

FINANCIAL STABILITY REVIEW 2023

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Abbreviations and symbols

p	Provisional
e	Estimated
.	Data unknown, not to be published or not meaningful
–	Nil

Discrepancies in the totals are due to rounding.

PROLOGUE: THE BUNDESBANK'S FINANCIAL STABILITY MANDATE

Under the Financial Stability Act (*Finanzstabilitätsgesetz*), the Bundesbank is mandated with monitoring the stability of the German financial system. It is tasked with identifying and assessing risks to financial stability. The Bundesbank understands financial stability as a state in which the financial system is able to fulfil its functions at all times. In its annual Financial Stability Review, the Bundesbank documents relevant developments as well as vulnerabilities in the German financial system and highlights risks to its stability.

The functional viability of the financial system is of vital importance for the real economy. The financial system is where credit is provided and savings are invested; it enables risks to be hedged and facilitates payments. Unforeseeable events, such as the outbreak of the COVID-19 pandemic, can jeopardise the stability of the financial system. The financial system should neither cause nor excessively amplify a downturn in overall economic activity. It therefore needs to be sufficiently resilient – in other words, able to absorb losses and, ultimately, reduce contagion or feedback effects.

The focus is on systemic risks that could jeopardise the stability of the financial system. For instance, if one or more market participants encounter distress, this can endanger the functioning of the entire system. This may be the case if a market participant is very large or closely interconnected with other market participants. Interconnectedness may be a channel through which adverse developments are transmitted to the financial system as a whole, impairing its stability. In addition, systemic risks can arise if a large number of market participants are exposed to similar risks or risks that are closely correlated with one another.

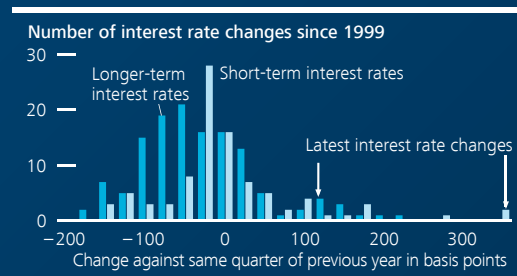
The Bundesbank also contributes its analytical findings to the work of the German Financial Stability Committee, which is the central body for macroprudential oversight in Germany. It provides the Committee with its assessment of the general risk situation. If the Bundesbank identifies systemic risks, it can make proposals to the Committee for warnings and recommendations to address these risks. Afterwards, the Bundesbank evaluates the implementation of these recommendations.

OVERVIEW

The German financial system has so far proven to be stable in the current macro-financial environment. However, the interest rate reversal and subdued economic developments continue to pose major challenges.

Changes in interest rates

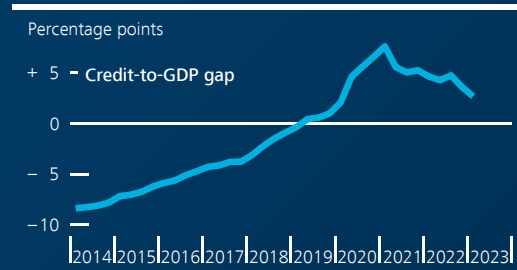
In an environment where inflation is high, the exceptionally sharp rise in interest rates marks a turning point for the financial system. The interest rate level is not expected to come down significantly in the short term.



See Chart 2.1.1

Credit-to-GDP gap

The dynamics of lending slowed significantly, also in relation to GDP. The financial cycle passed its peak and has since been in a downturn. Vulnerabilities continue to exist in the financial system.



See Chart 1.1

Asset prices

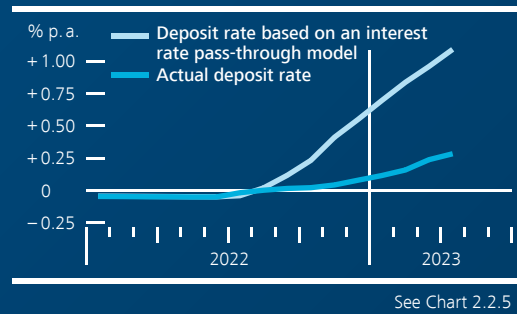
Real estate prices have fallen, but properties are still overvalued. Valuation levels in financial markets have risen. The risk of asset price corrections remains elevated.



See Chart 2.1.5

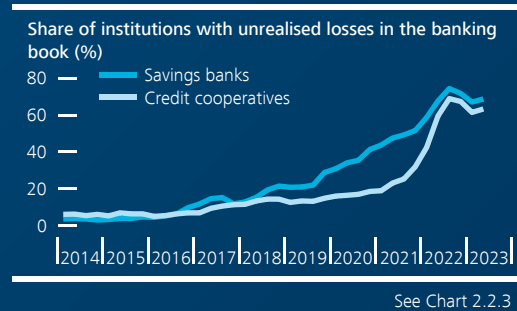
Interest on sight deposits

The transmission of the interest rate reversal to the German financial system and the real economy is not yet complete and could accelerate.



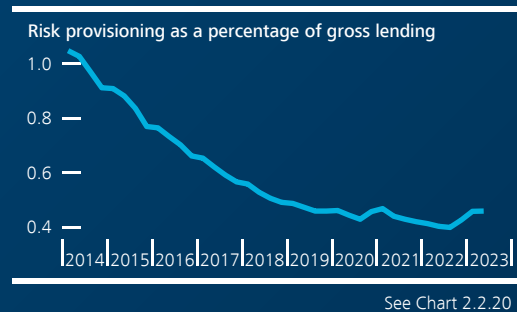
Unrealised losses in the banking book

For the majority of savings banks and credit cooperatives, the banking book shows a decrease in hidden reserves and an increase in unrealised losses.



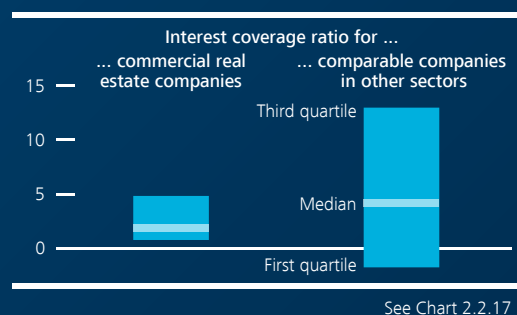
Loss provisions in lending business

The risk of losses in banks' credit portfolios is likely to rise further. After a long period of declining loss provisions, they have picked up of late.



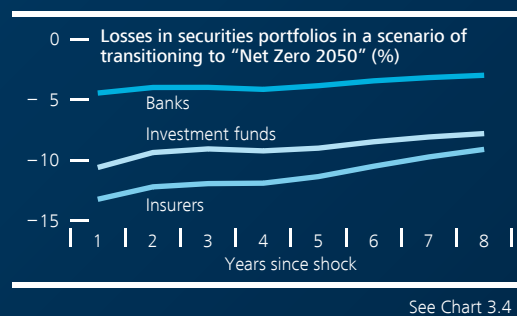
Interest coverage ratios for commercial real estate companies

The risks from developments in the commercial real estate markets have grown. As a result of low interest coverage ratios, real estate companies are vulnerable to rises in interest rates.



Vulnerability to climate-related transition risk

An orderly transition to a net-zero economy is likely to be manageable for the German financial system. Higher risks may result from an unexpected and abrupt rise in the carbon price.





The **resilience of the banking system** could be significantly diminished during periods of stress. The **package of macroprudential measures** is therefore **still appropriate**. Banks should also use their **profits to further strengthen** their **tier 1 capital**. Moreover, they should maintain and **step up their efforts** to increase their **resilience to operational risk**, such as cyber risk.

A **dependable climate action trajectory** can reduce the **risks** posed by the transition to a net-zero economy. **Disclosure requirements** are a key instrument for identifying **climate-related risks** in the financial system in a targeted manner.



It is essential to **further enhance the regulatory framework** on **liquidity risk management** for banks, insurers and funds. Amongst other things, this could help to reduce the risk of procyclical behaviour on the part of insurers during periods of stress.

To ensure the stability of the financial system, it is important to **continuously refine** not just the regulatory framework but also **supervision**, not least in light of the experience gained from the banking turmoil in the United States in the spring of 2023.



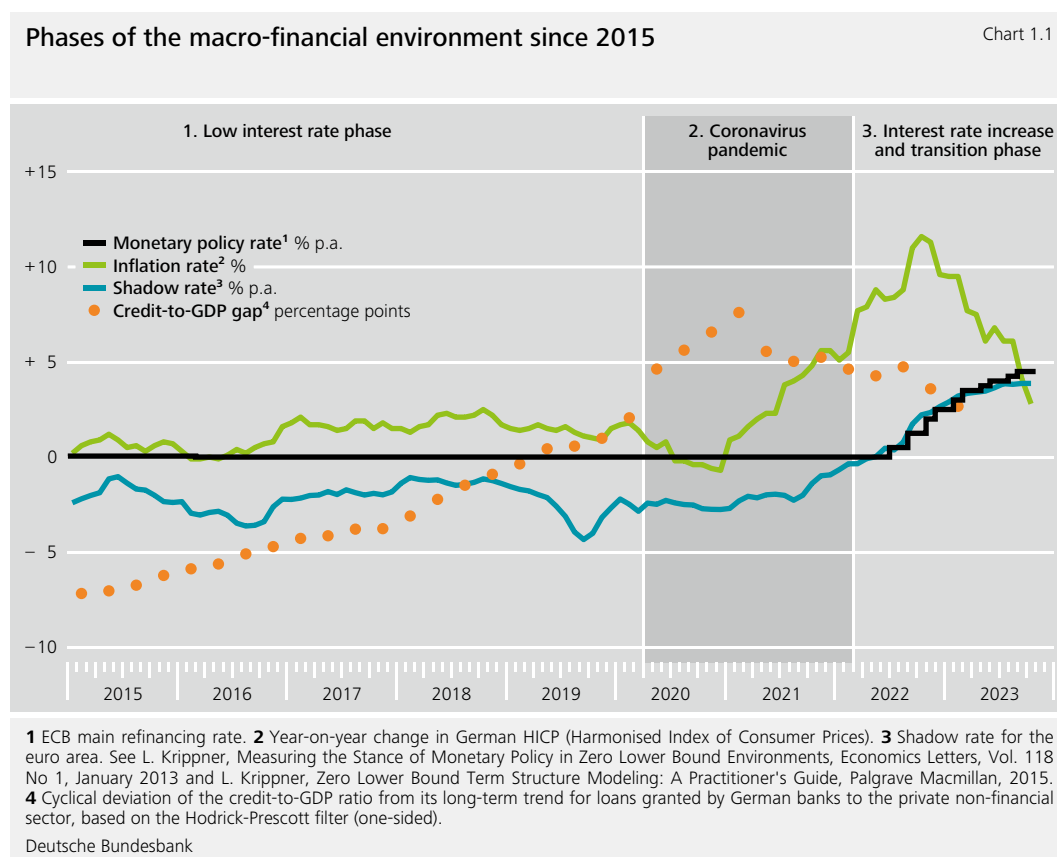
INTRODUCTION AND OVERVIEW

In recent years, the macroeconomic environment has changed fundamentally. With the coronavirus pandemic and Russia's attack on Ukraine, two unexpected and severe events hit the global economy, both with long-term repercussions. Last year, in response to the strong rise in inflation, the European Central Bank (ECB) raised key interest rates quickly and significantly. At the same time, the real economy and the financial system are undergoing a structural transformation, which also ushers in uncertainty about future macroeconomic developments. How does the strong rise in interest rates affect financial stability? What risks and vulnerabilities could this spell for financial stability going forward? In order to answer these questions, it is helpful to reflect on the developments that the German financial system has undergone in recent years and where it currently stands.

From a financial stability perspective, the period following the global financial and European sovereign debt crises can be divided into three phases for Germany: the low interest rate phase, the coronavirus pandemic, and the interest rate increase and transition phase. These three phases are delimited by the two turning points of recent years, namely the outbreak of the coronavirus pandemic in spring 2020 and Russia's invasion of Ukraine in February 2022 (see Chart 1.1).

Low interest rate phase: build-up of vulnerabilities in the financial system following the financial and sovereign debt crises

The global financial and European sovereign debt crises were followed by the longest upswing in the German economy since reunification. The previous trend of falling corporate insolvency rates and declining unemployment continued. At the same time, interest rates in the euro area were extremely low against the backdrop of weak inflation dynamics. With a very low key interest rate, asset purchases and other unconventional measures, monetary policy had an expansionary effect during this period. This was also reflected in a negative shadow rate (see Chart 1.1).¹ Financing costs and real interest rates were lower in the past decade than in the preceding 150 years.² In this environment of stable economic growth and low inflation, credit growth was high and credit default rates were exceptionally low. Asset prices rose significantly.³



¹ The shadow rate is a theoretical interest rate that would arise if there were no lower bound and conventional key interest rate cuts were to continue in the place of asset purchases; see Krippner (2013, 2015).

² See Grimm et al. (2023).

³ For example, real prices for residential real estate rose by more than 40% between 2015 and 2022.

As a result of these developments, vulnerabilities built up in the German financial system.⁴ Future risks may not have been priced in appropriately. Financing conditions were exceptionally favourable and risk premia were correspondingly low. Lending rose dynamically, while risk provisioning fell in view of low default rates. At the same time, overvaluations in the asset markets emerged, especially for residential real estate. According to Bundesbank estimates, real estate in towns and cities was overvalued by between 15% and 30% before the outbreak of the coronavirus pandemic.⁵ Lending standards for residential real estate loans have been continuously eased. Many banks expanded their maturity transformation to compensate for the effect of falling interest margins in the low interest rate environment. At the same time, firms and households increasingly sought loans with longer interest rate fixation periods and shortened the maturity of their deposits. This pushed up interest rate risk in the banking system as, when interest rates rise, the increase in banks' funding costs relative to interest income generally becomes stronger the longer the interest rate fixation of the outstanding loans. In addition, liquidity risks can arise if unexpectedly large volumes of deposits are withdrawn in response to interest rate increases. From the depositors' point of view, it makes sense to withdraw funds if they can be invested elsewhere at higher interest rates.

In view of this build-up of vulnerabilities, the Federal Financial Supervisory Authority (BaFin) decided in the summer of 2019 to raise the countercyclical capital buffer from 0 to 25 basis points.⁶ This was the first time the buffer was raised. The aim was to prevent the risk that, in the event of adverse developments, the supply of credit would be excessively curtailed. If that were the case, even creditworthy firms could run into financing difficulties.

Coronavirus pandemic: decoupling of macro and microeconomic developments

The coronavirus pandemic put an abrupt end to the period of stable growth and triggered one of the most severe economic slumps in Germany in recent decades. In 2020, gross domestic product (GDP) contracted by just under 2.8% globally and by as much as 3.8% in Germany. With revenue falling sharply and financing drying up, many firms quickly ran into liquidity problems.

⁴ See Deutsche Bundesbank (2017, 2018, 2019).

⁵ See Deutsche Bundesbank (2021a).

⁶ See German Financial Stability Committee (2019).

Extensive monetary and fiscal policy as well as micro and macroprudential measures were implemented to ensure that the banking system could continue to provide liquidity and that firms and households could meet their ongoing payment obligations.⁷ For instance, the ECB and BaFin used the flexibility of the regulatory framework to provide banks with temporary relief and to create scope for lending.⁸ At the same time, BaFin lowered its countercyclical capital buffer requirement from 25 to 0 basis points. In addition, German central and state governments provided firms and households with extensive support measures to prevent a sharp rise in insolvencies and unemployment.

The German financial system was thus largely spared losses. In fact, the support measures combined with the suspension of the obligation to file for insolvency caused the number of corporate and household insolvencies to actually fall. This indirectly prevented a sharp increase in the number of defaults on corporate loans and loans for house purchase. The measures to support the real economy thus protected the financial system from losses. There was no need for banks to use their capital buffers.

