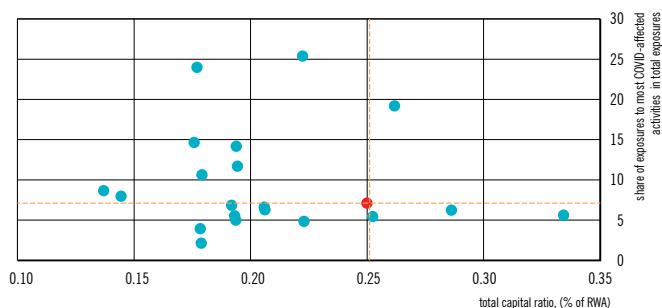
The total NPLR, which includes non-performing exposures to households, non-financial corporations, the government and financial institutions, might increase only slightly under the baseline scenario, from 5.4% at the end of 2020 to 6.0% at the end of 2023. The baseline macroeconomic scenario envisages favourable macroeconomic conditions between 2021 and 2023 and economic activity growth that will by 2023 exceed the rate in the pre-crisis years, a fall in the unemployment rate and further growth in real estate prices. The NPLR for households is thus expected to fall, both in the segment of housing and consumer lending. By contrast, non-financial corporations are expected to see an increase in the NPLR, primarily as a result of the cancellation of the favourable regulatory treatment of the moratoriums, for corporations that failed to bring their operations back on track during that time. In addition, fiscal support provided to companies in 2020 slowed down the exit of companies from the market, which can increase structural credit risk in credit institutions' portfolios (Box 4 The survival of zombie firms and risks to financial stability).

The total NPLR that includes non-performing exposures to all sectors might rise sharply under the adverse scenario and reach 9.4% at the end of 2023. Under the adverse macroeconomic scenario, which simulates the effect of unfavourable economic developments in the next three-year period and a considerable contraction in economic activity, the NPLR would rise in all sectors. As during the previous global economic crisis, the household sector would see a more moderate increase in the NPLR than the non-financial corporations sector which would see a faster growth in this ratio, which, in addition to the expiry of the moratoriums also includes an influx of new non-performing loans as a result of further deterioration of macroeconomic indicators in the period between 2021 and 2023.²⁰ Under IFRS 9, in addition to value impairment and provisions for placements in default (new and existing bad placements), also estimated for each credit institution, under the adverse scenario, are the costs of additional value impairment and provisions in the amount of the expected credit loss for placements not yet in default (Stage 2).

This year's stress test took into account the specific situation dictated by the COVID-19 crisis and the high degree to which some activities were affected by the social distancing measures introduced during the pandemic. Therefore the inflow of new non-performing loans on the level of each bank is proportionate to the share of its exposure to the so called "COVID-affected" activities. "COVID-affected" activities are those recording a fall in the gross value added (based on quarterly GDP

20 A faster loan deterioration in the corporate sector is also in line with current developments in exposures in Stage 2, with 2020, amid the pandemic, witnessing a sharp rise in Stage 2 loans in the corporate sector (up from 8% to 22% of the total corporate loans), while the household sector witnessed their more moderate growth (from 11% to 14% of the total loans to households). Stage 2 represents a considerable increase in credit risk for instruments not yet in default (Stage 3).

Figure 7.3 Share of total exposures of credit institutions to companies operating in activities most affected by COVID-19 and capital adequacy ratio



Notes: The red circle denotes all credit institutions. Activities most affected by COVID-19 are defined according to the criterion of a fall in GVA and an increase in Stage 2 loans.
Source: CNB.

calculation) in 2020 and the largest growth in Stage 2 loans.²¹ Under these criteria “COVID-affected” activities include: accommodation and food service activities (I), transportation and storage (H), administrative and support service activities (N) and art, entertainment and recreation (S).

7.3 Assessment of banking system stability under the baseline and adverse scenario

The banking sector entered the COVID-19 pandemic and the economic crisis with a record high capital adequacy, with the capital position of banks strengthening further in 2020, fuelled by CNB’s order on the inclusion of profit earned in 2019 in capital and the adoption of Regulation (EU) 2020/873 (the so-called “quick fix”), which, among other things, also provided for a re-introduction of the temporary use of the 0% risk weight for exposures to the central government denominated in the euro. This change in the European prudential regulatory framework also has a direct impact on the results of stress testing under the baseline and adverse scenario, given that it provides a preferential use of the risk weight of 0% until the end of 2022.²²

21 Quarterly calculation of GVA is available for NACE activities divided into groups of activities, therefore, exclusive use of this criterion alone prevented full determination of the impact of the pandemic on each individual activity.

22 In stress testing of credit institutions carried out in the previous years, the expiry of the preferential treatment for exposures to the central government denominated in euro and its interplay with the country’s credit rating, which would deteriorate under the adverse scenario, led to a further fall in capital under the adverse scenario (see Financial Stability, No. 19, 2018; Termination of preferential treatment for some of the exposures to central governments and central banks). According to the European prudential regulatory framework, the renewed application of the risk weight to exposures to the central government and the central bank denominated in euro is scheduled for 2023, however, given that 2023 is the target date for the introduction of the euro in the RC, in this stress test the risk weight used for exposures to the RC denominated in euro in 2023 is zero.

In addition, the CNB adopted a macroprudential Decision on a temporary restriction of distributions, temporarily restricting also in 2021 distributions relating to dividends, redemption of own shares and award of variable remuneration so as to increase credit institutions’ resilience and maintain the stability of the financial system as a whole (see chapter 8 Macroprudential policy implementation). In accordance with this decision, in the context of stress testing of credit institutions, it is assumed that credit institutions will not start with distribution of payments before 2022, under the assumption of steady payments at the level of 80% of the profit. The impact of the distribution of the entire 2019 and 2020 profit was also simulated to assess the impact of the CNB’s ban on distribution of profits generated in these years.)

The capital adequacy ratio under the baseline scenario continues to grow, rising from 24.9% at the end of 2020²³ to 26.7% at the end of the test horizon. Income from net operating earnings of banks under the baseline scenario is sufficient to compensate for the small increase in value impairment and provisions for credit risk.²⁴ The growth in value impairments under the baseline scenario reflects primarily the influx of non-performing loans due to the expiry of the existing moratoriums. At the same time, in 2022 credit institutions resume paying out dividends based on generated income, reducing the growth in the capital adequacy ratio in the system (Figure 4.a).