However, these developments may have made it more difficult to assess future macroeconomic risks. The support measures, for one, appear to have caused microeconomic risks to decouple from macroeconomic developments. This trend was already evident prior to the pandemic.⁹ Risk models calibrated on the basis of a period of stable economic development or low losses despite macroeconomic disruptions can only partially capture impending risks. If market participants were to assume on the basis of experience gained during the coronavirus pandemic that fiscal and monetary policy will continue to absorb a great deal of microeconomic risks in the future, there is a danger that they could potentially underestimate credit risk and overestimate their own resilience.¹⁰

Vulnerabilities initially continued to build up during the coronavirus pandemic. Prices for residential real estate went up faster and loans to households rose steeply.¹¹ Corporate lending remained high, with debt taken on particularly by those firms whose revenues were hit hard by the pandemic. As a result, overall lending expanded substantially and the credit-to-GDP gap widened (see Chart 1.1). Cyclical vulnerabilities in the financial system increased, i.e. the vulnerabilities to negative real economic developments. At the same time, inflation rose as a result of the resurgence in aggregate demand, pandemic-related

⁷ For example, in 2020, around one-third of all new lending in the European Union benefited from public support measures; see European Systemic Risk Board (2021). Analyses show that the complementary supervisory and monetary policy measures taken to support liquidity and lending were mutually reinforcing. See Altavilla et al. (2020).

⁸ In March 2020, the ECB and BaFin announced that banks would be allowed to use two supervisory buffers with no obligation to rapidly replenish them: the capital conservation buffer and the Pillar 2 guidance (P2G). The latter is determined on a bank-by-bank basis as part of the Supervisory Review and Evaluation Process (SREP).

⁹ See Deutsche Bundesbank (2021b).

¹⁰ See Deutsche Bundesbank (2021b).

¹¹ According to estimates, around the time of the coronavirus pandemic in 2020, prices for residential real estate in urban areas were between 15% and 30% above the level suggested by the demographic and economic fundamentals; see Deutsche Bundesbank (2021a).

supply chain problems and changes in consumption patterns – for example, through much higher demand for durable goods and constraints on consumption of contact-intensive services.

In order to preserve existing capital buffers in the banking system for bad times, at the beginning of 2022 BaFin announced a package of macroprudential measures.

The countercyclical capital buffer was raised by 75 basis points. In addition, BaFin activated the sectoral systemic risk buffer for housing loans in view of the specific risks stemming from loans secured by residential real estate. At the same time, supervisors called on lenders such as banks and insurers to avoid taking excessive risks. This package of measures has strengthened the resilience of the system by successfully preserving excess capital (see the box entitled “Impact of the package of macroprudential measures on the resilience of German banks” on pp. 73 ff.). There were neither undesirable side effects, such as excessive restrictions on the supply of credit, nor did the measures trigger a sharp increase in financing costs.¹²

Interest rate increase and transition phase: high inflation and end of low interest rates partly expose vulnerabilities

The year 2022 marked another turning point for both the global and the German financial system. Russia’s war of aggression against Ukraine pushed up the prices of energy and agricultural commodities. After consumer prices had already experienced a marked rise in 2021, inflation again picked up significantly over the course of 2022 and has remained above the Eurosystem’s medium-term target level of 2% in 2023 as well. The recovery in the German economy distinctly lost momentum, not least due to rising energy prices. Scope for economic growth remained tight over the course of 2023. The financial system continued to benefit indirectly from fiscal measures to mitigate the impact of increased energy prices.

In response to persistently high inflation, interest rates increased significantly. Over the course of 2022 alone, the yield on ten-year German government bonds rose by more than 250 basis points – an increase that would have previously been classified as a stress scenario. This makes it the strongest rise in interest rates in 25 years. In addition to further

¹² See, inter alia, Deutsche Bundesbank (2022). These empirical observations are consistent with the theoretical implications of such measures. In a macroeconomic environment in which banks can generate profits, higher capital requirements have little impact on the dynamics of lending; see Lang and Menno (2023).

key interest rate hikes in 2023, the ECB also embarked on a monetary policy course of quantitative tightening, a trend that had already started in 2021. Although the previous tightening of monetary policy has now been fully passed through to interest rates on money and capital markets, transmission to the German financial system and the real economy is not yet complete (see the section entitled “Risks arising from interest rate developments” on pp. 35 ff.).

The stress episode in the US banking sector in the spring of 2023 illustrates the importance of interest rate risk. In March, Silicon Valley Bank failed due to severe and specific deficits in the management of its interest rate and liquidity risks. Other US regional banks with similar business models and major Swiss bank Credit Suisse were quickly caught up in the turmoil. These contagion effects show how quickly a loss of confidence can prompt an outflow of liquid funds when the macro-financial environment is tense (see the box entitled “The failure of the United States’ Silicon Valley Bank” on pp. 27 f.). Although individual German banks temporarily experienced share price losses, contagion effects in the German financial system remained manageable.

The German economy is currently in a transition phase, not only in light of the rise in interest rates. The transition to a low-carbon economy, as stipulated under climate action guidelines, is likely to accelerate further as a result of the sharp rise in energy prices. In addition, structural change is being shaped by demographic change and the comprehensive digitalisation of all areas of life. Greater economic and financial fragmentation induced by geopolitical tensions will require further structural adjustments to the economy. This could potentially have a significant impact on trade flows, cross-border allocation of capital, asset prices and the international payment system.¹³

Both the real economy and the financial system will have to face the challenges of structural change. Structural change gives rise to adjustment costs and goes hand in hand with high uncertainty. In this environment, there is a risk that firms will delay investment decisions and households will increase their precautionary savings. Disorderly adjustment processes can lead to economic dislocation. Economic policy measures should therefore improve the conditions for supporting structural change in order to reduce uncertainty.

¹³ See Deutsche Bundesbank (2023) and International Monetary Fund (2023).

Implications of the macro-financial environment for financial stability

The interest rate reversal is having an impact on financial intermediaries – both directly as well as indirectly through their interconnectedness with the household and corporate sectors. A higher interest rate level directly implies market value losses in financial intermediaries' interest-bearing investments. At the same time, rising refinancing costs cause banks' net interest income to fall in the short term if higher refinancing costs cannot be offset by an increase in interest income. On the one hand, higher lending rates, in isolation, can support banks' earnings. On the other hand, however, they can also weaken demand for credit and thus diminish banks' earnings potential. In addition, higher interest rates may squeeze borrowers and can lead to credit defaults and write-downs in the financial system. In the long term, however, most banks are likely to benefit from higher interest rates, as the empirical correlation between interest rates and net interest margins is positive.¹⁴

The abrupt rise in interest rates led to direct valuation losses on interest-bearing securities in the German financial system. In the banking sector, resulting balance sheet losses were mitigated by reducing hidden reserves. However, these reserves were ultimately used up and unrealised losses were created. For savings banks and credit cooperatives, the net reduction of hidden reserves and build-up of unrealised losses amounted to 14.2% of common equity tier 1 (CET1) capital in the fourth quarter of 2022. Large, systemically important institutions reported unrealised losses totalling 5.9% of their CET1 capital. Since the first half of 2023, there has been a partial recovery effect for securities. The higher interest rates also drove down the market or present value of other interest-bearing assets and liabilities. Typically, market value losses do not have to be fully recognised on the balance sheet. However, had banks been under the obligation to report valuation losses in full, their tier 1 capital would have been significantly lower. German life insurers, too, have built up considerable amounts of unrealised losses. This could limit their scope to invest countercyclically on a larger scale (see the section entitled "Risks arising from interest rate developments" on pp. 35 ff.).

German banks are recording high net interest income as they have not yet passed on the higher interest rates in full to their depositors. Despite the rise in interest rates, German banks' interest expenditure went up only marginally overall. If banks had passed on the higher interest rates in full, their interest expenditure would be an estimated €29 billion higher in 2023, thus reducing net interest income by around 32%. However, the

¹⁴ See Busch and Memmel (2017).

longer interest rates remain higher, the sooner they are likely to be passed on. Households and firms have already begun to shift funds from low-interest sight deposits to higher-interest time deposits and other forms of interest-bearing investment. Though more expensive for banks, time deposits may be a more stable source of funding than sight deposits.

In general, retail deposits are considered to be a stable form of funding for banks.

Owing to their market power, banks do not pass on all changes in short-term interest rates to their retail customers. The economic value associated with this interest rate advantage is also referred to as the deposit franchise value.¹⁵ As retail deposits are relatively insensitive to changes in short-term interest rates, they are more akin to long-term liabilities. They therefore enable banks to partially hedge interest rate risk on the assets side of their balance sheets: as interest rates rise, the value of interest-bearing assets and that of deposits falls simultaneously. However, deposit business is only profitable if deposits remain in the bank. The digitalisation of financial services could increasingly affect banks' funding structures and thus the deposit franchise value.

In the short term, the increase in net interest income is limited by the high level of low-interest loans with long interest rate fixation periods and considerably weaker demand for credit.

For example, new lending to firms has fallen significantly since the autumn of 2022, not least given the weak economic situation. Similarly, new housing loans granted to households have decreased considerably. In the first half of 2023, lending to households for house purchase was down by half compared with the previous year. Net interest income is up in 2023 but could ultimately fall again significantly next year.

When net interest income falls, banks may take more risks in order to increase their returns.

For example, they could demand lower interest rate spreads on loans. Since the beginning of 2022, interest rate spreads on new loans have actually declined, while default risks have remained unchanged. This could be an indication of increased risk-taking.

The challenging macro-financial environment has recently increased credit risk for banks.

For example, loan loss allowances have risen significantly in some cases, but risk provisioning and risk weights have remained at a low level (see the section entitled "Risks from the household and corporate sectors" on pp. 49 ff.).

The higher interest burden on firms increases their solvency risk and thus also the credit risk emanating from firms.

Higher market interest rates may imply a faster and sharper increase in interest expenditure on corporate loans, which generally have shorter interest rate fixation periods, than, for example, on loans to households for house pur-

¹⁵ See Drechsler et al. (2021).

chase. Firms' interest payments are therefore likely to continue to increase. Rising financing costs should be manageable for the vast majority of firms. However, some could run into difficulties, especially those with both higher debt and lower earnings. In the first half of 2023, the number of corporate insolvencies increased by an average of 20% on the year. However, they still remain at a low level. Structural change can also give rise to mounting credit risk in the corporate sector.

Rising interest rates also increase the credit risk emanating from households. Despite the challenging macro-financial environment, debt sustainability in the household sector remained robust overall, partly on account of the persistently favourable labour market situation and strong nominal wage growth. Not least, the long interest rate fixation periods of existing housing loans are currently shielding households from higher interest payments. Loans that were granted at relatively low interest rates, for instance, are mostly not due for refinancing until 2028. However, a small proportion of indebted households could experience a deterioration in debt sustainability, for example, if they opted for short interest rate fixation periods and low repayment rates when they first took out their loans. In light of increased financing costs and a weak economic situation, it remains important to closely monitor the development of credit risk from both households and firms.

Overall, the German financial system has so far coped well with the rise in interest rates. German banks currently have comparatively high capital buffers; excess capital above the regulatory minimum requirements corresponds to around 4.7% of risk-weighted assets, or 1.7% of total assets. The package of macroprudential measures announced by BaFin at the beginning of 2022 has preserved capital amounting to 0.7% of risk-weighted assets, or 0.2% of total assets (see the section entitled "Resilience of the German financial system" on pp. 70 ff.).

However, the financial system could come under pressure in the event of adverse developments. Future supply shocks, for instance from escalating geopolitical tensions, could lead to a marked downturn in the economy involving rising inflation and higher interest rates as well as an abrupt decline in asset prices. Given the vulnerabilities that built up in the German financial system in the years before the interest rate reversal, losses in the financial system may then rise sharply.

Resilience of the financial system should be strengthened further

Sufficient resilience in the financial sector is needed to deal with the risks arising from heightened uncertainty and structural change. The financial system should have adequate levels of capital and liquidity, even during periods of stress, and guard itself against cyber and political risks. All relevant stakeholders should adopt a preventive approach to addressing the heightened uncertainty by preparing themselves for various scenarios.

Financial institutions must first and foremost ensure that they are sufficiently resilient. They must have adequate capital and liquidity in order to be able to absorb shocks on their own, even in adverse scenarios. Given the current favourable earnings situation, banks have the opportunity to strengthen their tier 1 capital and thus their resilience. Profits should therefore be distributed only moderately and with an eye to future burdens.

The management of operational risk is also crucial for the resilience of banks. The risk of operational disruptions caused by cyberattacks has increased in view of the geopolitical environment. If banks use outdated IT systems and security standards, they become vulnerable to cyber risk. Investing in a resilient IT infrastructure and protecting against cyber risk should therefore be a priority.

Investment funds can strengthen their resilience by making increased use of the available liquidity management tools. To this end, price-based liquidity management instruments should be incorporated into investment terms and conditions more widely. Procyclical behaviour on the part of investment funds can amplify price shocks during periods of stress. If funds do not have sufficient liquidity with which to service fund share redemptions, they are forced to sell assets. Liquidity management tools can be used to limit redemptions of fund shares during periods of stress, thus reducing risks to financial stability.

Supervision and regulation provide a clear framework for financial institutions' resilience and risk management. The nexus between weak risk management and negative macroeconomic developments can foster crises, as demonstrated by the banking turmoil in spring 2023. Strong, proactive supervision that can respond quickly to undesirable developments protects the financial system. The package of macroprudential measures announced in 2022 thus aims to strengthen the resilience of the German banking system and to limit banks' procyclical behaviour. Given existing vulnerabilities, the macroprudential buffers should be retained in full. While the financial cycle has weakened, ele-

vated risks have not materialised thus far. If, in periods of stress, large losses in the banking system threaten to cause a credit crunch, i.e. excessively restrict the supply of credit, the supervisory authorities could release the countercyclical capital buffer.

At the same time, supervision and regulation should continually evolve in order to ensure the stability of the financial system. Specific provisions on liquidity risk management should be introduced for insurers, for example. This can reduce the risk of procyclical investment behaviour during periods of stress. As part of the current review of SolvencyII, the European Commission envisages corresponding improvements such as mandatory internal liquidity stress tests.

The supervisory toolkit in Germany should also be expanded to include internationally standard instruments in the area of residential real estate financing which it still lacks. Although BaFin can set minimum requirements for the equity which households have to provide when buying a property and amortisation requirements for residential real estate loans, it is not yet authorised to impose caps for income-based lending standards such as the debt-service-to-income ratio or the debt-to-income ratio of new borrowers that are commonplace in other countries. Both ratios are important indicators for assessing borrowers' default risk. The new data collection on lending standards for housing loans will provide the reference dataset needed to assess risks from new lending (see the section entitled "Overall assessment and implications for macroprudential policy" on pp. 81 ff.). The current assessment of the risk situation does not call for borrower-based instruments to be used at present.

In view of structural changes and the associated risks, a resilient financial system is crucial. A stable financial system ensures that enterprises and firms are supplied with adequate financial resources. Models calibrated on the basis of historical data can, by their nature, only partially capture future developments and structural changes. Financial institutions' risk management should therefore address existing uncertainties and keep pace with structural change.

An important aspect of structural change is the ecological transformation. This may entail risks for the financial sector if, for example, exposures to carbon-intensive sectors lose value. Whilst updated analyses reveal that potential risks from orderly long-term structural change towards a net-zero economy are somewhat higher than presented in the 2021 Financial Stability Review, these potential risks are probably still well manageable. Concerns about losses in the financial sector therefore should not stand in the way of good climate policy. An orderly ecological transformation, a predictable energy transition and transparency about its consequences would instead spare the financial system larger losses going forward. In order to identify and respond to climate-related risks in the finan-

cial system in a targeted manner, disclosure requirements for non-financial corporations and financial intermediaries are thus a key instrument.

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STABILITY SITUATION IN THE GERMAN FINANCIAL SYSTEM

MACRO-FINANCIAL ENVIRONMENT

Exceptionally strong rise in interest rates

The strongest rise in interest rates in 25 years is shaping the current phase of the macro-financial environment and marks a turning point for the financial system.

Faced with persistently high inflation, the European Central Bank (ECB), like other central banks, continued its restrictive monetary policy in 2023.¹ As a result, interest rates in the euro area's money and capital markets have continued to rise exceptionally strongly.² In the third quarter of 2023, interest rate differentials compared with the same quarter a year earlier climbed to relatively high figures as compared to the last 25 years (see Chart 2.1.1). Increases of this magnitude used to be a component of stress test scenarios.³ Real interest rates over longer maturities have also continued to rise in Germany and the euro area since the autumn of 2022 and are now in positive territory. In March 2023, the ECB began to reduce its balance sheet and continued the exit from non-standard monetary policy measures. This balance sheet run-off on the part of the Eurosystem has so far reduced liquidity in government and corporate bond markets only marginally.

As inflation is still high, market participants do not expect interest rates to come down significantly in the short term.⁴ In the euro area, inflation probably peaked in October 2022, but remained at a significantly elevated level. Inflation expectations derived

¹ After initiating interest rate hikes in July 2022, the ECB raised the main refinancing rate by 4.5 percentage points in ten increments up to September 2023.

² The three-month EURIBOR has risen by more than 4 percentage points since mid-2022. Long-term interest rates, such as yields on ten-year German government bonds, had already started to rise at the end of 2021 and climbed by more than 2.5 percentage points during 2022. Over the course of 2023, yields on these bonds continued to rise, albeit less noticeably than in 2022.

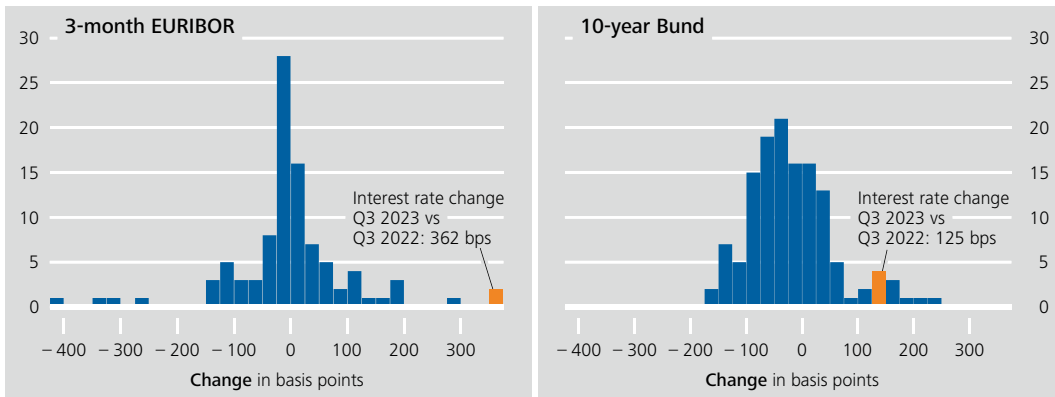
³ A 200 basis point interest rate increase is assumed when calculating the Basel interest rate coefficient. The Bundesbank and Federal Financial Supervisory Authority (BaFin) stress test for small and medium-sized banks and savings banks in Germany (Less significant institutions stress test, or LSI stress test) also looks at scenarios in which interest rates rise by up to 200 basis points. For the EU-wide banking sector stress test conducted by the European Banking Authority (EBA) and the ECB, an even greater deviation from the baseline scenario is assumed in some cases.

⁴ Data on forward transactions show that market participants are not pricing in any further interest rate increase for 2023 and are pricing in first declines in interest rates from the second half of 2024 onwards.

Distribution of year-on-year interest rate changes

Chart 2.1.1

Number of changes, based on quarterly averages (Q4 1999 to Q3 2023)



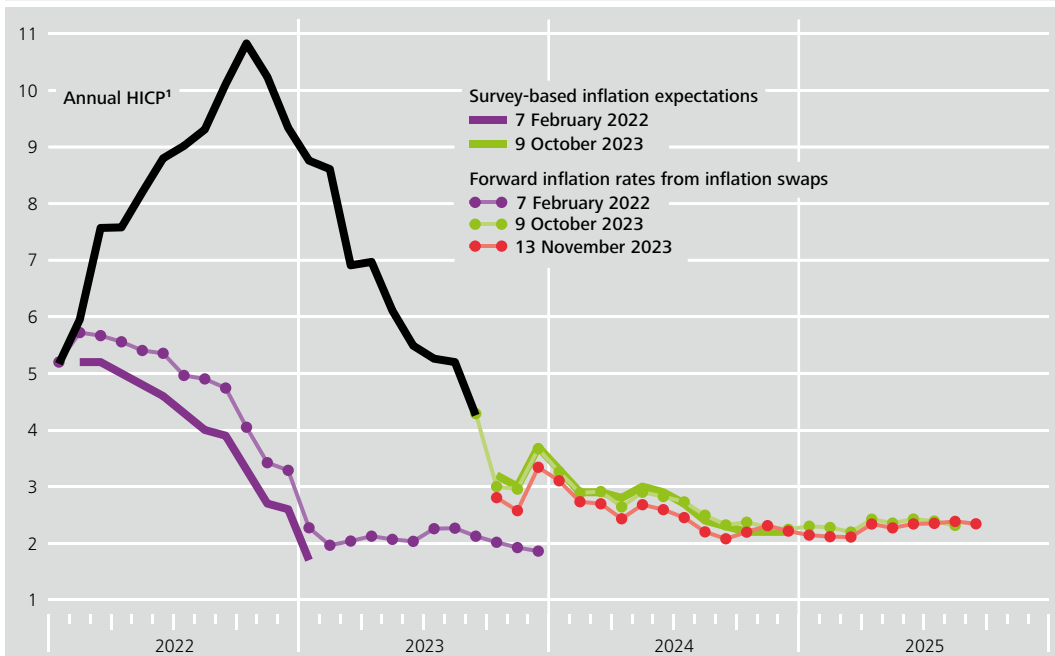
Deutsche Bundesbank

from surveys and market prices show that euro area inflation is likely to remain noticeably above the inflation target of 2% next year, which is in line with the ECB projection published in September 2023 (see Chart 2.1.2). For Germany, the Bundesbank, based on its June projection, expects inflation rates of 3.1% and 2.7% for 2024 and 2025 respectively, figures that are likewise above the euro area's inflation target.⁵ In addition, core inflation,

Harmonised Index of Consumer Prices (HICP) and inflation expectations for the euro area

Chart 2.1.2

Year-on-year percentage change



Sources: Fenics Market Data, Consensus Economics, Eurostat and Bundesbank calculations. ¹ HICP excluding tobacco.

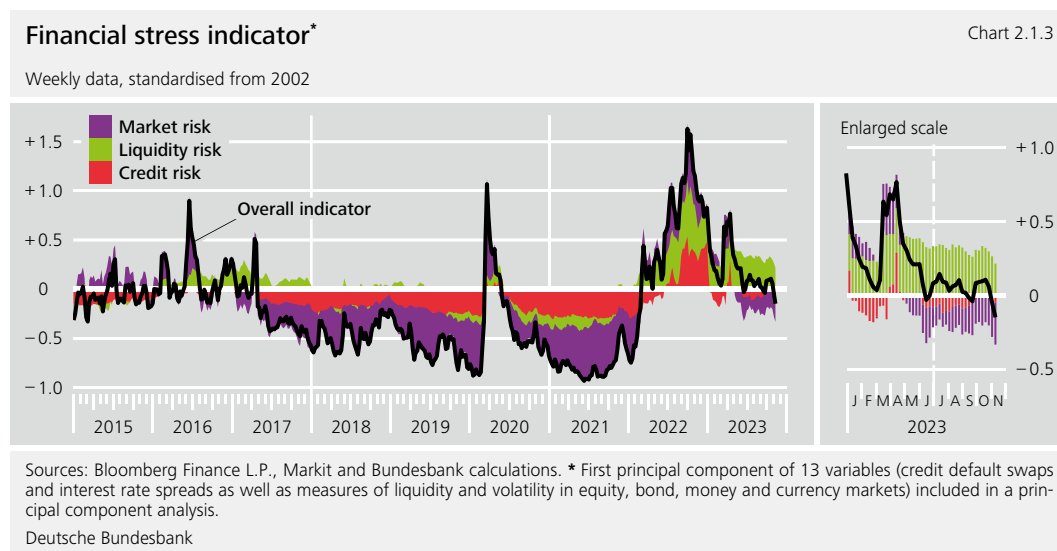
Deutsche Bundesbank

⁵ See Deutsche Bundesbank (2023a).

which excludes changes in energy and food prices, stubbornly remains at an elevated level in both Germany and the euro area.⁶ Since the pandemic, inflation expectations have often fallen short of realised inflation (see Chart 2.1.2). Overall, there is a possibility that inflation and thus the interest rate level will prove significantly more persistent than anticipated by market participants so far.

Rise in interest rates led to stress in the international financial system

The rise in interest rates resulted in heightened stress in financial markets in March 2023, though the German financial system proved stable. Financial market volatility increased when several regional banks in the United States failed (see also the box entitled “The failure of the United States’ Silicon Valley Bank” on pp. 27 f.) and major Swiss bank Credit Suisse was taken over. The Bundesbank’s financial stress indicator for Germany briefly spiked sharply higher (see Chart 2.1.3). Although individual German banks temporarily experienced marked share price losses, there were no further contagion effects. One reason was that German banks’ liquidity position was better and their interest rate risk lower than that of the US banks that failed. In addition, government measures to stabilise the financial systems of the United States and Switzerland have helped to reduce contagion risks for other countries. These include, for example, measures in the United States to protect bank depositors and support the continued flow of credit to households and

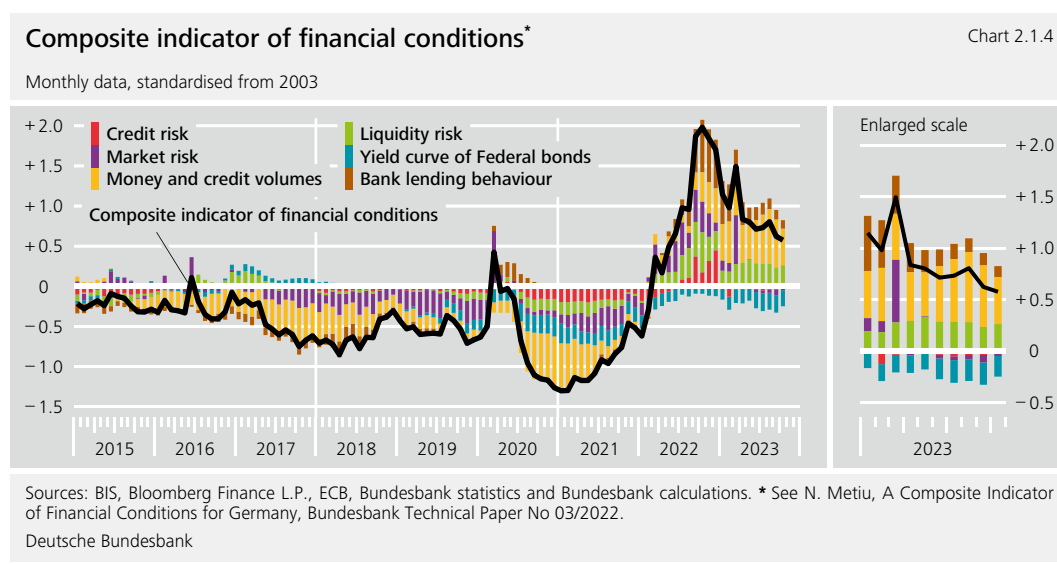


⁶ In October 2023, preliminary estimates by Eurostat put core inflation (Harmonised Index of Consumer Prices excluding food and energy) at 4.2% for both Germany and the euro area. As measured by the general Harmonised Index of Consumer Prices, the headline inflation rate was 3% for Germany and 2.9% for the euro area in October 2023, according to preliminary estimates.

businesses.⁷ Nevertheless, the turmoil experienced in the spring of 2023 illustrates how the changed global macro-financial environment can impact financial stability given existing vulnerabilities. International interconnectedness means that serious contagion effects may occur, both via balance sheet links between the German financial system and foreign countries and via other contagion channels, such as a loss of confidence.

Subdued economic activity in Germany

As in 2022, economic activity in Germany remained subdued during 2023. According to its June projection, the Bundesbank expects an overall decline in Germany's GDP of 0.3% in 2023 after price and calendar adjustment.⁸ Although supply bottlenecks have eased and gas shortages appear unlikely in the coming winter, weak global economic developments in the course of 2023 provided only limited stimulus for economic growth in Germany. In addition, high interest rates and tighter financing conditions are weighing on private investment.⁹ This tightening is reflected in the increase in the Bundesbank's composite indicator of financial conditions, which has, since last year, been significantly elevated compared with before the COVID-19 pandemic (see Chart 2.1.4).¹⁰ Uncertainty about future economic conditions in view of structural economic change could currently also be weighing on investment. Despite the subdued economic situation, the labour market was robust. This reflects, not least, the shortage of skilled labour.¹¹ With GDP



⁷ See Board of Governors of the Federal Reserve System (2023a).

⁸ See Deutsche Bundesbank (2023a). According to Consensus Economics surveys, market participants also expect Germany's economic output to decline in 2023. The ifo Business Climate Index likewise returned to roughly its level of autumn 2022 following an increase at the beginning of the year.

⁹ See Deutsche Bundesbank (2023b).

¹⁰ In addition to financial market indicators, the indicator also contains information on developments in money, credit volumes and bank lending behaviour; see Metiu (2022).

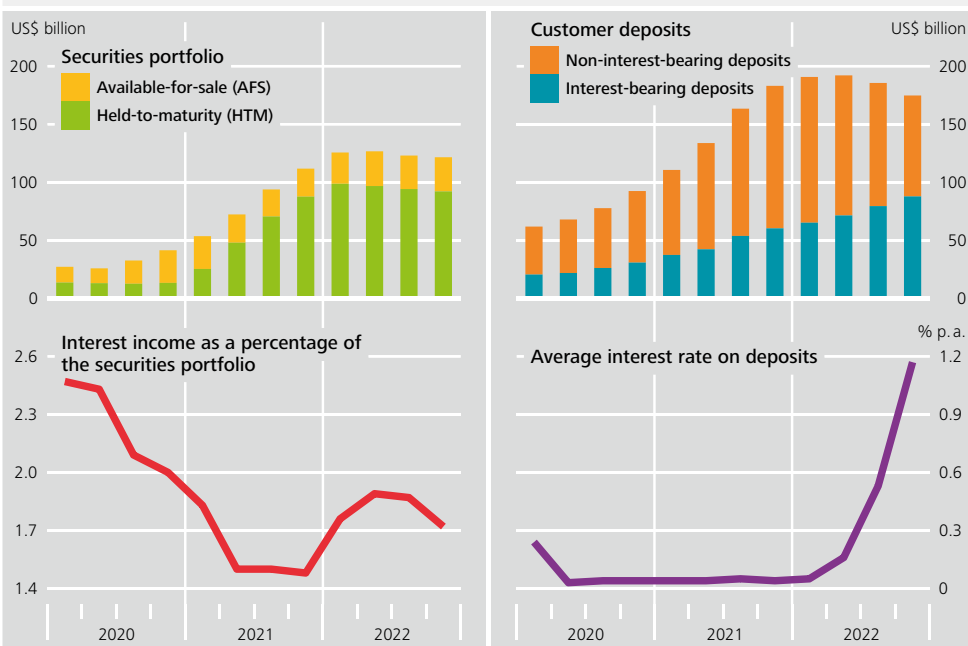
¹¹ See Deutsche Bundesbank (2023a).

The failure of the United States' Silicon Valley Bank

In March 2023, California-based Silicon Valley Bank (SVB) ran into difficulties. The institution was a subsidiary of SVB Financial Group and held almost all of the latter's assets.

SVB's deposits were heavily concentrated in certain sectors. Thus, at the end of 2022, more than half of deposits came from technology sector enterprises.¹ The bank had mainly invested strong inflows into deposits in long-dated bonds (see the chart).² These investments lost considerable value when interest rates were raised in 2022. At the same time, SVB customers began to shift their deposits from non-interest-bearing into interest-bearing deposits. This increased interest costs for the bank.

Selected metrics for SVB Financial Group



Source: SVB Financial Group's quarterly reports.
Deutsche Bundesbank

¹ See Board of Governors of the Federal Reserve System (2023b).
² See Barr (2023).

Furthermore, customers increasingly withdrew deposits from mid-2022. In order to accommodate these withdrawals, the bank sold most of its available-for-sale portfolio at the beginning of March 2023. According to the applicable accounting standards in the United States, this portfolio is recorded at fair value and thus at market value for bonds. SVB therefore had to deduct the accumulated losses in value from balance sheet equity (but did not have to record them in the profit and loss account). However, discretionary rights enshrined in US banking regulation for relatively small institutions meant that SVB was not obliged to include the losses in value in regulatory capital until the sale. At the beginning of March, SVB announced the sale of bonds in its available-for-sale portfolio with accumulated losses of around US\$1.8 billion after tax.³ This meant the bank also had to deduct these losses from regulatory capital.⁴ A planned capital increase never took place because it had become apparent that SVB's business model was not sustainable in the medium term in an environment of higher interest rates.