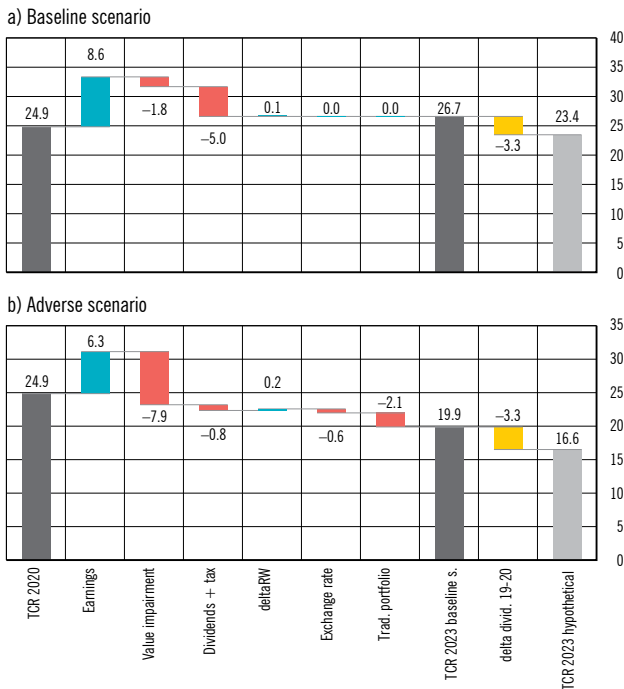
Under the adverse scenario the capital adequacy ratio kept declining steadily in the first two years of the time horizon; from 24.9% at the end of 2020 to 19.5% at the end of 2022, since operating earnings in 2021 and 2022 were smaller than provisions and value impairments in most institutions in the system, with the banking system operating with a loss. In 2023, the system capital started rising again slowly and at the end of 2023 stood at 19.9%, mirroring a small recovery in earnings and provisions and value impairments somewhat smaller than in 2022. In addition to the already mentioned credit portfolio deterioration, i.e. the increase in value impairments and provisions for credit risk exposures, the capitalisation under adverse conditions was also negatively affected by the increase in the amount of risk exposures resulting from kuna depreciation, trade portfolio revaluation, and resumed payment of dividends from 2022. (Figure 4.b).

And finally, Figure 4 (a and b) shows that system capitalisation under the baseline and adverse scenario would be much lower had it not been for the issued order and the decision restricting distributions pertaining to the profit generated in 2019 and 2020. The presented hypothetical total capital ratio was obtained under the assumption of credit institutions paying out 100% of the profit generated in 2019, 2020 and beyond.

23 According to preliminary unaudited data as at 31 December 2020.

24 In the interpretation of the results account should be taken of the fact that the methodology of the conducted stress testing relies on the assumption of a static balance sheet, i.e. there are no changes in the total exposures of banks under the baseline and adverse scenarios; instead they hold steady at end-2020 level.

Figure 7.4 Decomposition of the change in the capital ratio under the baseline and adverse scenario over a three-year period from 2020 to 2023



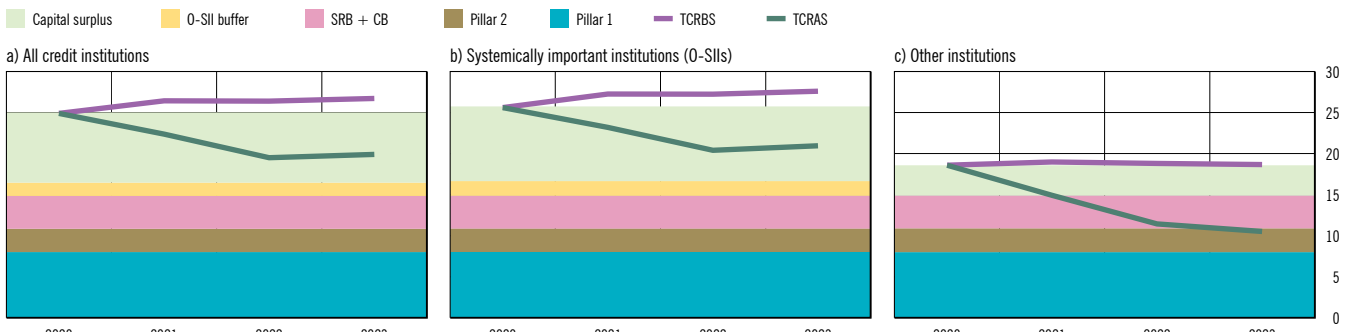
Source: CNB.

The restriction of distributions for 2019 and 2020 has proved relevant for overall system capitalisation under both scenarios as well as for overall system resilience under the adverse scenario (given that the hypothetical capital ratio that assumes the distribution of profit generated in 2019 and 2020 falls to 16.6%).

High initial capitalisation of credit institutions and their profitability had an impact on the results of the stress test, which showed that the system is resilient and ready to bear increased credit losses under the adverse scenario. The capital surplus maintained by credit institutions at the end of 2020 at a level above the minimum legal capital requirements is vital for the absorption of credit losses in the conditions of stress (Figure 5.a). If no capital surpluses were maintained in the system and if credit institutions maintained capital ratios equal to the minimum legal capital requirements, the adverse scenario would witness an encroachment on the combined capital buffers (all the three buffers currently in use: the capital buffer for systemically important institutions, the systemic risk buffer and the capital conservation buffer) and on the required own funds (pillar 2), which underlines the relevance of capital surpluses in maintaining system stability.

The capital adequacy ratio under the adverse scenario remains above the minimum legal capital requirements on the overall system level, however, considerable heterogeneity can be seen in the response of individual groups of credit institutions to adverse conditions (Figure 5.b and Figure 5.c). Systemically important credit institutions also operate relatively well on an aggregate level under the adverse scenario, although the fall in the capital adequacy ratio slightly reduces capital surplus. The total result for other credit institutions shows that they are much more vulnerable to adverse economic conditions, with the aggregate capital surplus being all but fully exhausted in the first year of the adverse scenario (2021). Any extended duration of economic contraction under the adverse scenario leads to encroachment on the combined capital buffers (in 2022) and on own funds (in 2023) of other credit institutions (on an aggregate level). The analysis of individual credit institutions shows that five credit institutions encroach on capital buffers

Figure 7.5 Capital ratio under the baseline and adverse scenario and minimum legally prescribed capital requirements



Notes: Pillar 1 prescribed minimum capital requirements; Pillar 2 own funds requirements appropriate to overall system average; SRB – systemic risk buffer, CCB – capital conservation buffer, O-SII buffer – the capital buffer for other systemically important institutions, TCRBS – total capital ratio under the baseline scenario; TCRAD – 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 legal capital requirements for that credit institution, i.e. as the TCR – (pillar 1 + pillar 2 + CCB + SRB + O-SII buffer). Source: CNB.

and a further three encroach both on capital buffers and own funds (pillar 2). And finally, another eight credit institutions do not meet even the prescribed minimum capital requirements (of 8%, pillar 1) under the adverse scenario. If the threshold after which a credit institution fails stress testing is taken to be

a conservative assumption that credit institutions that do not meet test results are those that encroach on the total SREP capital ratio (TSCR), a total of 11 credit institutions failed the system's stress testing. These credit institutions account for 4.8% of the total banking system assets.

Box 6 Macro models for forecasting non-performing loans

Banking system solvency and liquidity stress testing are one of the main macroprudential tools used in the assessment of bank capital sensitivity to macroeconomic disturbances, thus contributing to maintaining financial system stability. Therefore, the Croatian National Bank makes continuous efforts to develop and upgrade the entire system as well as the satellite models used in stress testing of credit institutions. The model for the assessment of the response of the non-performing loans ratio to adverse macroeconomic conditions (*Financial Stability, No. 1*), one of the key elements of the system, has already been upgraded twice (*Financial Stability, No. 7* and *Financial Stability, No. 14*).¹

The NPLR is known to rise sharply at a time of crisis, posing a challenge to the sustainability of credit institutions' operations, and has the potential to threaten overall financial stability. Therefore, proper assessment of the credit risk model and its robustness are crucial for credible stress testing results. To strengthen the credibility of the model's results, it is important to choose from among a range of possible model specifications those that best estimate the impact of adverse macroeconomic conditions on the non-performing loans ratio. The results of the simulations made based on the selected models are then used to examine if the simulated baseline and adverse scenarios lead to an increase in the NPLR and credit risk losses that might threaten individual credit institutions' solvency and have an unfavourable impact on overall financial system stability.²

Credit risk model was updated for data from the first quarter of 2004 to the first quarter of 2020.³ Since the impact of individual adverse macroeconomic conditions on individual types of debtors may differ greatly, credit quality is analysed by separate models, assessed for different sectors: households (separately accounting for housing and non-housing loans) and non-financial corporations.⁴

1 In addition to the NPLR models developed by the CNB, the developments in the NPLR and its main macroeconomic determinants for the Croatian banking system were also analysed by, among others, Erjavec et al. (2012), Bošnjak et al. (2013), Benazić and Radin (2015), Živković et al. (2015), Pavković et al. (2018). In addition to individual studies focusing exclusively on the analysis of the Croatian banking system, the determinants of the NPLR have also been examined in a panel analysis (for overview and more information, see Škarica (2014)).