After it became clear that SVB's business model was unsustainable, a bank run commenced. Depositors withdrew their predominantly uninsured deposits on a large scale. The situation was exacerbated by the highly concentrated customer base and rapid communication via digital channels. On 10 March 2023, the US Federal Deposit Insurance Corporation (FDIC) closed SVB. As a consequence, other US regional banks with similar business models or balance sheet items came under pressure. Only after JPMorgan Chase Bank acquired a substantial part of First Republic Bank on 1 May 2023 did the situation calm down. Overall, it is evident that the insufficient management of interest rate and liquidity risk was the underlying cause of SVB's failure.⁵ This management had not kept up with the bank's rapid growth.

³ See Silicon Valley Bank Financial Group (2023).

⁴ See Wilkes (2023).

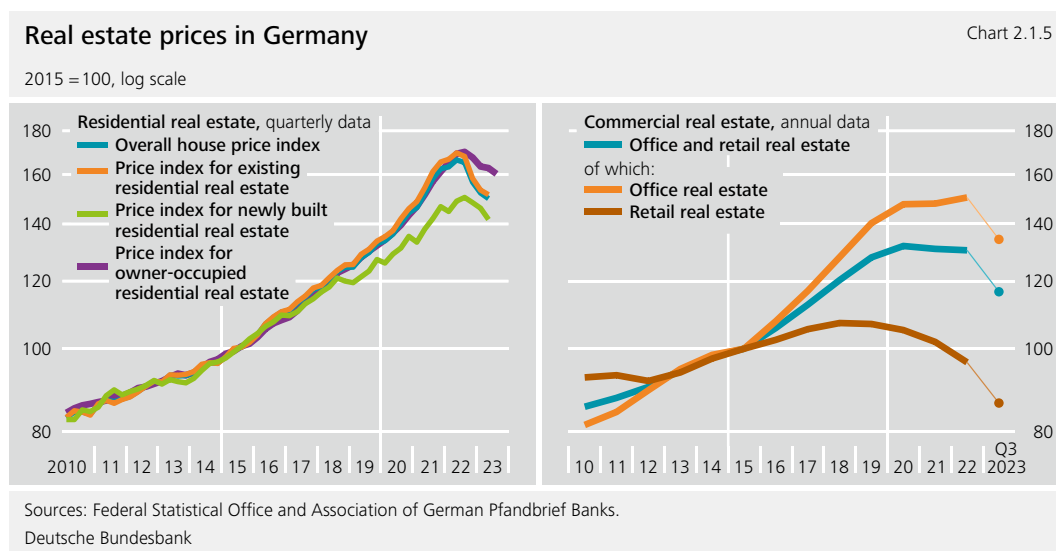
⁵ See Board of Governors of the Federal Reserve System (2023b).

growth forecast at 1.2%, the growth outlook for 2024 also remains subdued according to the Bundesbank's June projection.¹²

Financial cycle in a continued downturn

Credit volume and asset prices – two indicators of the financial cycle – passed their peaks during 2022 and have since been in a downturn.¹³ Credit growth recorded by both non-financial corporations and households in Germany declined significantly in 2023. The credit-to-GDP gap, a broad indicator of excessive credit growth, has also declined further (see Chart 1.1 on p. 10).

After Germany's long-standing housing market boom came to a standstill in the second half of 2022, prices continued to fall in 2023 amid declining transaction volumes (see the section entitled "Risks from the household and corporate sectors" on pp. 49 ff.).¹⁴ The prices of existing properties have fallen more sharply than prices for new builds (see Chart 2.1.5). Higher financing costs combined with lower real incomes significantly narrowed many prospective buyers' financing options, and demand for residential property fell significantly (see the box entitled "The adjustment of the German residential real estate market to the changed macro-financial environment" on pp. 54 f.).



¹² See Deutsche Bundesbank (2023a). According to Consensus Economics surveys, market participants also expect only slight growth of roughly 0.5% in 2024.

¹³ The financial cycle describes fluctuations in financial variables such as credit volume and asset prices. Empirical studies suggest that these fluctuations are often medium term. By comparison, fluctuations in the business cycle tend to be shorter; see Borio (2014).

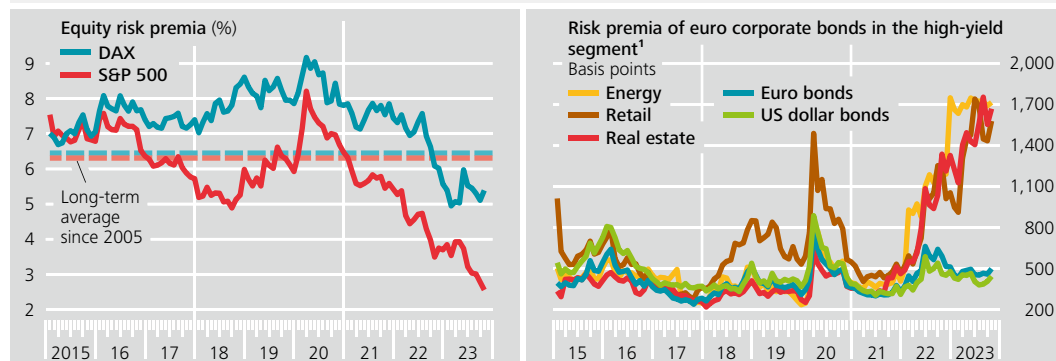
¹⁴ According to the Association of German Pfandbrief Banks (vdp), the prices of owner-occupied housing were 5.8% lower in the third quarter of 2023 than in the previous year. The house price index compiled by the Federal Statistical Office shows prices falling by 9.9% in the second quarter of 2023 compared with the previous year.

The commercial real estate market has also been experiencing a downturn since mid-2022. This development continued in 2023 (see Chart 2.1.5).¹⁵ Both commercial real estate prices and transaction volumes declined in the face of high inflation, the abrupt rise in interest rates, weak economic activity and structural economic changes. In particular, the downward momentum in retail real estate that has been observed for several years accelerated further – not least as a result of the sharp increase in the importance of e-commerce.¹⁶ Following a long period of growth, office property prices have also been falling since 2022. As with retail real estate, cyclical factors as well as structural factors are at play. Structural factors include increased working from home and higher energy standards.¹⁷

Despite heightened cyclical and inflation risks, valuation levels in financial markets have risen over the course of 2023. Equity markets in the United States and Germany have gained since the beginning of the year, while market-implied equity risk premia have trended downwards and are below their long-term averages (see Chart 2.1.6). The risk premia of high-yield corporate bonds in the euro area are also below the levels that appear appropriate based on fundamentals.¹⁸ In some market segments, high risk premia already reflect increased credit risk. For example, the risk premia for bonds issued by real estate enterprises increased (see Chart 2.1.6).

Risk premia in equity and corporate bond markets

Chart 2.1.6



Sources: Bloomberg Finance L.P., ICE data used with permission from ICE Data, OECD (2023), Real GDP long-term forecast (indicator), doi: 10.1787/d927bc18-en (Accessed on 31 October 2023) and Bundesbank calculations. ¹ European issuers.

Deutsche Bundesbank

Given high macroeconomic uncertainty, weak growth prospects and low risk premia, the risk of market price corrections and the associated losses at financial inter-

¹⁵ According to the vdp, office property and retail real estate prices fell by 10.3% in the third quarter of 2023 compared with the same quarter a year earlier. Corresponding transaction volumes have also fallen markedly in the last 12 months, with Savills data showing a decline of 65.3%.

¹⁶ For more information on the increased importance of e-commerce, see German Retail Federation (2023).

¹⁷ For more information on the increased prevalence of working from home, see Federal Statistical Office (2023).

¹⁸ The estimation using fundamentals is based on a model developed by the International Monetary Fund (IMF); see International Monetary Fund (2023). This included the use of data provided by the BIS and Consensus Economics.

mediaries remains elevated. The default rates of high-yield corporate bonds in Europe have risen in 2023 and, at 2.8%, exceed the long-term median of 2.4%.¹⁹ Estimates based on tighter bank lending standards and the majority expectations of rating agencies and market participants suggest that default rates will continue to go up.²⁰

Overall, the macro-financial environment remains challenging, and risks to financial stability are elevated in the current downturn of the financial cycle. Vulnerabilities had built up in Germany during the upturn in the financial cycle in the period of low interest rates and during the COVID-19 pandemic and remain elevated (see the section entitled “Introduction and overview” on pp. 9 ff.). Historical relationships suggest that after the financial cycle peaks, risks from vulnerabilities that have built up previously may materialise.²¹

¹⁹ The long-term median is calculated based on data since 1999. Data source: S&P Global Market Intelligence, as at 2 November 2023. See also the disclaimer: <https://www.spglobal.com/marketintelligence/en/legal/disclosures#sp-global-market-intelligence>

²⁰ The default rates of high-yield corporate bonds in Europe are forecast using regression analyses based on the net change in lending standards as reported in bank lending surveys for the euro area and the United States.

²¹ See Deutsche Bundesbank (2022).

VULNERABILITIES AND RESILIENCE IN THE GERMAN FINANCIAL SYSTEM

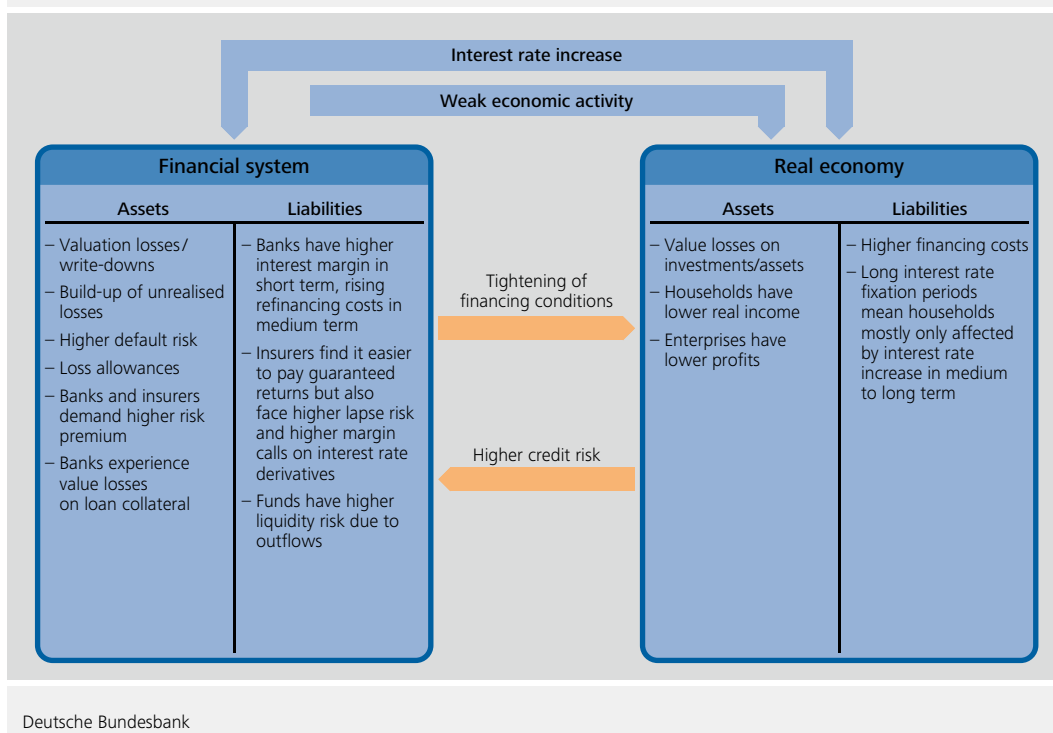
The following sections of the report focus on the vulnerabilities within the financial system, and its resilience. Vulnerabilities are defined here as developments in the financial system that may cause a shock to spread through the financial system and lead to systemic disruption. Resilience is defined as the capacity of the financial system to absorb shocks. Systemic risk – and thus the extent of potential systemic disruption – arises from the interplay of vulnerabilities, resilience and shocks.²²

Vulnerabilities had built up in the German financial system during the phase of low interest rates and the COVID-19 pandemic (see the section entitled “Introduction and overview” on pp. 9 ff.). These vulnerabilities are due, notably, to a potential underestimation of credit risk and overestimation of the recoverability of loan collateral in recent years.²³ In addition, the financial system is exposed to heightened interest rate risk. The interest rate reversal has already partially revealed these vulnerabilities. The risks associated with the vulnerabilities could materialise in the future. The main transmission channels through which the higher interest rate level is affecting the financial system are outlined below (see Chart 2.2.1). The following sections of the report are structured around these transmission channels.

First, the interest rate reversal is having a direct impact on financial intermediaries. A higher interest rate level is leading to direct market and present value losses in institu-

²² This definition is in line with widespread international usage; see Financial Stability Board (2021).

²³ See Deutsche Bundesbank (2022).



tions' interest-bearing existing business.²⁴ In some cases, these losses are diminishing institutions' capital base and thus their resilience. Considerable economic losses may be incurred, in particular, on instruments with long interest rate fixation periods. Particularly in the case of long-term assets, however, these losses do not have to be recognised on institutions' balance sheets. This nevertheless results in unrealised losses, which have an indirect negative impact on institutions' stability: if an institution is forced to sell the affected assets, say, in the event of unexpected liquidity outflows, it must then recognise the value losses on its balance sheet, thus reducing its capital. This was experienced by some US banks in the spring, for example (see the box entitled "The failure of the United States' Silicon Valley Bank" on pp. 27 ff.). If an institution decides to hold on to the assets instead, it forgoes this amount of increased interest income from new business. The unrealised losses reflect this opportunity cost. If an institution's financing costs rise at the same time, it could come under pressure. In addition, unrealised losses may reduce the informative value of balance sheet capital as a measure of an institution's resilience.

Another transmission channel arises from the impact of the interest rate reversal on banks' net interest income. The interest rate reversal is affecting new business through growing lending rates and refinancing costs. In the past, rising interest rates have

²⁴ The term "present value losses" is used when a market value cannot be calculated but an indirect approximation can be derived from the data.

initially had a stronger impact on interest expenditure than on interest income owing to the shorter interest rate fixation periods for refinancing. Should demand for credit weaken, interest income might even fall, especially if interest rates on outstanding loans are low. Net interest income would fall via both channels. Maturity transformation has been high in parts of the banking system for years now.²⁵ Losses resulting from this could tip particularly exposed institutions into distress.

Most banks perform hedging transactions to protect themselves from interest-induced value losses; hedging against interest rate risk shifts the risk within the financial system. Although such hedging can diversify risk from the perspective of an individual institution, the risk still exists within the financial system. In an unfavourable scenario, this may generate concentration risk among hedge providers. Burdens in the financial system may then increase if the solvency of hedge providers falls given a materialisation of interest rate risk.

Second, the interest rate reversal is having an indirect impact on the German financial system, namely through its interconnectedness with the household and corporate sectors. Higher interest rates may place a heavy burden on borrowers and could lead to credit defaults and write-downs in the financial system (see the section entitled “Increasing risk of losses in banks’ credit portfolios” on pp. 63 ff.). The maturity of the loans is crucial here: longer interest rate fixation periods initially shield borrowers from an increase in debt service (see the section entitled “Risks from the household sector so far limited” on pp. 50 ff.). If loans reach maturity, however, they may need to be refinanced at higher interest rates (see the section entitled “Debt sustainability in the corporate sector stable” on pp. 58 f.). If financing costs rise, demand for credit also tends to fall, especially if there is little impetus from economic activity. This then diminishes the earnings potential of the banking sector.

In the event of adverse economic developments, banks’ lending business can be expected to suffer growing losses. If an economic downturn causes corporate profits and household incomes to fall, this reduces these sectors’ debt sustainability. If higher interest rates coincide with an already weakened level of debt sustainability, the negative effects of rising financing costs and lower income may be mutually reinforcing. As a result, credit defaults could increase and trigger losses in the financial system.

The German financial system has so far proved stable. To date, financial intermediaries have been well able to cope with market price losses on their investments following the rise in interest rates, mainly thanks to higher earnings. Credit defaults have remained at a comparatively low level despite subdued economic activity. Falling prices on the resi-

²⁵ See Deutsche Bundesbank (2019, 2021, 2022).

dential real estate market are helping to reduce existing overvaluations and have had barely any adverse impact on the stability of the financial system, partly as a result of long interest rate fixation periods and low credit defaults. However, transmission of the interest rate reversal is not yet complete and could, in the future, expose existing vulnerabilities in the German financial system.

Risks arising from interest rate developments

The financial system has coped well so far with the interest rate reversal. German banks were able to increase their net interest income as monetary policymakers reversed course on interest rates. The unexpectedly low financing costs played an important role in this. Insurers' solvency ratios according to Solvency II have improved owing to the changed interest rate environment. The higher market interest rates make it easier for life insurers to generate the minimum returns they have promised their policyholders in the long term.

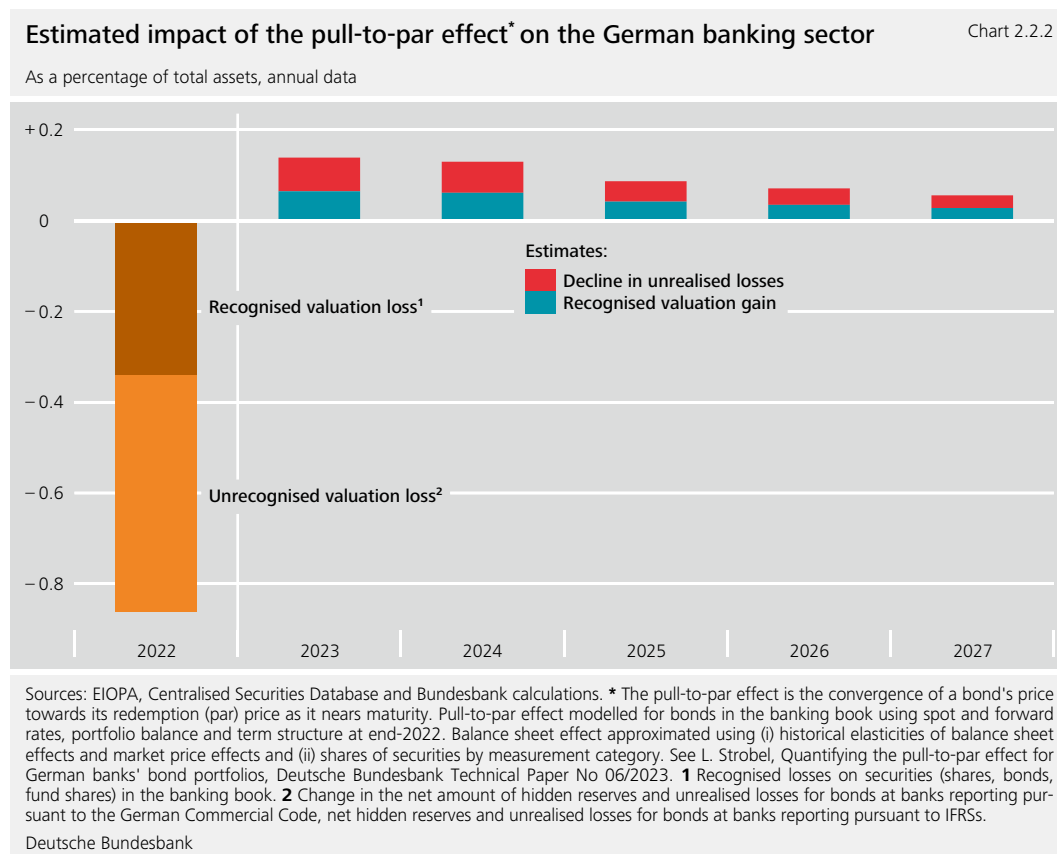
But even so, the risks to the German financial system from the interest rate reversal are still elevated. Model calculations suggest that the longer the current interest rate environment persists, the sooner we can expect banks to adjust their deposit rates and thus see their net interest income decrease. This will be the case, in particular, if demand for loans weakens further. The significant increases in market interest rates have also led to (unrealised) losses in the securities portfolios of banks and insurers. German open-end investment funds likewise recorded valuation losses as a result of the higher interest rates. In economic terms, an interest rate rise drives down the present value, i.e. the value today of future payment streams, of all interest-bearing assets. Even if these losses are not always recognised in profit or loss, they nonetheless show how much income will be lost in the future in interest business.

Banks' bond portfolios have recovered slightly

The losses on fixed income securities prompted by the uptick in market interest rates in the first half of 2022 increased further over the course of the year.²⁶ In 2022,

²⁶ For more on the rise in interest rates in the first half of 2022, see Deutsche Bundesbank (2022).

primary institutions, i.e. savings banks and credit cooperatives, recorded mark-to-market losses of €13.5 billion on these portfolios.²⁷ This represented 5.9% of their common equity tier 1 (CET1) capital in the fourth quarter of 2022. At €6.9 billion, the losses sustained by other systemically important institutions (O-SIIs) were significantly lower, representing 3.1% of their CET1 capital in the fourth quarter of 2022.²⁸ Overall, recognised losses on securities in the German banking system account for €25.8 billion, or 0.34% of total assets (see Chart 2.2.2).



Hidden valuation reserves prevented these losses from being significantly higher. Valuation reserves are created when securities are not recognised at their respective market prices but at a lower value on the balance sheet.²⁹ One scenario in which this occurs is when securities were carried at cost in the past but their price has since risen and these increases in value cannot be recognised.³⁰ Overall, the losses on securities brought about

²⁷ Mark-to-market gains and losses take into account changes in the valuation of securities after hedging in the narrower sense.

²⁸ Recorded here are gains and losses on securities and derivatives recognised in profit or loss and their revaluations that are directly offset against equity and reported under other comprehensive income (OCI).

²⁹ According to the German Commercial Code (*Handelsgesetzbuch*), banks value securities assigned to long-term assets in the banking book using the less strict lower of cost or market principle. This rule stipulates that the carrying amount need not be written down to a lower market value, but can be reported at amortised cost if the reduction in market price is considered temporary. In accordance with the International Financial Reporting Standards (IFRSs), banks can measure securities at amortised cost if they belong to that measurement category.

³⁰ This also applies to amortised cost.

a large-scale reduction in hidden reserves; in some cases, they even led to unrealised losses being accrued. Unrealised losses arise when the market value of securities falls below their value on the balance sheet. Over the course of the year, savings banks and credit co-operatives reduced their hidden reserves by €21 billion owing to the interest rate rise. By the end of 2022, the institutions had accumulated new unrealised losses in the aggregate amount of €11.7 billion.³¹ On aggregate, the net reduction of hidden reserves and build-up of unrealised losses amounted to 14.2% of CET1 capital in the fourth quarter of 2022. At the end of 2022, O-SIIs reported unrealised losses totalling €13 billion. This represented 5.8% of their CET1 capital.

Avoiding losses and accumulating unrealised losses comes at an economic cost, however. The institutions in question miss out on the commensurate amount of higher interest income from securities that have become cheaper. They therefore simply spread the loss on securities over a longer period of time. If an institution needs to sell securities for, say, liquidity reasons, it would have to realise the securities losses and its equity capital would be reduced accordingly.

Over the course of the year, banks were able to reclassify securities to other measurement categories in order to avoid direct write-downs. Primary institutions, which predominantly report in accordance with the German Commercial Code (*Handels-gesetzbuch*), reclassified securities from current to long-term assets. As a result, the share of securities classified as long-term assets increased from 14% at end-2021 to 44% at end-2022, in relation to total securities in the banking book. O-SIIs, which report in accordance with International Financial Reporting Standards (IFRSs), reclassified securities from the fair value measurement categories to the amortised cost measurement category. Over the course of 2022, the share of O-SIIs' securities measured at amortised cost grew from around 32% to roughly 41%.

Securities in institutions' banking books have experienced a recovery effect since the first half of 2023.³² This is primarily due to the pull-to-par effect,³³ which is the convergence of a bond's price towards its redemption (par) price as it approaches maturity, regardless of temporary fluctuations in its value. The pull-to-par effect can be approximated by deriving, for future returns, the implied interest rates from the current term

³¹ These figures refer to net hidden reserves in securities business, which are derived by offsetting hidden reserves and unrealised losses for securities and related derivatives in hedge accounting. Hidden reserves pursuant to Section 340f of the German Commercial Code arise if securities classified as current assets are carried at up to 4 percentage points below the lower of cost or market value. For all securities in the banking book, the value cannot exceed the purchase price on the balance sheet.

³² See Deutsche Bundesbank (2023a).

³³ See Strobel (2023).

structure.³⁴ In 2027, it is likely that 68% of the losses in value incurred in 2022 will be offset due to the pull-to-par effect (see Chart 2.2.2 on p. 36).³⁵

Institutions also made greater use of interest rate hedges to minimise their market and interest rate risk. Primary institutions hedge against interest rate movements most notably with swaps.³⁶ The use of interest rate swaps to hedge the banking book increased at all primary institutions over the course of 2022. The share of savings banks entering into interest rate swaps for more than 10% of their total assets went up from 31% to 38%. Among credit cooperatives, the share remained relatively slim despite increasing from 9% to 15%.

Significant unrealised losses in banks' banking books

Overall, the higher interest rates have led to losses in market value and present value of the banking book. The banking book comprises all interest-bearing positions on the assets and liabilities sides that are not part of the trading book. The economic value of non-traded assets, particularly of loans as well as liabilities, can be approximated by their present value. This is defined as the sum of the values, discounted using current interest rates, of all future payments of the respective position in the banking book. The present value of the banking book is a supervisory metric for interest rate risk, which banks are required to determine on a regular basis.³⁷ For long-term loans in particular, such as real estate loans, interest rate rises lead to significant present value losses. Although these are not recognised in profit or loss for the majority of the banking book, they still represent economic losses. For one thing, the present value losses reflect the opportunity costs of forgone investment opportunities. They show that the remuneration of outstanding loans and securities at the banks concerned is comparatively low. Rising funding costs are likely to pose challenges particularly for institutions with high present value losses in their

³⁴ This means, for example, that the expected price, in one year's time, of a zero coupon bond with a residual maturity of two years is the quotient of the current prices of a zero coupon bond with a residual maturity of three years and a zero coupon bond with a residual maturity of one year.

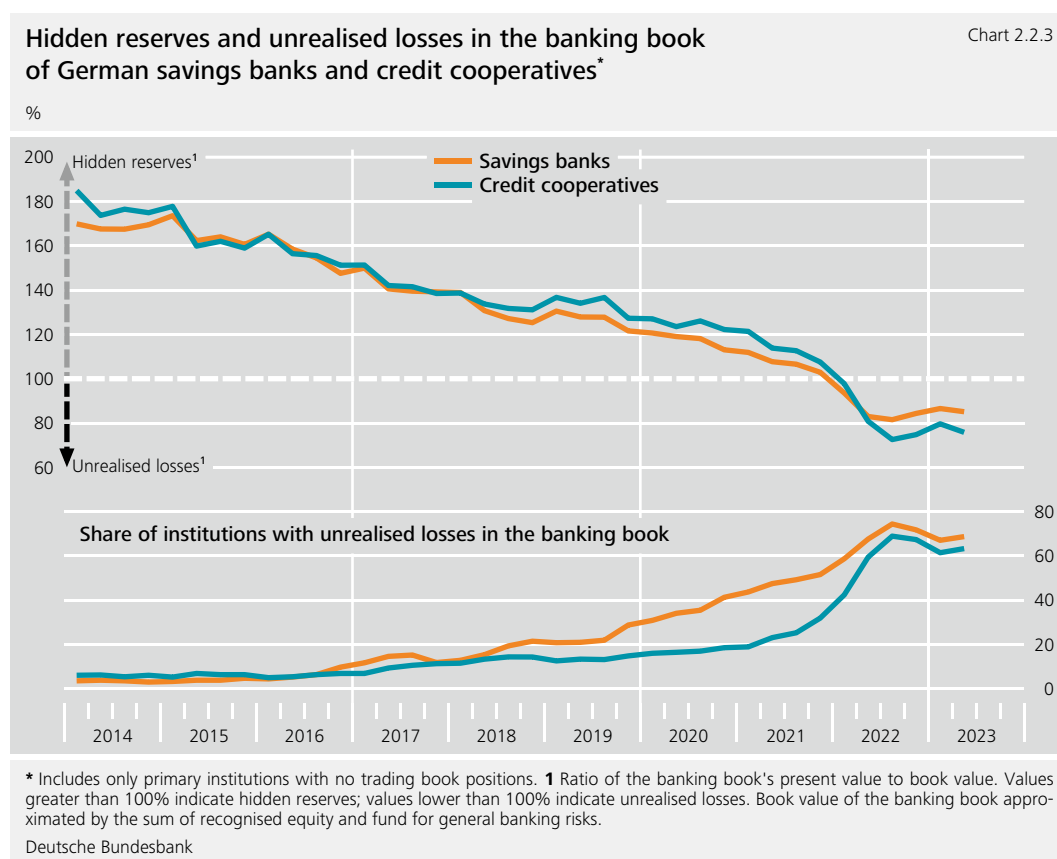
³⁵ The depicted losses in value in 2022 relate to all securities, i.e. bonds as well as shares and fund shares, whereas the pull-to-par effect only relates to reversals of write-downs for bonds. They therefore are not fully comparable.

³⁶ In a swap contract, one party exchanges its fixed interest rates for another party's floating interest rates. This preserves the value of the hedged fixed interest position. The interest payment on the combined position may change. The accounting treatment of derivatives transactions differs depending on whether the institution reports in accordance with the German Commercial Code or IFRSs. Under the Commercial Code, changes in the value of derivatives are recognised if, together with the underlying instruments, they qualify as a hedging relationship. Otherwise, they are treated as pending contracts and increases in value are not recognised. However, in this case, institutions can prematurely close out derivatives positions and take the resulting profit to profit or loss. Under the IFRS framework, derivatives are generally measured at fair value, meaning that all changes in value are recognised.

³⁷ Discounting is based on the yield curve as at the reporting reference date.

loan portfolios, as the average remuneration there is likely to adjust more slowly, relatively speaking, to rising interest rates. For another thing, the present value losses would have to be realised if assets were to be sold or liquidated as collateral.

In the banking book, hidden reserves have decreased and unrealised losses have increased (see Chart 2.2.3). The ratio of present to book value of the banking book has gone down significantly due to the interest rate rise. The book value of the banking book is the difference between the reported value of all the assets it contains and the reported value of the corresponding liabilities. It can be approximated by the sum of recognised equity and the fund for general banking risks.³⁸ In 2022, among primary institutions, the ratio of the banking book's present value to its book value fell from 103% to 84% for savings banks and from 108% to 75% for credit cooperatives. Accordingly, hidden valuation reserves have declined and unrealised losses have increased. At the end of 2022, the ratio was lower than 100% for more than two-thirds of savings banks and credit cooperatives, pointing to unrealised losses. At the start of 2023, the present value of the banking book was even negative for 15 savings banks and 37 credit cooperatives. These institutions therefore appear particularly vulnerable to a further rise in interest rates on the funding side.



³⁸ It is difficult to determine the book value precisely. The proxy chosen here includes the most important items, however.