2 The inclusion of the credit risk model in the stress testing system provides a conditional assessment of loan quality and credit risk relative to the expected future developments in different macroeconomic indicators. For the purposes of stress testing of banks, two scenarios of developments in macroeconomic indicators are mostly used: the baseline scenario, which is also the CNB's monetary projection for the forthcoming period and the adverse (stress) scenario, which forecasts the emergence of bigger macroeconomic and/or financial shocks than the baseline scenario.

3 Source of data for the period up to December 2009 was the form RS1. In the period that followed, data were created according to the RS4 form rules, using the RS2 form up to September 2013, RS3 up to December 2017 and for the period beginning with 2018, data were taken directly from the RS4 form. Also available from June 2016 are data from the template F 18.00 from the Commission Implementing Regulation No 680/2014, the values of which are regularly published on the official CNB web page and which are aligned with the shared methodology for all credit institutions in the EU. Although official, this time series of non-performing loans is still too short for modelling long-term relationships.

The group of independent variables used in the model was selected on the basis of a group of variables contained in the macro model *Policy Analysis Croatian MACroecoNometric model* (PACMAN) developed by the CNB for forecasting, scenario analysis, as well as for simulating macroeconomic developments under an adverse scenario (Nadoveza Jelić and Ravnik 2021).⁵ This ensures consistency of the projected macroeconomic scenarios under a baseline and an adverse scenario. A group of 20 variables were taken from the available variables used in the PACMAN model, which according to research found in the literature (e.g. Bonaccorsi di Patti and Cascarino 2020) might be relevant for developments in the NPLR. The model also includes the sale of NPLs (*Financial Stability, No. 21/2020*) to control for their impact on the level of the NPLR.

The autoregressive distributed lag (ARDL) model is used in econometric estimation where the dependent variable Y_t enters the model in a differentiated form and is defined as the function of its time lags and current values and time lags of the group of independent variables X_t^k :

$$Y_t = \alpha_1 + \rho_1 Y_{t-1} + \dots + \rho_p Y_{t-p} + \sum_{k=1}^k (\beta_0^k X_t^k + \dots + \beta_q^k X_{t-q}^k) + \varepsilon_t \quad (1)$$

where p and q denote time lags of the dependent and independent variables and k denotes each explanatory variable.⁶

Model estimate is not based on a selection of a preferred model specification, or handpicked equations. To reduce the risk of error due to a possible omitted variable bias, the models were estimated taking into account all the possible combinations from group K of independent variables (Gross and Poblacion, 2015). The largest number of independent variables L included in the model was limited to four, so as to ensure sufficient degree of freedom in model estimation in view of the length of the available time series and the inclusion of time lags in the model.

Combinations containing two or more variables from the same group were excluded due to their high multicollinearity. The first group of variables includes the rate of change of domestic and foreign GDP and the different components of this change, and the other relates to different types of interest rates. In addition to these two groups, regressions also include unemployment indicators, real estate prices and the exchange rates of the kuna against the euro and the Swiss franc.⁷ The exact defini-

4 Loans to households and non-financial corporations accounted for approximately 60% of total exposures at the end of 2020. Of the remaining exposures, at the end of 2020, 32% were accounted for by loans to the government, the least risky of loans, and only 8% to exposures to other sectors, so the models capture most of the credit risk to which credit institutions are exposed.

5 PACMAN is a medium large macroeconomic model characterised by a high level of aggregation which takes into account the relationships between key macroeconomic variables in the economy in a systematic manner.

6 Similar systems for credit risk analysis are given in STAMPE (2017) and Gross and Poblacion (2015).

7 Foreign and domestic GDP and their components, unemployment rate and developments in real estate prices are included in model estimate as annual rates of change of quarterly values. Interest rates, inflation and exchange rate are included in model estimate as the average of the values recorded in the quarter. The value of the sale of non-performing claims is included in model estimate as a share in total assets in the same quarter.

tion of the groups and an overview of all the variables included in model estimate are given in Table 1. Using the described rules and restrictions, a total of 770 models were estimated for the household sector (and for housing and non-housing loans) and 415 models for the non-financial corporations sector.

For each model estimated using the Akaike Information Criteria (AIC), the optimal length of time lags of the dependent and independent variables was estimated, with the maximum number of time lags being exogenously set to 2. If the maximum number of time lags is endogenised and estimated automatically using the AIC criterion, in some equations the optimal number exceeds 2. However, in view of the limited degree of freedom in model estimate and the intended purpose of the model per se in the context of stress testing, the inclusion of several time lags of independent variables in the model for forecasting the NPLR would prevent a timely spillover of macroeconomic conditions worsening under a simulated adverse scenario into the NPLR. Therefore, in these equations the maximum number of time lags has also been exogenously set to 2.⁸

The direction and intensity of the impact of individual independent variables on the dependent variable were examined next. The long run multiplier of each independent variable is estimated in the following way:

$$\sum_{i=0}^{\infty} \frac{\partial E(Y_{t+i})}{\partial X_t^k} = \frac{(\beta_0^k + \dots + \beta_2^k)}{(1 - \sum_{i=1}^p \rho_i)} \equiv \theta^k \quad (2)$$

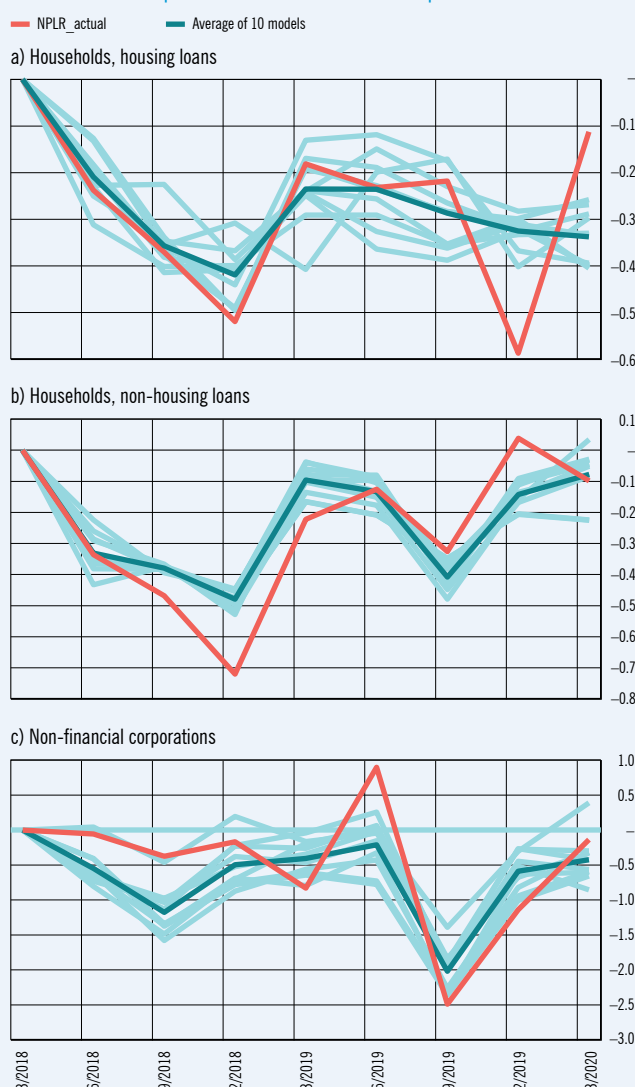
and the sign of the obtained long run multiplier for each variable is compared to sign restrictions shown in Table 1 as found in the literature.