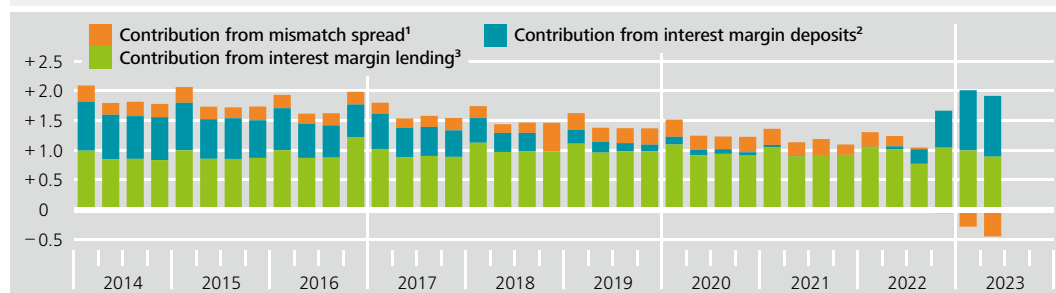
Interest rates on overnight deposits being adjusted slowly

Continued low deposit rates mean that banks' funding costs have increased only slightly, bolstering their net interest income. Rising interest rates usually lead to banks' net interest income being eroded in the short term, because interest expenditure tends to increase more rapidly than interest income on account of shorter interest rate fixation periods. Up to the middle of 2023, however, German banks' interest expenditure went up only marginally overall because deposit rates were adjusted only slowly to the higher interest rate level. As a result, institutions' net interest income rose, significantly in some cases. Among primary institutions, in particular, the rise in interest rates had virtually no impact on interest expenditure up to the end of the first quarter of 2023. This could be due to the customer base of these institutions and their focus on branch business. Indeed, a Bundesbank survey of households shows that customers of primary institutions are less willing to switch compared with other categories of bank.³⁹ With that in mind, primary institutions have raised their deposit rates only a little. As a consequence, the contribution from interest margins to net interest income rose significantly among savings banks and credit cooperatives (see Chart 2.2.4).⁴⁰ Growth in net interest income was dampened by the declining contribution from the mismatch spread, i.e. the amount that banks usually earn from maturity transformation.⁴¹ The main reason for this is that the yield curve is

Components of net interest income of German savings banks and credit cooperatives

Chart 2.2.4

As a percentage of total assets



1 Part of the interest margin generated by the difference between maturities on the assets and liabilities sides of the balance sheet. **2** Part of the interest margin generated by the interest rate spread between a customer deposit and a money and capital market investment with the same maturity. **3** Part of the interest margin generated by the interest rate spread between a loan and an investment in the money or capital market with the same maturity.

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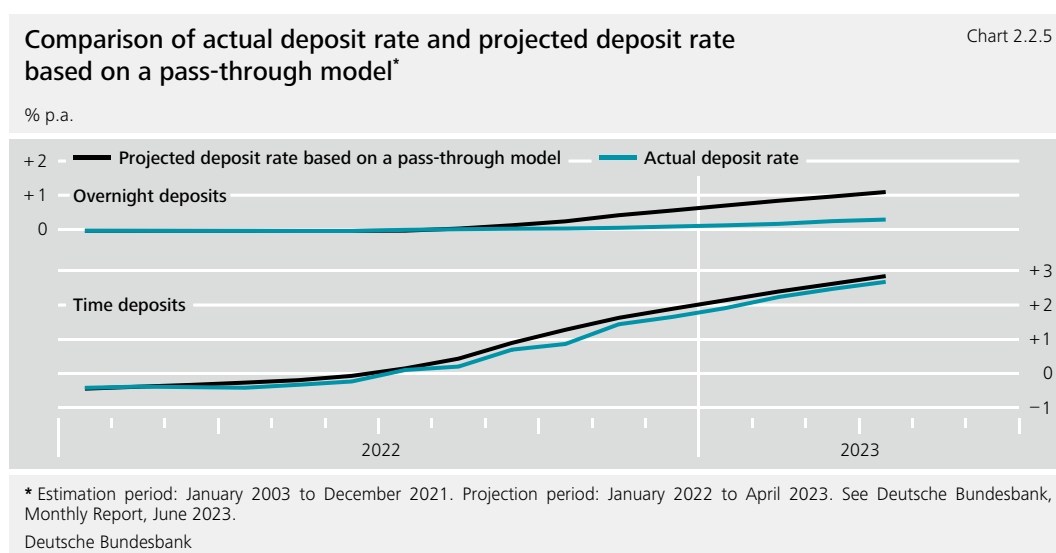
³⁹ Bundesbank Online Panel – Households (BOP-HH).

⁴⁰ The contribution from the interest margin on the liabilities side consists of interest income generated by the difference between deposit rates and money and capital market funding with the same maturity.

⁴¹ The contribution from the mismatch spread is the (hypothetical) profit that would have been generated if lending and deposit-taking business had been remunerated at the risk-free interest rate instead of at the agreed interest rate. The risk-free interest rates correspond to the yields on government bonds with the relevant residual maturity.

currently inverted.⁴² Commercial and regional banks have the smallest contribution from interest margins. This is especially true of direct banks, which have no branch network and offer only limited services. These banks have raised their deposit rates much more than primary institutions because their customers are more sensitive to interest rates.

The delayed pass-through of interest rates for customer deposits meant that banks made high interest savings in some cases. The actual interest rates on overnight deposits are significantly lower than those that would have been expected based on past developments. For time deposits, by contrast, interest rates were adjusted largely as expected (see Chart 2.2.5). If banks had passed on the higher interest rates as observed in the past, their interest expenditure would have been around €13.5 billion higher in 2022. This equates to roughly 15% of their total net interest income. For 2023 as a whole, that figure is likely to be as high as €29 billion.⁴³ The delayed pass-through of interest rates could be due to the unusually rapid rise in interest rates. A Bundesbank analysis shows that higher interest rates are not passed on as much if banks and depositors consider the increase to be at least partly temporary.⁴⁴



⁴² Interest rates are usually higher for longer maturities than for shorter ones. This generally means an interest gain for banks, as they normally obtain comparatively short-term funding and grant long-term loans. When the yield curve is inverted, interest rates are lower for longer maturities than for shorter ones.

⁴³ See Memmel (2023). The data are based on empirical time series estimates, where the interest saving corresponds to the deviation of the actual deposit rates from the modelled ones multiplied by the deposit volume. For more on the modelling of deposit rates, see Busch and Memmel (2021). Once transmission is complete, the interest rate on overnight deposits is likely to reach a level of around 1.5%. This estimate holds if interest rate pass-through follows historical patterns and assuming that the three-month EURIBOR, which is the reference rate used in the pass-through model, remains at its April 2023 level.

⁴⁴ Interest rate pass-through was estimated using a structural dynamic stochastic general equilibrium (DSGE) model based on macroeconomic data for Germany. The model depicts a series of financial market frictions and their interaction with the real economy. The analyses show that around 20% of a temporary cost-driving shock is passed on via higher interest rates, compared with 40% in the case of a permanent shock. See also Gerali et al. (2010).

Rising deposit rates could weigh on banks' net interest income in future

Deposit rates for new business are going up significantly at present. This notable catch-up effect could be related to changed expectations about how long market interest rates will remain at a higher level.

Interest expenditure is also likely to rise in future as customers begin to switch from sight deposits to time deposits. Household surveys conducted by the Bundesbank show that wealthy households, in particular, plan to move out of sight deposits into higher-interest forms of investment. These planned short-term switches would lead to a 10% reduction in sight deposits, meaning they would be limited in scope. This is therefore unlikely to lead to a sharp rise in interest costs in the shorter term. Over a longer horizon, however, switching can be expected to contribute to an increase in banks' funding costs. The interest rate reversal has seen time deposits, i.e. deposits with a maturity of up to two years, gradually become a more important component of deposit business. This trend can be observed, in particular, among commercial and regional banks, but also among primary institutions. For these categories of institution, respectively, the share of time deposits went up from 1.5% of total assets in May 2022 to 4.4% in June 2023 and from 0.8% in December 2021 to 4.9% in June 2023. This development is likely to continue as long as interest rates keep rising.

In future, net interest income is likely to decrease owing to sharply declining demand for loans. Alongside rising financing costs, waning loan demand in both the corporate and household sectors could exert pressure on net interest income. The Eurosystem's quarterly Bank Lending Survey (BLS) shows that corporate demand for loans has fallen sharply since October 2022. New lending to households has roughly halved since the interest rate rise at the start of 2022. This is especially true of loans for house purchase (see the section entitled "Risks from the household and corporate sector" on pp. 49 ff.). Relative to the size of the credit portfolio, the volume of new loans for which higher interest rates could be charged was correspondingly low. Outstanding residential real estate loans generally have long maturities and relatively low interest rates. Banks' future net interest income can be estimated on the basis of projected credit and interest rate developments.⁴⁵ Following the sharp rise in the first half of 2023, net interest income is likely to fall significantly in the second half of the year, with the positive effects from the first six months likely to carry through to net interest income for full-year 2023. While net interest income stood at €91.6 billion in 2022, it could increase by around €17 billion in

⁴⁵ See Memmel (2023).

2023. Next year, by contrast, it is likely to be €15 billion down on the 2022 figure. Assuming that, in addition, 10% of sight deposits are switched to time deposits, net interest income could decrease by a further €2 billion. However, net interest income is still likely to be sufficient for banks engaged in interest business, without the prospect of losses in the overall result. That said, losses could arise if credit defaults increase more than expected (see the section entitled “Risks from the household and corporate sector” on pp. 49 ff.).

Risk situation in the insurance sector improved despite unrealised losses and liquidity risks

The rise in interest rates has improved the risk situation in the insurance sector as a whole, especially among life insurers, who tend to benefit from an increase in interest rates because their assets have shorter maturities than their liabilities. Higher market interest rates make it easier for life insurers to generate the minimum returns they have guaranteed to their policyholders in the long term. The reduced reinvestment risks are reflected in high solvency ratios pursuant to SolvencyII, which are based on a market-consistent valuation (see the section entitled “Resilience of the German financial system” on pp. 70 ff.).

That said, life insurers are burdened with unrealised losses as a result of the rise in interest rates (see Chart 2.2.6). As in the banking sector, these are the result of the lower market values of fixed income assets. These unrealised losses could limit the ability of life insurers to invest countercyclically in future periods of stress, thus hampering the kind of market-stabilising behaviour that life insurers showed during the stress episode at the onset of the coronavirus pandemic in March 2020.⁴⁶ This is because the rising market interest rates have significantly reduced the value of the fixed income securities held in life insurers’ asset portfolios. At present, only around 5% of German life insurers’ assets could be liquidated at short notice without realising unrealised losses.⁴⁷ Insofar as these losses in value are solely attributable to higher interest rates, life insurers are not required to recognise any corresponding write-downs on their balance sheets prepared pursuant to the Commercial Code.⁴⁸ Hence, the market value of their assets at the end of 2022 was just over 9% below their carrying amounts. If life insurers were to sell those assets, unreal-

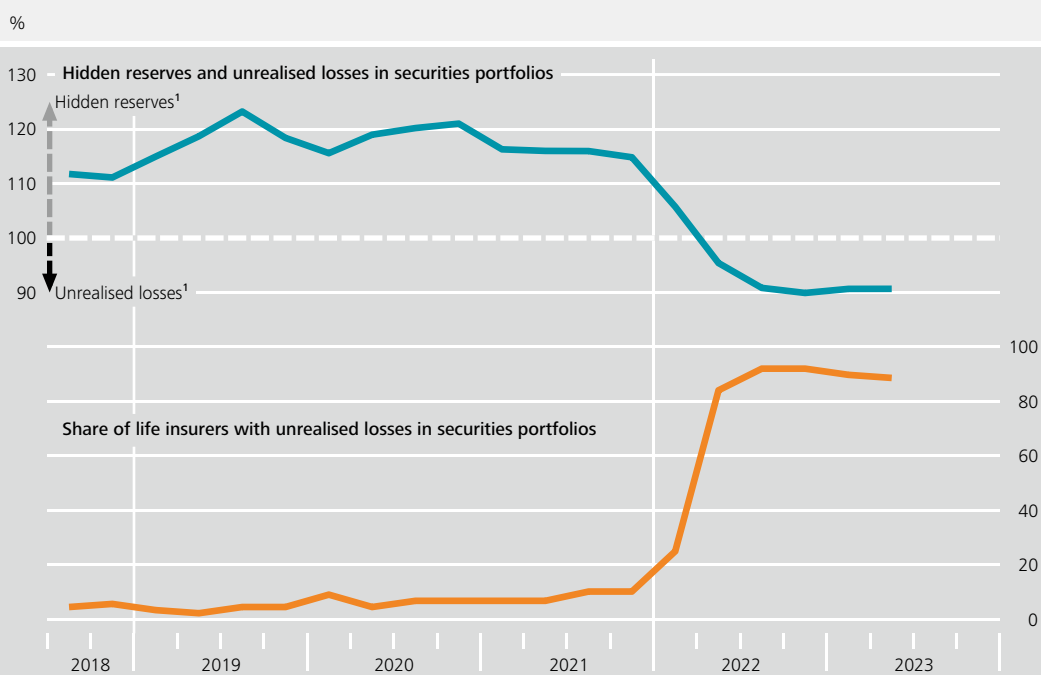
⁴⁶ While banks and investment funds sold low-rated securities whose prices had fallen sharply, life insurers countercyclically increased their holdings of these securities. At the same time, they reduced their holdings of lower-risk securities whose prices had fallen. See Deutsche Bundesbank (2020a, 2021).

⁴⁷ According to a survey by the Federal Financial Supervisory Authority (BaFin), the share of assets that were unencumbered by unrealised losses as at 30 June 2023 and that could be liquidated within five working days stood at around 5% of all assets. The survey included data from 27 of the 80 German life insurers subject to national supervision.

⁴⁸ Provided they intend to hold the securities in question to maturity.

Hidden reserves and unrealised losses in the securities portfolios of German life insurers

Chart 2.2.6



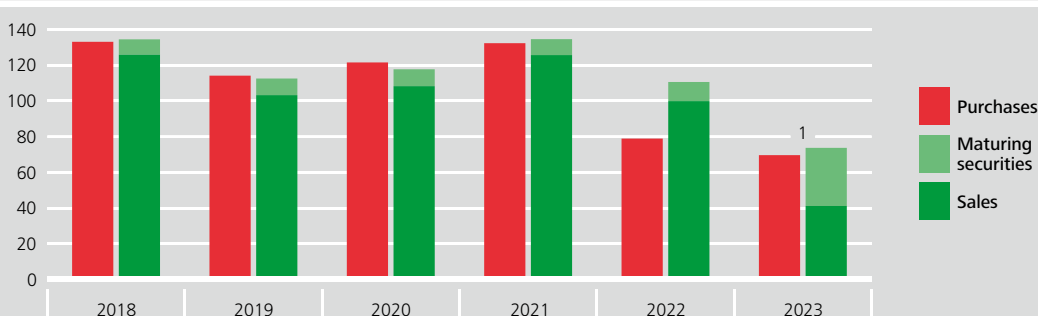
Sources: Federal Financial Supervisory Authority and Bundesbank calculations. ¹ Ratio of the assets' market to book value in accordance with the Commercial Code. Values greater than 100% imply hidden reserves; values lower than 100% imply unrealised losses. Deutsche Bundesbank

ised losses would turn into realised losses and thus become an expense item for life insurers. Since 2022, life insurers have been buying and selling far fewer fixed income securities than in previous years (see Chart 2.2.7).⁴⁹ If part of the portfolio is subject to

Change in the bond portfolios of German life insurers*

Chart 2.2.7

€ billion, market prices



Sources: Federal Financial Supervisory Authority and Bundesbank calculations. * Estimate of volume changes based on quarterly data with fund look-through; excluding assets invested for the purpose of unit-linked life insurance policies, at prices for the respective quarter or previous quarter. In the event of persistent structural price changes, an adjustment for price effects is only possible to a limited extent. ¹ Annualised based on data for the first half-year.

Deutsche Bundesbank

⁴⁹ More securities matured in 2023 because life insurers also invested in short-dated bonds during the period of interest rate increases in 2022.

mark-to-market losses that have not yet been recognised in profit or loss, life insurers will refrain from reallocating their portfolios in order to avoid losses.

Life insurers could use the freed up additional interest provision (*Zinszusatzreserve*) to reduce the losses incurred when unrealised losses are realised. The additional interest provision is a reserve that was built up within the low interest rate environment to enable life insurers to honour their guarantee commitments to their policyholders in the long term. As it is calculated on the basis of a ten-year average of market interest rates, there is a certain lag effect.⁵⁰ At the end of 2022, the additional interest provision came to just under 9% of the assets' carrying amount. If interest rates persist at a higher level, the additional interest provision will be gradually reduced again in future, thus bolstering profitability.⁵¹

The unrealised losses are a source of liquidity risk to German life insurers in the event of a wave of policy lapses. Every contract termination leads to outflows of funds for life insurers. In the hypothetical extreme scenario of a wave of policy lapses, life insurers would have to pay out surrender values to a great number of policyholders. To do this, they would need to sell securities, which might mean that previously unrealised losses would have to be realised. So far, lapse rates at German life insurers have increased only slightly during the period of rising interest rates, while those observed elsewhere in Europe have risen substantially in some countries. In the case of one foreign life insurer, the supervisory authority in that jurisdiction had to prohibit further policy lapses until a resolution strategy had been put in place.⁵²

The risk of a wave of policy lapses appears limited for the German life insurance sector. The estimated enterprise-specific critical interest rates, i.e. the levels at which the going concern of individual life insurers could be at risk in the hypothetical extreme scenario of a wave of policy lapses, stand at a median of 4.3% (see the box entitled "Refined critical interest rate estimation methodology for life insurance companies" on pp. 47 f.). Since a policy lapse entails transaction and information costs, and because supplementary

⁵⁰ For an explanation of how the additional interest provision is calculated and for further information, see Deutsche Bundesbank (2018a).

⁵¹ Moreover, the additional interest provision is reduced when obligations under policies guaranteeing high returns decline, e.g. because their residual maturity decreases. An interest-induced reduction in the additional interest provision was not observed over the course of 2022, but there was a portfolio-induced reduction as a result of expiry and a shortening of the remaining terms of existing policies. See Oehlenberg (2022).

⁵² See Banca d'Italia (2023). The Italian market has seen a sharp increase in the number of life insurance policies surrendered since the second half of 2022. This was reportedly due both to insured persons needing more liquidity in a changed macroeconomic environment and to them seeking more profitable alternative investments. The crisis at life insurer Eurovita was to be seen against the background of unrealised losses and firm-specific weaknesses, in particular insufficient risk management, limited equity resources and the lack of financial support from its shareholder. Policy lapse risks are particularly high in France and Italy because insured persons there are able to lapse their policies at comparatively favourable conditions. For example, brisk competition for retail investors and low tax incentives to prevent lapses are typical of the Italian market. See Moody's (2023) and Gallagher Re (2023).

insurance policies covering occupational disability and the like are lost, the critical interest rate is likely to be higher from the perspective of many policyholders.

Readiness to cancel a policy depends in part on the interest on low-risk bank investments. According to a Bundesbank survey, around one-quarter of people owning a life insurance policy with guaranteed returns would cancel their policies if low-risk bank investments promised an annual return of at least 6%. On the other hand, more than half of the people owning life insurance policies with guaranteed returns would not lapse them no matter how high the alternative rate of interest was. The most significant obstacle to contract cancellation named by respondents is the risk of losing insurance cover against life risks such as occupational disability.

To reduce lapse risk, German life insurers are allowed to reduce surrender values for one year in each instance. One condition is that corresponding assets, when marked to market, cover the surrender values only incompletely.⁵³ However, life insurers may be reluctant to do this because of the threat of reputational risk. From a financial stability perspective, it therefore seems appropriate to give life insurers the legal right to offer policies with interest rate-sensitive surrender values.⁵⁴

In addition, spells of market volatility may expose life insurers to liquidity risks owing to rising margin requirements under interest rate derivatives.⁵⁵ At the end of 2022, German insurance groups were holding derivatives with a nominal value of just over €850 billion, roughly double what they were holding eight years previously. While derivatives are used as hedging instruments and often subject to central clearing, changes in market prices can trigger margin calls and thus liquidity outflows. Within the past eight years, the largest market price changes – and thus, by way of an approximation, the largest margin calls, too – were observed in interest rate derivatives, followed by foreign currency derivatives. If macro-financial shocks occur in the future, margin calls under derivatives contracts could increasingly force life insurers to realise unrealised losses, because the rise in interest rates has left life insurers with barely any liquid securities they could sell without realising a loss.

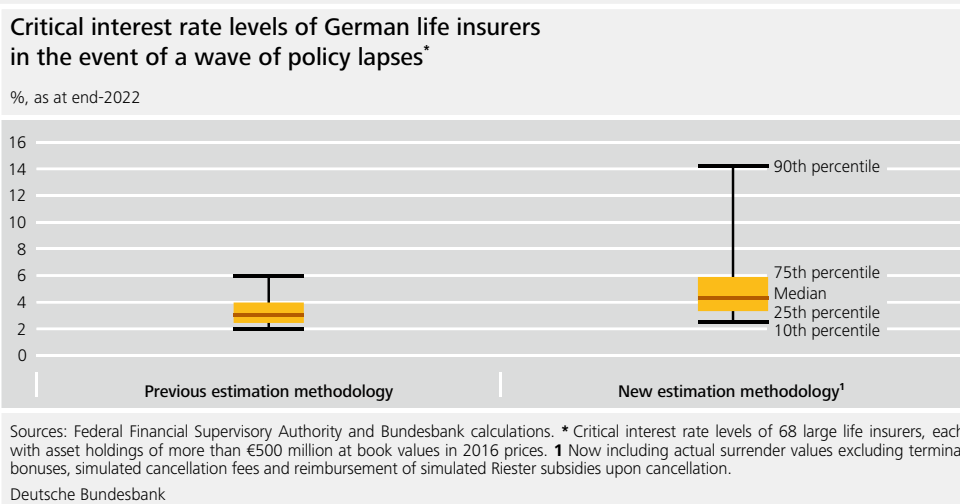
⁵³ See the explanatory memorandum on Section 169(6) of the German Insurance Contract Act (*Versicherungsvertrags-gesetz*) (BT-Drucksache 16/3945).

⁵⁴ For example, life insurance policies whose surrender values are subject to market value adjustments are common in the United States. In Germany, the method used to calculate surrender values was revised when the Insurance Contract Act was reformed in 2007. Under Section 176(3) sentence 1 of the unamended version of the Insurance Contract Act, surrender values were calculated at current values. Section 169(3) sentence 1 of the amended Act states that the surrender value shall generally be calculated based on the life insurer's premium reserve (*Deckungskapital*). Since this reform, the amount of surrender values has been fixed at the start of the contract, implicitly ruling out any market value adjustment. The benefit of the amended German regulation for insured persons requiring liquidity is that they are able to lapse their life insurance policy in return for a stable surrender value. For life insurers, however, the new regulation presents risks because they may be forced to realise losses if lapse rates surge following a rise in interest rates.

⁵⁵ Parties to derivatives transactions typically have to provide margins to ensure that their trades are fulfilled. Significant movements in market prices may force them to provide additional collateral. This is referred to as a margin call.

Refined critical interest rate estimation methodology for life insurance companies

Since 2014, the Bundesbank has undertaken the task of estimating critical interest rate levels for German life insurance companies.¹ These indicate the market rate levels at or above which the going concern of life insurers could be at risk should the hypothetical extreme scenario of a wave of policy lapses come to pass.² The previous estimation methodology suggested a median critical interest rate level for German life insurance companies of 3.0% at the end of 2022 (see the chart). Under the previous estimation methodology, the 25th percentile is at 2.4%, meaning that one-quarter of life insurance companies have lower critical interest rates.



However, data gaps meant that the previous estimation methodology was partially based on assumptions about characteristics of life insurance policies such as surrender values or cancellation fees. As a one-off exception, a recent survey by the Federal Financial Supervisory Authority (BaFin) makes it possible to factor in exact surrender values for the end of 2022. Using these data produces a median critical interest rate level of 3.3%. If we assume that life insurance companies would reduce their terminal bonuses to zero in the event of a wave of policy lapses, the median increases to 3.5%.³

¹ See Deutsche Bundesbank (2014).

² Here, the market rate levels refer to the yield on Bunds with a residual maturity of ten years.

³ A terminal bonus represents a policyholder's participation in a life insurance company's surpluses. Unlike current profit participation shares, the terminal bonus is allocated only once, typically once the contract is terminated. Under German law, terminal bonuses are generally not guaranteed.

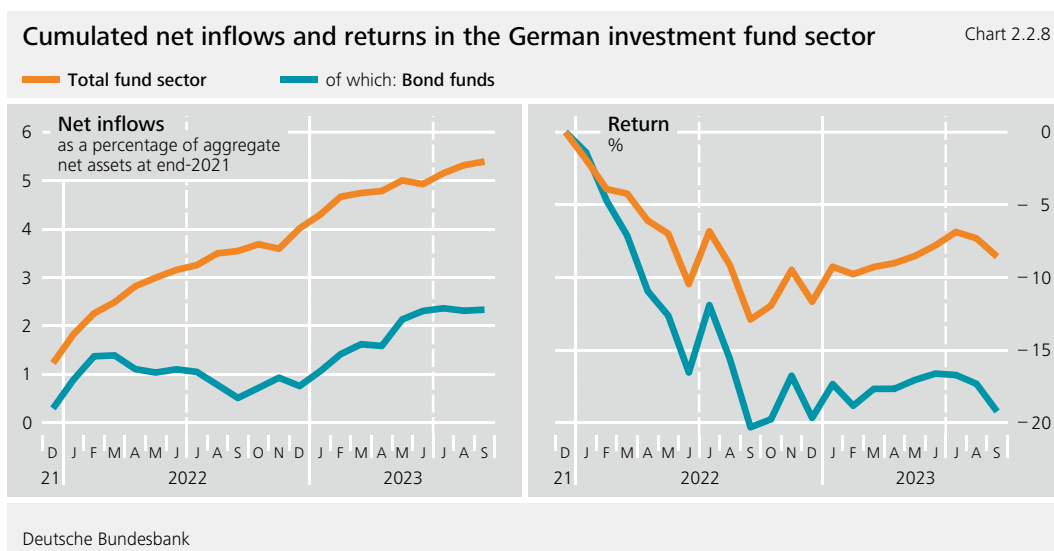
The impact of various impediments to policy cancellation can still be estimated only roughly. Simulated cancellation fees of 5% of the surrender value, excluding terminal bonuses, increase the median to 4.0%. If simulated public “Riester” subsidies are taken into account as well, the median rises to 4.3% and the 25th percentile reaches 3.3% (see the chart).

The values obtained via the new estimation methodology are likely to be more economically relevant than those obtained via the previous estimation methodology. However, they can only be calculated once and only for 2022, and also carry a high degree of estimation uncertainty, as cancellation fees and public “Riester” subsidies can only be simulated. The actual values may be even higher owing to information and transaction costs as well as the loss of supplementary insurance cover against life risks in the event of policy cancellation.

Among life insurers, the rise in interest rates has led to the build-up of substantial unrealised losses that could limit their scope to invest countercyclically in future periods of stress and has increased the risk of policy lapses. Furthermore, life insurers are potentially exposed to liquidity risks if margin calls under interest rate derivatives increase during spells of market volatility.

German investment funds register continued inflows despite valuation losses

Despite suffering valuation losses in their bond portfolios, German open-end investment funds only experienced outflows for a time. German investment funds invest around one-third of their fund assets in bonds. The value of the aggregate bond portfolio of German funds fell by 14% between February 2022 and September 2022 on account of the increased interest rates. Since then, the bond portfolio has seen its value recover slightly, rising by 4% up to September 2023. As the value of outstanding fund shares is generally recalculated daily based on the securities held by the fund, the fund shares directly reflect valuation losses on securities. In the case of bond funds and mixed securities



funds, in particular, investors responded at times to the valuation losses observed during 2022 by redeeming fund shares (see Chart 2.2.8). Overall, the German fund sector has coped well so far with the outflows associated with valuation losses, seeing as the funds in question were able to honour requests for the redemption of fund shares. Furthermore, the German fund sector as a whole has primarily seen net inflows. Open-end investment funds do, however, remain vulnerable to a surge in fund share redemptions because they hold not only liquid assets but less liquid ones as well.⁵⁶ During periods of stress, sales of less liquid assets are sometimes impossible, or only possible at significant discounts.⁵⁷ In this scenario, a high volume of redemption requests can lead to fire sales of securities, amplifying the price shocks in financial markets.⁵⁸ In extreme cases, situations of this kind may also force funds to suspend the redemption of fund shares.

Risks from the household and corporate sectors

The household and corporate sectors have so far proven largely resilient to higher interest rates and uncertainties stemming from structural change. In the multi-year period of low interest rates, which was a defining feature of the first two phases of the macro-financial environment in recent years, households and companies had incentives to take on debt (see the section entitled “Introduction and overview” on pp. 9 ff.). In the

⁵⁶ See Deutsche Bundesbank (2018a).

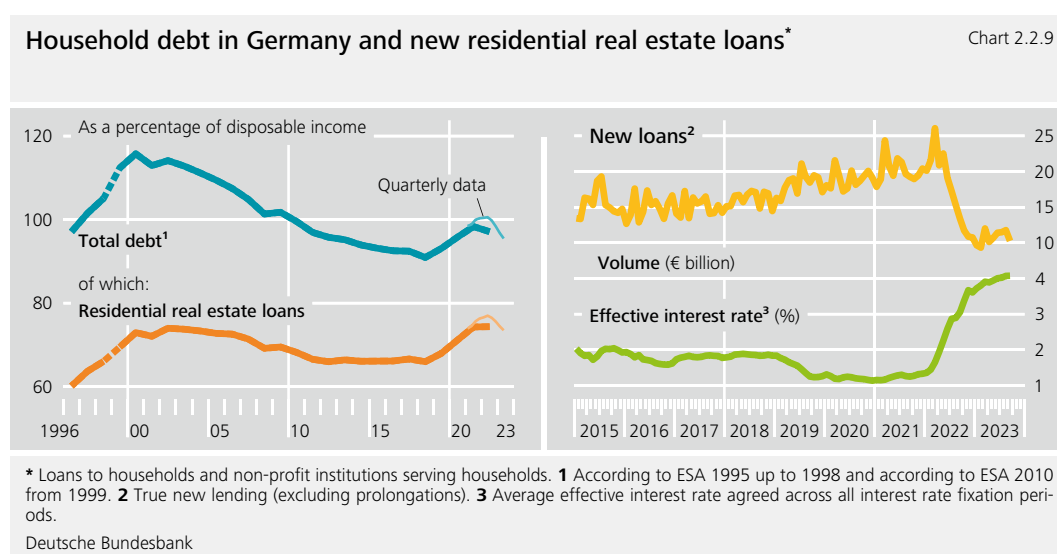
⁵⁷ See Financial Stability Board (2020).

⁵⁸ See Deutsche Bundesbank (2019, 2022) and Fricke and Wilke (2023).

current interest rate increase and transition phase, rising interest rates are tending to push up borrowing costs. This is weakening new lending and could place a strain on borrowers with outstanding loans when these reach maturity and need to be refinanced at higher interest rates. In connection with a period of economic slowdown, credit risk is increasingly shifting into the foreground again. In addition, structural change with regard to the decarbonisation, digitalisation and deglobalisation of the economy is creating heightened uncertainty, bringing with it insolvencies and increased credit risk for banks. If the risks of default in the household and corporate sectors were to climb, this would lead to losses in the financial system via loss provisions and credit defaults.

Risks from the household sector so far limited

The sustainability of debt in the household sector is robust overall. Whilst aggregate household debt rose between 2016 and 2022 on account of increasing lending in the low interest rate environment, it fell slightly following the rises in interest rates from mid-2022 to mid-2023, declining from 100% to 97% of disposable income (see Chart 2.2.9). A key

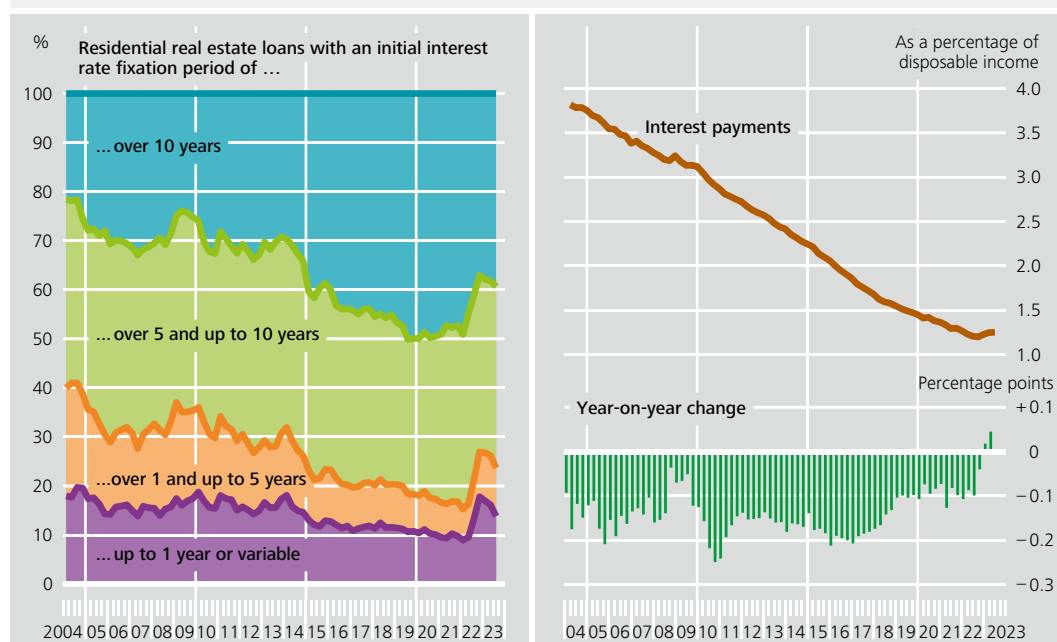


contributing factor here was the fact that new lending was around one-half lower than up to the start of 2022, before the period when interest rates rose most sharply.⁵⁹ In this context, lending decreased mainly due to the higher costs of financing. The average effective interest rates agreed in contracts for residential real estate loans rose from around 1.3% in 2021 to 4.0% by mid-2023.