So, for instance, an a priori given negative sign restriction (-) with the GDP shows an expectation that a fall in GDP increases the NPLR over a long term. Conversely, an a priori given positive restriction (+) with the unemployment rate shows an expectation of a positive correlation between unemployment and the NPLR. If the estimated sign of the long run multiplier differed from the set restrictions, the estimated equation was excluded from further consideration.

To evaluate the predictive power of each model, the models are estimated as at the first quarter 2018, and their predictive powers were evaluated based on a fixed window estimation method from the second quarter of 2018 to the first quarter of 2020. For each model, a root mean square error (RMSE) was calculated, and in each of the three sectors, ten models were selected with the smallest RMSE value. Additional validation of the results of the selected models was obtained by comparison with the predictive power of the simple autoregressive model (AR) on the same sample and only models with the root mean square error lower than that implied under the AR model were retained. Generally, the average of model projections follows the actual developments in the NPLR rather well in a sample covering the period from the second quarter of 2018 to the first quarter of 2020, with the dispersion of the results of individual models being greater in housing loans and corporate loans and slightly smaller in consumer loans (Figure 1).

⁸ Were the primary intention of the model to analyse determinants affecting developments in the NPLR, the preferred approach would lie in an endogenous selection of the optimal number of time lags.

Figure 1 Results of the simulation of change in the NPLR in a sample from the second quarter of 2018 to the first quarter of 2020 and comparison with actual developments



Sources: CNB DWH and authors' calculation.

The selected models, updated in a sample for each sector as at the first quarter of 2020 (Table 2),⁹ show that the NPLR in the household sector is best predicted by the following group of variables: GDP (domestic and foreign), personal consumption, disposable income, unemployment rate, real estate price index, long-term and short-term interest rates for

⁹ The procedure described above was conducted twice; in a sample beginning with 2004 and in a sample beginning with 2010, given the switch between the RS1 and RS2 forms in 2010 and the ensuing methodological changes involving new sectorisation and exposure classification rules, so data contain a structural break in that year. According to the criteria of the minimum RMSE for the household sector (housing and non-housing loans) the models selected were estimated on a sample beginning with 2004, while for non-financial corporations, the sample beginning with 2010 was selected.

Table 1 Overview of explanatory variables and their groups included in the estimate of the NPLR models and implemented sign restrictions

	Independent variables	Sign	Model with sign restriction		
			HH (non-housing)	HH (housing)	NFC
Group 1	GDP	–	x	x	x
Group 1	C (personal consumption)	–	x	x	
Group 1	I (investments)	–			x
Group 1	Ex (exports)	–			x
Group 1	Gross operating surplus	–			x
Group 1	Disposable income	–	x	x	
Group 2	IR short-term_hh	+	x	x	
Group 2	IR short-term_nfc	+			x
Group 2	IR long-term_hh	+	x	x	
Group 2	IR long-term_nfc	+			x
Group 2	Interest rates on money market	+	x	x	x
Group 2	Yields on government bonds	+	x	x	x
Group 2	EURIBOR	+	x	x	x
	Unemployment rate (LFS)	+	x	x	
	Real estate price index	–	x	x	x
	EUR/HRK	+	x	x	x
	CHF/HRK	+	x	x	x
	Sale of NPLs	–	x	x	x
Independent variables with unpredetermined impact on the developments in NPLs					
	Inflation	NO			
Group 1	GDP EU	NO			
Group 1	GDP EA	NO			

Source: Authors' calculation.

Table 2 Overview of the minimum and maximum coefficient range with explanatory variables of the ten best NPLR forecasting models for the household sector (housing and non-housing loans) and non-financial corporations

Households housing loans													
	GDP EA	GDP EU	C (personal consumption)	Disposable income	Unemployment rate (LFS)	Real estate price index	IR short-term_hh	IR long-term_hh	Interest on money market	EUR/HRK	CHF/HRK	Inflation	Sale of NPLs
Min	–0.03	–0.06	–0.06	–0.03	0.00	–0.01	0.03	0.01	0.003	0.01	0.01	–0.02	–1.21
Max	–0.03	–0.06	–0.04	–0.03	0.01	–0.01	0.11	0.01	0.04	0.01	0.01	0.02	–0.26
Households non-housing loans													
	GDP	GDP EU	Disposable income	Unemployment rate (LFS)	Real estate price index	IR short-term_hh	IR long-term_hh	Interest on money market	EURIBOR	EUR/HRK	Sale of NPLs	–	–
Min	–0.06	–0.08	–0.02	0.004	–0.003	0.02	0.01	0.02	0.01	0.03	–1.11		
Max	–0.06	–0.06	0.00	0.01	–0.003	0.02	0.04	0.02	0.01	0.03	–0.92		
Corporations													
	Gross operating surplus	Ex (exports)	IR short-term_nfc	Interest on money market	Yield on government bonds	EURIBOR	EUR/HRK	CHF/HRK	Inflation	Sale of NPLs	–	–	–
Min	–0.16	–0.003	0.05	0.59	0.06	0.07	0.04	0.00	0.23	–1.32			
Max	–0.08	–0.003	0.16	0.59	0.06	0.07	0.18	0.01	0.47	–0.58			

Source: Authors' calculation.

the household sector, interest rates on the money market, EURIBOR, the exchange rate (EUR/HRK and CHF/HRK) and the consumer price index, with the sale of NPLs in the household sector as a corrective variable. Table 2 shows the minimum and maximum range of the estimated coefficients (their long run multiplier).

As regards the non-financial corporations sector, the main determinants of the NPLR in that sector are gross operating surplus, exports, short-term aggregate interest rates for the corporate sector, interest rates on the money market, yields on generic government bonds, EURIBOR, the

exchange rate (EUR/HRK and CHF/HRK), the consumer price index and sale of NPLs in the non-financial corporations sector to NPL investors.

The described revised model was used to forecast the NPLR in chapter 7. Stress testing of credit institutions. Developments in the NPLR were also projected for 2020 to eliminate the impact of the moratoriums and the possibility of postponement of bad loans for that part of the portfolio that was considered orderly at the end of 2019, while the projections for the 2021-2023 period were differentiated and contain the baseline and adverse scenarios.

8 Macprudential policy implementation

In 2020 financial system stability was maintained without the need for recourse to extraordinary macroprudential measures, owing to the good capitalisation and liquidity of credit institutions before the outbreak of the pandemic, ample government support to the economy and monetary and supervisory measures. However, amid persisting uncertainty regarding the duration of the pandemic and its implications for the economy, to strengthen further credit institutions' resilience to possible losses, in January 2021, the CNB issued a decision temporarily restricting distributions of profits in credit institutions.

In mid-2020 the Republic of Croatia entered the European Exchange Rate Mechanism (ERM II) and the Croatian National Bank entered into close cooperation with the European Central Bank. The end of the year saw the finalisation of the adjustment of Croatian legislation for the purpose of implementing the provisions of the Capital Requirements Directive (CRD V) and the Capital Requirements Regulation (CRR II), a part of the new package of European legislation regulating bank operations. This resulted in an increased combined capital buffer requirement for some credit institutions.

Financial system stability in 2020 and in the first quarter of 2021 remained unthreatened despite the increase in systemic risk exposures caused by the negative impact of the COVID-19 pandemic on economic activity. This was largely due to the prompt monetary and supervisory measures taken by the CNB following the outbreak of the crisis and the banking sector's good capital and liquidity position owing to the reserves accumulated before the outbreak of the crisis (see chapter 6 Credit institutions). In such circumstances there was no need to change the existing macroprudential policy because of the outbreak of the crisis (Table 8.1).

Macprudential policy instruments

To preserve financial system stability once the regulatory reliefs and government support to the economy are no longer available, the CNB issued in January 2021 a [Decision on a temporary restriction of distributions](#) (OG 4/2021) restricting distributions in credit institutions until 31 December 2021, which includes dividend distributions, the creation of obligations to make dividend distributions, redemption of own shares, award of variable remuneration and other forms of distributions. Amid uncertainty regarding the further duration and intensity of the health crisis and its impact on the economy, the temporary restriction of distributions aims to strengthen the ability of credit institutions to absorb possible risks associated with credit risk materialisation, the impacts of which cannot be properly assessed with government support and favourable regulatory treatment still being provided. The CNB has committed to a review by 30 September 2021 at the latest if the grounds that prompted the adoption of this Decision still exist and it may, depending on that review and health and economic conditions lift the temporary restriction before its expiry. With the adoption of this Decision, the CNB has aligned itself with the Recommendation of the European Systemic Risk Board ([ESRB/2020/15](#)) of 15 December 2020 amending Recommendation ESRB/2020/7 on restriction of distributions during the COVID-19 pandemic.

Table 8.1 Macroprudential policy instruments in Croatia

Measure	Year of introduction	Prescribed rate
Macroprudential measures envisaged under the CRD and the CRR		
Capital conservation buffer	2014	2.50%
Systemic risk buffer	2014	1.5% (from 29 December 2020)
O-SII buffer	2015	0.5% or 2% (from 1 January 2021)
Countercyclical capital buffer	2015	0%
Risk weights for exposures secured by residential real estate	2014	Stricter definition of residential real estate for the use of the preferential weight
Risk weights for exposures secured by commercial real estate	2016	100%
Additional criteria for consumer creditworthiness assessment when granting consumer housing loans	2017	Taking into account the minimum costs of living in accordance with the Foreclosure Act
National macroprudential measures		
Recommendation to mitigate the interest rate and interest rate-induced credit risk	2017	
Recommendation on actions in granting non-housing consumer loans	2019	
Decision on a temporary restriction of distributions	2021	

Source: CNB.

Credit institutions in the RC are obligated to maintain capital buffers for systemic risks of a structural nature, which are primarily aimed at increasing their resilience to shocks caused by systemic risks materialisation, while the countercyclical capital buffer is 0% and as such is not maintained by credit institutions in the RC. The years of favourable macroeconomic developments prior to the outbreak of the crisis did not see any build-up of cyclical pressures or excessive credit growth that would require build-up of a countercyclical capital buffer intended for release once the financial cycle reverses. To ensure continuity in bank lending to the non-financial private sector, the countercyclical capital buffer in the period to mid-2022 will remain 0%.

In responding to the outbreak of the crisis associated with the COVID-19 pandemic, the CNB did not release capital buffers because the buffers maintained by credit institutions in the RC are by definition not intended for release at the time of crisis, but are associated with the level of structural systemic risks that tends to be additionally elevated during such times²⁵. Regular recalibration of O-SII buffers and systemic risk buffers was carried out towards the end of 2020 and took into account the changes in the regulatory framework.

²⁵ The purpose of capital buffers is to help credit institutions at the time of crisis to absorb losses without jeopardising lending flows. Credit institutions encroaching on the combined capital buffer are subject to restrictions on the distribution of profit.

As of 29 December 2020, the systemic risk buffer for credit institutions with a head office in the Republic of Croatia amounts to 1.5% of the total risk exposure amount. The review of the systemic risk buffer rate and the adoption of the new [Decision on the application of the structural systemic risk buffer](#) (OG 144/2020) are associated with the implementation of the new Capital Requirements Directive (CRD V) in Croatian legislation through the adoption of the Act on Amendments to the Credit Institutions Act (OG 146/2020), introducing additivity of the systemic risk buffer and the buffer for other systemically important credit institutions (O-SIIs) (see [Macroprudential diagnostics, No. 13](#) chapter 3.2). The two buffer rates (1.5% and 3%) previously prescribed for the structural systemic risk for two groups of credit institutions, depending on the type, scope and complexity of their operations, were replaced under the new decision by a single rate for all credit institutions. Since the systemic risk associated with the size and significance of credit institutions is now covered by an O-SII buffer, there is no longer need for a higher systemic risk buffer for bigger credit institutions, which also prevents double coverage of the same risks. The decision on the systemic risk buffer rate of 1.5% for all credit institutions is based on a regular analysis of structural elements of financial stability and systemic risk in the economy, described in previous chapters.

The regular review of the systemic importance of credit institutions conducted in the second half of 2020 identified seven O-SII credit institutions, for which the required capital buffer rates to be applied as of 1 January 2021 were prescribed (Table 8.2). The buffer rates were determined within the legally permitted range, which was raised as a result of the implementation of the provisions of the CRD V and now ranges between 0% and 3%, instead of the previous maximum of 2%. The rates were determined according to the results of the method of equal expected impact, taking into account the indicators of

Table 8.2 Other systemically important credit institutions

O-SII credit institutions	Buffer rate	
	determined for O-SII credit institutions as from 1 January 2021	that O-SII credit institutions are obligated to maintain as from 1 January 2021 ^a
Zagrebačka banka d.d.	2.0%	2.0%
Privredna banka Zagreb d.d.	2.0%	1.75%
Erste&Steiermärkische Bank d.d.	2.0%	2.0%
Raiffeisenbank Austria d.d.	2.0%	2.0%
OTP banka Hrvatska d.d.	2.0%	2.0%
Addiko Bank d.d.	0.5%	0.5%
Hrvatska poštanska banka d.d.	0.5%	0.5%

^a Capital buffers that O-SII credit institutions whose parent institution is an O-SII or a global systemically important institution (G-SII) in the EU are obligated to maintain depend on the buffer rate of the parent institution and they may not exceed the lower of the following two values: the parent institution rate increased by 1 percentage point and 3%. Source: CNB.

systemic importance, historical losses in the system and expert assessment in relation to other macroprudential instruments as a segment of a coordinated policy aimed at preserving financial stability. In view of the earlier mentioned changes in the legislative framework resulting from the implementation of the CRD V, this buffer came into effective use on 29 December 2020. The combined capital buffer requirement thus rose by 0.5 p.p. for O-SII credit institutions (i.e. by 0.25 p.p. for one O-SII credit institution due to the restriction imposed on the parent institution in the EU^a) and remained unchanged for other credit institutions.

Other macroprudential activities

Towards the end of 2020 the CNB started collecting granular data on consumer lending. Pursuant to the [Decision on collecting data on standards on lending to consumers](#) (OG 36/2020), starting with 30 September as the reporting date, credit institutions have begun reporting to the CNB individual data on newly-granted loans to consumers on a monthly level, and once a year they will also report on the stock of all loans to consumers. The collected data will be used as the basis for systemic risk monitoring and analysis in the segment of consumer lending, early identification of vulnerabilities and calibration of the measures needed to mitigate those risks (see Financial Stability, No. 22, Box 1 A new source of data on consumer lending standards), the implementation of which is based on precise legislative provisions enshrined in April 2020 amendments to the Credit Institutions Act.

In addition to pursuing its own macroprudential policy, the Croatian National Bank also acted in accordance with the recommendations of the ESRB. Since the outbreak of the COVID-19 pandemic, the ESRB has issued a number of recommendations, one of which is the Recommendation of the European Systemic Risk Board ([ESRB/2020/7](#)) on restriction of distributions during the COVID-19 pandemic later slightly amended by ESRB Recommendation [ESRB/2020/15](#). The ESRB has recommended relevant authorities to request financial institutions under their supervisory remit to refrain from making dividend distributions, buying back ordinary shares or creating obligations to pay variable remuneration which have the effect of reducing the quantity or quality of own funds at the EU group level and, where appropriate, at the sub-consolidated or individual level. By adopting the Decision on a temporary restriction of distributions, the CNB has achieved full compliance with the provisions of the ESRB recommendation ESRB/2020/15. Considering the high systemic importance of the biggest credit institutions in the RC that are parts of EU groups, the decision on the restriction of distributions that complies with the provisions of the ESRB recommendation ESRB/2020/7 was adopted on an individual level. However, since in the context of their parent groups in the EU these credit institutions are not particularly important in terms of their size or income, such a decision has no negative impact on the financial stability of other member states. Also important is the

[ESRB Recommendation \(2020/8\)](#) on monitoring the financial stability implications of debt moratoriums, and public guarantee schemes and other measures of a fiscal nature taken to protect the real economy in response to the COVID-19 pandemic. With regard to this Recommendation the CNB has collected data from the institutions responsible for the implementation of the measures of support to the economy (Ministry of Finance, Tax Administration, Croatian Employment Service, CBRD, HAMAG-BICRO and the banks, in cooperation with HANFA and non-banking financial institutions), using them to analyse financial stability implications of the measures of support and to report to the ESRB.

As concerns the reciprocation of macroprudential policy measures adopted by other EU member states in accordance with the ESRB recommendations, in early 2021 the CNB adopted two decisions repealing the reciprocation of the decision adopted by the relevant authority of another member state. As the original decisions ceased to be valid in their home countries and were removed from the list of decisions recommended for reciprocation by the ESRB, and while they were still reciprocated in the RC, none of the credit institutions in the RC exceeded the importance threshold that would make them obligated to apply them. These two decisions are the [Decision repealing the Decision on the reciprocity of the macroprudential policy measure adopted by the relevant authority of Estonia](#) (OG 28/2021) repealing the reciprocity in the application of a one percent systemic risk buffer rate to exposures in Estonia and the [Decision repealing the Decision on the reciprocity of the macroprudential policy measure adopted by the relevant authority of Finland](#) (OG 28/2021), repealing the application of a 15-percent floor for the average risk weight for exposures in Finland of credit institutions using the internal ratings-based approach for mortgage loans to the Finnish household sector secured by residential immovable property located in Finland.

Institutional and legislative changes in the area of macroprudential policy

On 1 July 2020, the Croatian National Bank entered the European Exchange Rate Mechanism and established close cooperation with the European Central Bank. The entry into the European Exchange Rate Mechanism (ERM II) followed the successful implementation by the Republic of Croatia of the measures it undertook to take under the July 2019 letter of intent, which include a further strengthening of banking system supervision, strengthening of the macroprudential policy implementation framework, strengthening of the anti-money laundering framework, improvement of the system for statistical data collection, processing and disclosure, improvement of public sector governance and reduction of the administrative and financial burden for the economy. At the same time, the Governing Council of the European Central Bank (ECB) adopted a decision on the establishment of close cooperation with the Croatian National Bank with the result that as of 1 October 2020 the ECB became responsible for the on-site supervision

of credit institutions identified as important in the Republic of Croatia and for joint procedures relating to all supervised entities. The establishment of close cooperation enabled participation by the Republic of Croatia in the banking union where decisions are adopted for the supervision on a consolidated level of groups of credit institutions operating in the EU, which contributes to the safety and stability of the banking system in the RC. Also, as of the date of entry into force of the ECB decision on close cooperation, the Republic of Croatia will also participate in the Single Resolution Mechanism (SRM). In the area of macroprudential policy implementation, following the establishment of close cooperation, the Croatian National Bank cooperates with the ECB in macroprudential policy formulation and implementation. Cooperation is conducted by way of early notifications of the intended measures based on harmonised European regulations, with the ECB having the authority to tighten a national measure if it estimates that it is not sufficiently stringent in the light of the risks it addresses.

The end of December of 2020 saw the entry into force of the [Act on Amendments to the Credit Institutions Act](#) (OG 146/2020, hereinafter: AACIA), transposing the provisions of the CRD V into Croatian legislation. To promote the transposition of Basel III standards, the regulation package in force consisting of the CRD IV (Directive 2013/36/EU on access to the activity of credit institutions and the prudential supervision of credit institutions and investment firms) and the CRR (Regulation (EU) No 575/2013 on prudential requirements for credit institutions and investment firms) has been replaced by a new package, consisting of the CRD V and the CRR II that entered into force on 27 June 2019. The provisions of the CRR II are to be applied directly, while the transposition of the provisions of the CRD V into national legislations should be completed by 28 December 2020, the condition which the Republic of Croatia met with the entry into force of the AACIA.

The biggest changes in the area of macroprudential instruments are those in the part that regulates systemic risk buffer, which, as explicitly prescribed now, may not be used to

address the risks covered by the countercyclical capital buffer or the capital buffer for other systemically important credit institutions. This prevents overlapping in the use of these capital buffers. However, it has been provided for that this capital buffer may be used by sectors in such a way that, in addition to the general rate, a specific rate may be applied to specific exposures.

As regards the O-SII buffer, a higher rate may now be used, with the maximum permitted rate of this buffer being raised from 2% to 3% of the total risk exposure amount. The restriction on the rate that may be applied to those credit institutions whose parent institution is an O-SII or a global systemically important institution (G-SII) in the EU has also been raised. Before the AACIA entered into force, an O-SII whose parent institution is an O-SII or a G-SII in the EU on a consolidated level had to maintain only the capital buffer rate determined for the parent institution, or 1% if that rate was below 1%. Under the new legislative framework, this restriction was raised to the lower of the following two values: the rate of the parent institution increased by 1 percentage point and 3%.

A significant change is that the O-SII buffer and the systemic risk buffer will be additive. Under this new arrangement, if a credit institution is subject to an O-SII buffer, such a buffer is added to the systemic risk buffer while previously these buffers were additive only in cases in which the systemic risk buffer was applied exclusively to domestic exposures (in other cases only the higher of the two buffer rates was used). Taking into account this innovation, as of 29 December 2020 all O-SII credit institutions with a head office in the Republic of Croatia have also maintained a systemic risk buffer in the amount of 1.5% of the total risk exposure amount, and the O-SII buffer.

As regards the countercyclical capital buffer, the change involves only the system of ESRB notification, which will under this new arrangement be notified only in the case of a change in this buffer instead of after each quarterly review, which was previously the practice.

List of figures and tables

Figure 1 Risk map	5	Figure 2.5 The fiscal deficit to GDP ratio is comparable to that found in EU countries with a similar share of tourism-related activities in GVA	16
Figure 1.1 The contraction of global economic activity caused by the pandemic was stronger than that in the 2009 crisis	8	Figure 2.6 Despite the worsening of fiscal indicators, yields on generic bonds remained stable	17
Figure 1.2 The intensity of the fall in economic activity in Europe in the previous year depended partly on the structure of individual economies	9	Figure 2.7 The government continued to finance itself on the domestic and international markets without difficulty	17
Figure 1.3 Restrictive epidemiological measures largely extended into the current year	9	Figure 2.8 The sovereign-bank-nexus continues to be strong	17
Figure 1.4 Uneven speed and scope of vaccination in different countries	9	Figure 3.1 The large unemployment inflow in spring 2020 was short-lived	19
Figure 1.5 Leading central banks will continue to pursue an expansionary monetary policy	10	Figure 3.2 Financial assets of household rose in 2020	19
Figure 1.6 Housing prices continued to grow	10	Figure 3.3 Deposits and pension fund shares spurred further growth in the financial assets of households	20
Figure 1.7 The peak of economic and political uncertainty and a temporary rise in capital market volatility were observed in the first half of last year	10	Figure 3.4 The demand for housing loans held steady in 2020 while consumer loans fell	20
Figure 1.8 The year 2020 was marked by weakening of the dollar against leading global currencies	10	Figure 3.5 The fall in general-purpose cash loans led to a considerable slowdown in total household lending in 2020	20
Figure 1.9 Financial markets also responded strongly to the pandemic, but they stabilised soon	11	Figure 3.6 The stock of loans to households rises, fuelled by housing lending	20
Figure 1.10 Growth in personal consumption, exports and investments should contribute to economic activity recovery this year	11	Figure 3.7 The contraction of economic activity in 2020 led to an increase in the household debt to GDP ratio	21
Figure 1.11 Economic confidence is still below the pre-pandemic level	12	Figure 3.8 The trend of growth in the share of new long-term household financing came to a halt in 2020	21
Figure 1.12 Domestic financial market volatility stabilised at the usual pre-crisis level	12	Figure 3.9 Renewed agreements grew in 2020	21
Figure 1.13 CROBEX and CROBIS values plummeted in 2020	12	Figure 3.10 Kuna loans account for over one half of the stock of household loans	21
Figure 1.14 Kuna liquidity of the domestic banking market continued to reach historical highs	12	Figure 3.11 Interest rates on newly-granted household loans continued to fall in 2020	21
Figure 1.15 External debt increase notwithstanding, the risks to the government's external position are moderate	12	Figure 3.12 The share of the stock of loans agreed at variable interest rates continued to fall in 2020	22
Figure 1.16 Public debt level around the world has risen considerably	13	Figure 3.13 Variable interest rates are mostly tied to the NRR	22
Figure 2.1 Measures to contain the impact of the COVID-19 pandemic on economic developments and contraction of economic activity led to a sharp increase in the fiscal deficit...	15	Figure 3.14 Household sector debt repayment burden held steady at moderate levels	22
Figure 2.2 ... and the public debt to GDP ratio in 2020	15	Figure 3.15 The increase in household vulnerability is suggested only by the increase in the debt to disposable income ratio	23
Figure 2.3 Of all the CEE countries, Croatia had the highest level and the fastest growth of the public debt to GDP ratio in 2020	16	Figure 3.16 COVID-19 pandemic has led to a moderate increase in systemic vulnerabilities of the household sector	23
Figure 2.4 The increase in fiscal imbalances in CEE countries is in line with the intensity of the fall in economic activity	16	Box 1	
		Figure 1 Distribution of the loan repayment to income ratio (LSTI)	24
		Figure 2 Distribution of the total debt service to income ratio (DSTI)	24
		Figure 3 Distribution of the principal of newly-granted housing loans according to the DSTI ratio classes	25

Figure 4 Distribution of the principal of newly-granted cash loans according to the DSTI ratio classes	25	Figure 5.1 Continuance of lower business activity due to the pandemic	36
Figure 5 Distribution of the LTC ratio of newly-granted housing loans	25	Figure 5.2 COVID score for enterprises that applied for support measures through FINA, by activities	36
Figure 6 Distribution of the LTV ratio of newly-granted housing loans	26	Figure 5.3 Loan and leasing payment deferrals (moratoriums), job preservation grants and tax exemptions account for around 90% of the amount of COVID-19 measures	37
Figure 7 Distribution of the principal of unsubsidised housing loans by the LTC ratio classes	26	Figure 5.4 Moratoriums predominate in requested and granted measures to support corporations	37
Figure 8 Distribution of the principal of subsidised housing loans according to the LTC ratio classes	26	Figure 5.5 Tourism activity predominates in requested and granted moratoriums and rescheduling of existing obligations	37
Figure 4.1 Growth in residential real estate prices slowed down in Zagreb and on the Adriatic coast and picked up in the rest of Croatia	27	Figure 5.6 More than HRK 5bn of moratoriums falls due in the last three quarters of 2021	37
Figure 4.2 Growth in real estate prices in Croatia above the European average	27	Figure 5.7 The number of firms that ceased operations and the number of newly established firms both decreased during the pandemic	38
Figure 4.3 Real estate prices above the level based on fundamentals	28	Figure 5.8 The pandemic has been characterised by a fall in credit demand and the tightening of credit standards	38
Figure 4.4 Number of transactions in residential real estate decreased moderately in 2020	28	Figure 5.9 New lending was weaker and mostly related to working capital financing	38
Figure 4.5 Number of approved applications for subsidised housing loans was much higher in 2020 than in the previous years	29	Figure 5.10 Moratoriums and other types of agreement renewal accounted for the bulk of lending activity	39
Figure 4.6 Introduction of two subsidy cycles per year equalised the intra-year dynamics of the number of transactions	29	Figure 5.11 Substantial fall in gross operating surplus exacerbated the vulnerability of the non-financial corporate sector	39
Figure 4.7 Residential real estate prices grew faster than construction costs	29	Figure 5.12 With the sharp GDP contraction and marginal debt growth in 2020, indebtedness of the corporate sector increased, breaking its years-long downward trend	39
Figure 4.8 After plummeting, business optimism in construction started to grow	29	Figure 5.13. Large share of total corporate debt in foreign currency held steady while interest rate risk edged up	40
Analytical annex		Figure 5.14 Interest rates on corporate loans in Croatia and in the euro area were stagnant for most of 2020	40
Figure 1 Office and logistics space availability	30	Box 3	
Figure 2 Assessment of annual purchase and sale transactions shows a larger demand in the retail space segment	30	Figure 1 Distribution of I4.0 potential across activity classes	41
Figure 4.9 Growth in housing loans continued into 2020	31	Figure 2 Structure of total liabilities according to financing sources	41
Figure 4.10 Interest rates on housing loans hit record lows	31	Figure 3 Distribution of proportions of firms across rating grades	42
Figure 4.11 Net wages grew slower than real estate prices, while the decrease in the loan-installment-to-disposable-income ratio was backed by low interest rates	31	Figure 4 Shares of loans classified in stages 1, 2 and 3 according to technological readiness	42
Figure 4.12 Consumer optimism and a marginal increase in unemployment gave a boost to real estate demand	31	Table 1 Classification of loans by stages of riskiness before and during the pandemic	42
Box 2		Figure 5 Share of new loans in total loans according to the degree of technological readiness	43
Table 1 Number, relative importance and rates of change in transactions	33	Table 2 New credit activity before and during the pandemic per unit of operating income	43
Figure 1 Structure of residential properties sold in the period from 2017 to 2020 purchased by non-residents and residents with housing loan subsidies, by counties	33	Table 3 Demand for measures to help the economy in manufacturing industry (C) per unit of operating income	43
Figure 2 Share of residential properties purchased by foreigners in 2019 and 2020	34	Box 4	
Figure 3 Number of APN housing loan subsidies per 1000 inhabitants	34	Figure 1 Contributions of change in aggregate labour productivity in the non-financial corporate sector in the	
Figure 4 Structure of buyers according to residence in all residential property transactions, by counties	35		

period from 2015 to 2019 (left) and the level of GVA per employee at the end of 2019 (right)	44	Figure 6.19 Capital adequacy increased during the crisis	52
Figure 2 Share and structure of weak firms in the number (left) and total income (right) of firms	45	Figure 6.20 Croatia is among the EU countries with the largest government exposures of credit institutions	53
Table 1 Structure of the number of weak firms, as percentage of total, 2019	45	Figure 6.21 Continued decrease in credit institutions' exposure to currency-induced credit risk	53
Figure 3 Share of zombie firms in the number and income of the sector, 2019	45	Box 5	
Figure 4 Use of support in 2020	46	Figure 1 Credit institutions' exposure to physical climate risks	55
Table 2 Model results for the performance of healthy firms	46	Figure 2 Credit institutions' exposure to transition climate risks	55
Figure 6.1 Strong annual growth in the assets of credit institutions was driven by expansionary monetary policy	47	Figure 3 Differences in exposure to transition risks across banks and time	55
Figure 6.2 Credit standards were tightened and demand decreased in 2020	47	Table 1 CO ₂ emissions and income of enterprises in the EPR	56
Figure 6.3 From the standpoint of credit institutions, housing loans and placements to the government became relatively more attractive	48	Figure 4 Intensity distribution of CO ₂ emission across enterprises grouped by activity	56
Figure 6.4 Changes in demand affected the structure of credit activity in 2020	48	Figure 5 Credit institutions' exposures to enterprises with CO ₂ emissions reported to EPR	56
Figure 6.5 Share of transaction deposits increased	48	Figure 7.1 Developments in real GDP under the baseline and adverse scenario	59
Figure 6.6 Continued decline in lending and deposit interest rates	49	Table 7. 1 Main features of the baseline and adverse macroeconomic scenario	59
Figure 6.7 Relatively mild deterioration in asset quality in 2020	49	Figure 7.2 Developments in total NPLR under the baseline and adverse scenario	60
Figure 6.8 Share of moratoriums in Croatia is above average	49	Figure 7.3 Share of total exposures of credit institutions to companies operating in activities most affected by COVID-19 and capital adequacy ratio	61
Figure 6.9 Most loans of credit institutions in 2020 went to non-financial corporations severely impacted by the crisis	49	Figure 7.4 Decomposition of the change in the capital ratio under the baseline and adverse scenario over a three-year period from 2020 to 2023	62
Figure 6.10 Coverage of loans was higher at the onset of the pandemic than at the beginning of the global financial crisis	50	Figure 7.5 Capital ratio under the baseline and adverse scenario and minimum legally prescribed capital requirements	62
Figure 6.11 Sale of claims dropped significantly in 2020	50	Box 6	
Figure 6.12 Credit institutions' exposure to the real estate sector on the rise	50	Figure 1 Results of the simulation of change in the NPLR in a sample from the second quarter of 2018 to the first quarter of 2020 and comparison with actual developments	65
Figure 6.13 Pressure on the profits of credit institutions continues into 2021	51	Table 1 Overview of explanatory variables and their groups included in the estimate of the NPLR models and implemented sign restrictions	66
Figure 6.14 Profitability was reduced due to the slump in operating income and growth in value adjustment charges	51	Table 2 Overview of the minimum and maximum coefficient range with explanatory variables of the ten best NPLR forecasting models for the household sector (housing and non-housing loans) and non-financial corporations	66
Figure 6.15 Decrease in interest income driven by the fall in interest rates and changes in the portfolio structure	51	Table 8.1 Macprudential policy instruments in Croatia	69
Figure 6.16 Decrease in interest rates reduced the profitability of credit institutions	52	Table 8.2 Other systemically important credit institutions	69
Figure 6.17 Fall in net income reduced the productivity of credit institutions	52		
Figure 6.18 High levels of liquidity and net stable funding	52		

Abbreviations and symbols

Abbreviations

bn	– billion
CAR	– capital adequacy ratio
CBS	– Central Bureau of Statistics
CCE	– Croatian Chamber of Economy
CDCC	– Central Depository & Clearing Company
CDS	– credit default swap
CEE	– Central and Eastern European
CES	– Croatian Employment Service
CICR	– currency-induced credit risk
CIHI	– Croatian Institute for Health Insurance
CIs	– credit institutions
CM	– Croatian Motorways
CNB	– Croatian National Bank
CPII	– Croatian Pension Insurance Institute
DAB	– State Agency for Deposit Insurance and Bank Resolution
EAD	– exposure at default
EBA	– European Banking Authority
EBITDA	– earnings before interest, taxes, depreciation and amortisation
EC	– European Commission
ECB	– European Central Bank
EFSS	– European Financial Stability Facility
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
ILO	– International Labour Organization

IMF	– International Monetary Fund
IR	– interest rate
LTIR	– long-term interest rates
m	– million
MoF	– Ministry of Finance
MRR	– marginal reserve requirements
NFC	– non-financial corporations
NPLR	– ratio of non-performing loans to total loans
OECD	– Organisation for Economic Co-operation and Development
OF	– own funds
ON USLIBOR	– overnight US dollar London Interbank Offered Rate
pp	– percentage points
RC	– Republic of Croatia
ROAA	– return on average assets
ROAE	– return on average equity
RR	– reserve requirements
RWA	– risk-weighted assets
SDR	– special drawing rights
SEE	– South-Eastern European
yoy	– year-on-year
ZIBOR	– Zagreb Interbank Offered Rate
ZSE	– Zagreb Stock Exchange

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
Ø	– average
a, b, c,...	– indicates a note beneath the table and figure
*	– corrected data
()	– incomplete or insufficiently verified data

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