⁵⁹ Wage settlements were also higher as of 2023, which played an additional role in bringing down debt relative to disposable income.

In the case of residential real estate loans, long interest rate fixation periods are protecting most households from rising interest expenditure in the short term. Residential real estate loans account for just over three-quarters of household debt in Germany. During the low interest rate period, households had agreed considerably longer interest rate fixation periods with their lenders (see Chart 2.2.10). Loans granted when interest rates were at their lowest, and that were responsible for the sharp growth in residential real estate loans, are typically not due for refinancing until 2028 at the earliest. Long interest rate fixation periods are thus shielding the majority of households with outstanding residential real estate loans from an imminent rise in their interest burden.⁶⁰ However, a small proportion of indebted households could experience a deterioration in the sustainability of their debt. This would be the case, for example, if they opted for short interest rate fixation periods and low repayment rates when they first took out their loans and then needed follow-up financing at higher interest rates. As a result of the rise in interest rates, aggregate interest expenditure for household debt from outstanding residential real estate loans has gone back up slightly relative to disposable income for the first time in years. This small increase is occurring from a very low level of interest expenditure relative to disposable income by longer-term standards (see Chart 2.2.10).

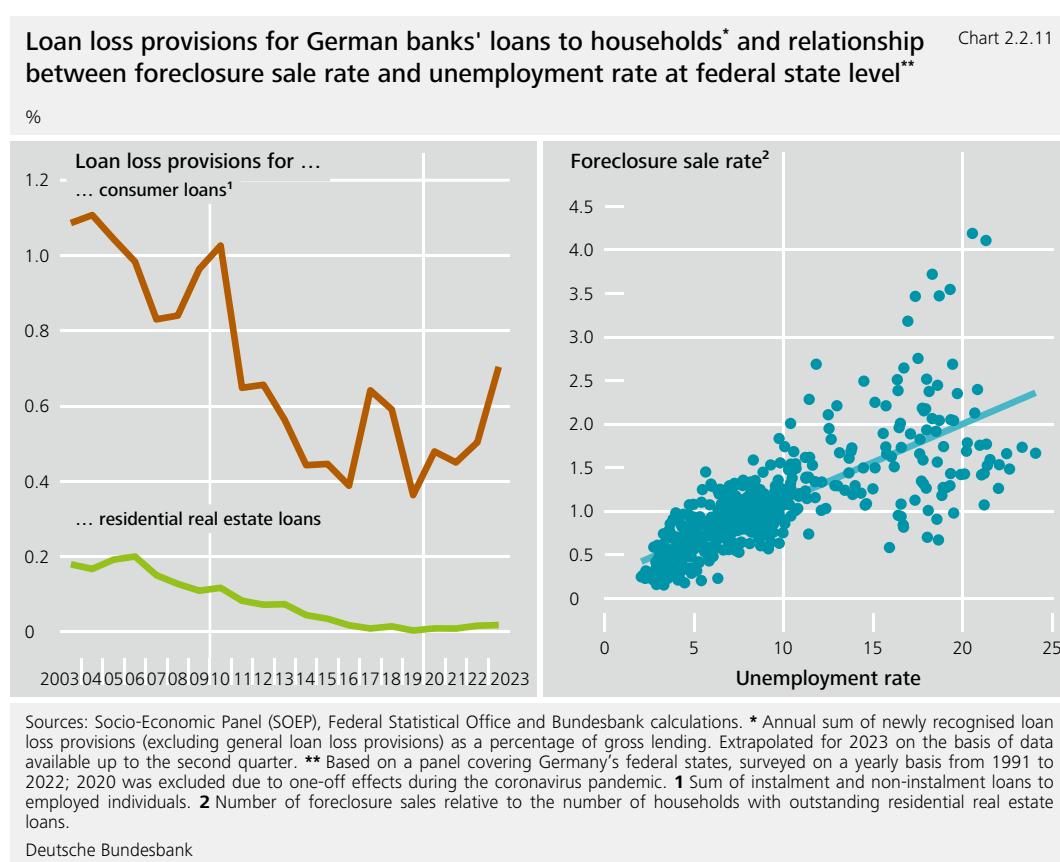
Interest rate fixation periods of new residential real estate loans* and interest payments on outstanding residential real estate loans to households in Germany** Chart 2.2.10



* Domestic banks' new loans with the stated interest rate fixation periods as a proportion of the total volume of new lending (including prolongations). ** Data based on MFI statistics for gross secured and unsecured lending, including overdrafts, at given points in time. Deutsche Bundesbank

60 The interest rate risk arising from long interest rate fixation periods lies with the lenders, however.

Consumer credit may be associated with greater risks. Consumer loans account for just over one-tenth of household debt in Germany.⁶¹ According to the results of the Bundesbank Online Panel – Households (BOP-HH), borrowers whose only outstanding debt takes the form of consumer credit often have comparatively low incomes, barely any financial reserves and low saving ratios.⁶² Furthermore, based on historical loan loss provisions at German banks, the percentage potential loss on consumer loans is higher than that on residential real estate loans (see Chart 2.2.11). This means that, in the event of a downturn in the real economy involving a significant increase in unemployment, this area is more likely to see high rates of loan default. According to the results of the BOP-HH, the proportion of households whose only debt consists of consumer credit and that have no noteworthy savings rose from 12% at the beginning of 2022 to 18% in mid-2023. Loan loss provisions for consumer credit have also gone up since 2022.

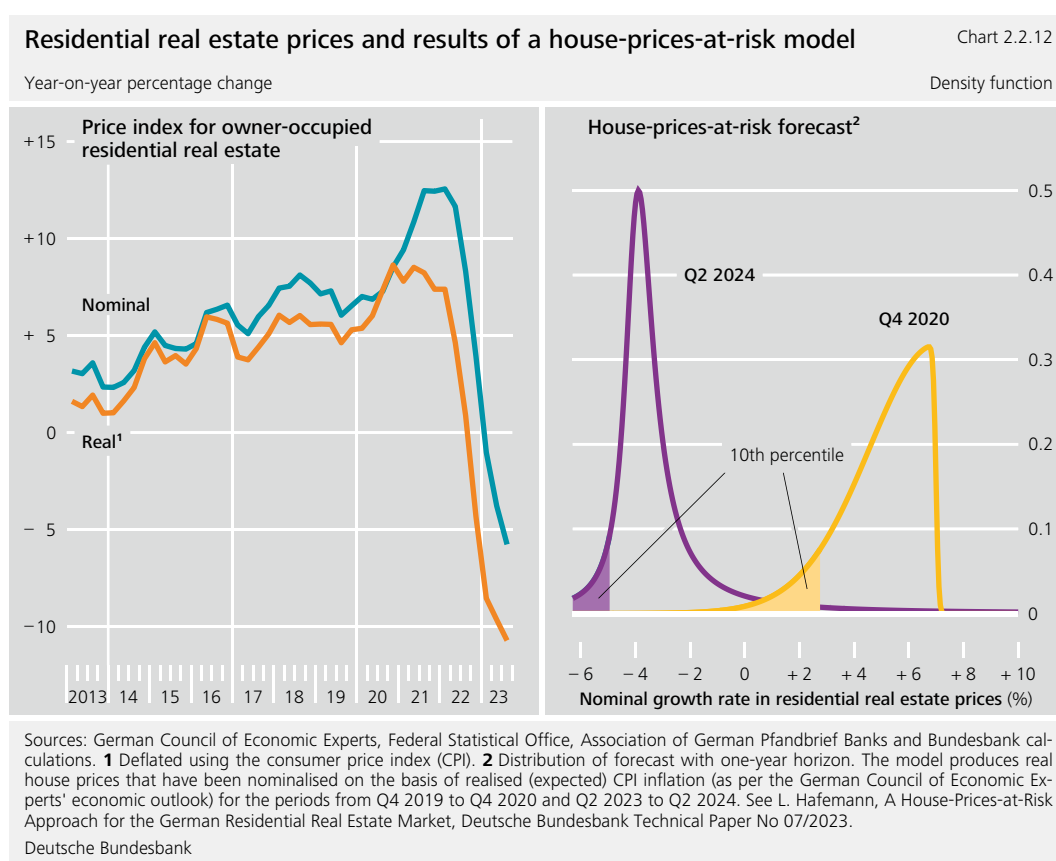


61 The remaining share of household debt aside from residential real estate and consumer loans is accounted for by commercial loans.

62 For more information on the greater impact of inflation on low-income households, see Deutsche Bundesbank (2022).

Residential real estate prices fall and credit standards tightened

The turnaround in interest rates brought an end to the years-long upward trajectory of residential real estate prices in Germany. Increased financing costs and high inflation have dampened demand for residential real estate. Real residential real estate prices, in particular, have fallen sharply (see Chart 2.2.12).⁶³ The outlook for the German residential real estate market going forward is surrounded by uncertainty due to the mix of conflicting factors. In addition to the rise in interest rates, the residential real estate market's adjustment to the altered macro-financial setting is being shaped by supply-side and demand-side factors (see the box entitled "The adjustment of the German residential real estate market to the changed macro-financial environment" on pp. 54 f.). The high level of uncertainty is also reflected in a significant decline in transactions.⁶⁴



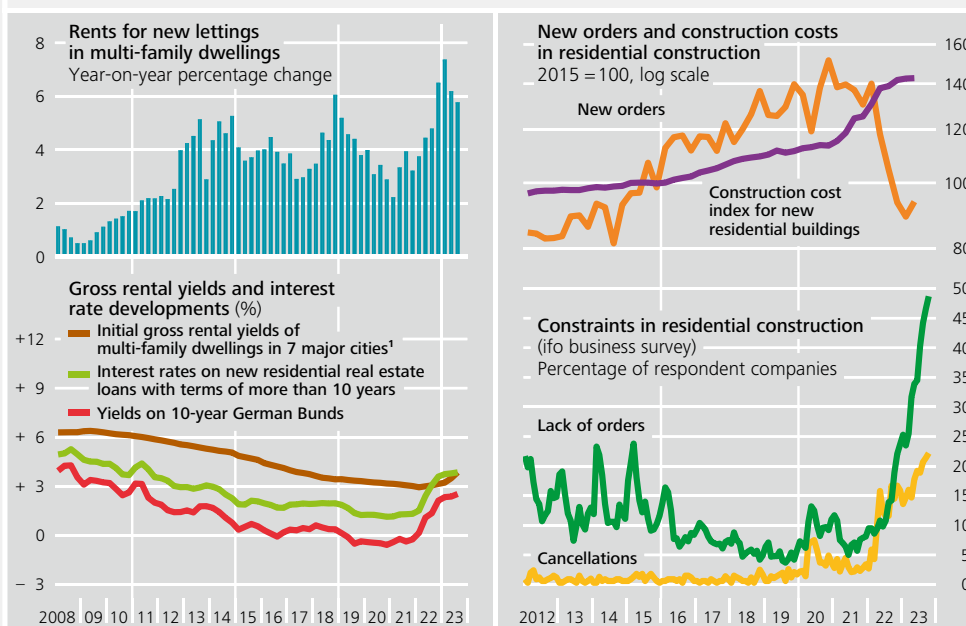
⁶³ See Deutsche Bundesbank (2023c).

⁶⁴ See gewos (2023) as well as various individual reports by regional committees of surveyors, such as Gutachterausschuss für Grundstückswerte in Niedersachsen (2023).

The adjustment of the German residential real estate market to the changed macro-financial environment

Following an upswing spanning many years, the German residential real estate market has undergone a cyclical turnaround.¹ Initially, the abrupt rise in interest rates as of the second quarter of 2022 onwards made it more expensive to finance residential real estate. As a result, there was a strong decline in the demand for residential real estate loans (see the section entitled “Risks from the household and corporate sectors” on pp. 49 ff.). Potential buyers are instead increasingly turning to the rental market.² As demand for housing remains high, rents for new lettings are rising more sharply than in previous years (see the chart). By contrast, purchase prices fell for the first time in many years (see the section entitled “Macro-financial environment” on pp. 23 ff.).³

Indicators for the German residential real estate market*



* Bundesbank calculations based on data from bulwiengesa AG, ifo Institute, Bundesbank statistics, Federal Statistical Office and the Association of German Pfandbrief Banks. ¹ Berlin, Cologne, Düsseldorf, Frankfurt am Main, Hamburg, Munich and Stuttgart.
Deutsche Bundesbank

¹ See Deutsche Bundesbank (2023a).

² Households could also postpone their purchase decisions, for example to adapt to new market conditions by building up more savings. See Ludwig and Vogel (2023).

³ For more information on the various factors influencing developments in the residential real estate market, see also Duca, Muellbauer and Murphy (2021).

On the supply side, higher financing and building costs are slowing the construction of new residential real estate. New orders for residential construction are in decline, while cancellations of existing orders are on the rise (see the chart).⁴ As a result, the order backlogs built up during the previous upswing have diminished, and an increasing share of the surveyed construction firms have recently reported a shortage of orders (see the chart). Furthermore, the number of insolvencies in the sector including construction firms and real estate project developers has already gone up (see the section entitled “Increased risks from the corporate sector” on pp. 59 ff.). Due to the higher interest rate level, investors have, in turn, a greater incentive to invest in fixed income securities rather than, for instance, in real estate. However, due to lower residential real estate prices and rising rents, initial gross rental yields have recently increased again somewhat after having previously fallen during the low interest rate period (see the chart). The heightened uncertainty in the residential real estate market – with regard to energy efficiency requirements, for example – is likely to be dampening growth in the supply of housing even further.

Adjustment processes in the residential real estate market may take several years.⁵ This was previously observed in the years following German reunification, for instance. At the beginning of the 1990s, the German real estate market experienced a strong upswing – especially in the former East Germany – and construction activity saw significant growth. In the subsequent downturn, residential real estate prices in Germany largely stagnated in nominal terms, but fell in real terms. In the current situation characterised by shortages of housing in many regions, and in light of the low vacancy rates and high rents, buyers could instead be inclined to take on greater financing burdens. While this would bolster both demand and real estate prices over the short term, lenders would have to assume greater risk over the medium term.

From the perspective of financial stability, it is important that, even in times of adjustment processes such as these, there is sufficient resilience among both borrowers and lenders. When it announced its package of macroprudential measures in January 2022, and given the developments in the residential real estate market, the Federal Financial Supervisory Authority (BaFin) therefore warned lenders to be especially cautious when granting new loans to finance residential real estate.⁶

⁴ See ifo Institute (2023).

⁵ See Deutsche Bundesbank (2020b).

⁶ See Federal Financial Supervisory Authority (2022).

In and of themselves, falling residential real estate prices do not necessarily pose a risk to financial stability.⁶⁵ As things stand now, declines in prices are primarily contributing to reducing the overvaluations that built up over the market's multi-year upswing, thereby lowering the risk of sharper price declines in the future.⁶⁶ For lenders, however, price declines can become problematic if the loans used to finance the real estate default and the recoverable value of the collateral falls short of the outstanding loan amount. Further declines in collateral values could prompt lenders to be somewhat more cautious in their lending. A house-prices-at-risk model estimated for Germany shows that there could still be a certain degree of downside potential for nominal residential real estate prices in the short term (see Chart 2.2.12 on p. 53).⁶⁷

Lending standards for new residential real estate loans have recently become more stringent. According to the Eurosystem's quarterly Bank Lending Survey (BLS), German credit institutions significantly tightened their lending conditions for household residential real estate financing from mid-2022 onwards.⁶⁸ In addition to the higher costs of living due to inflation, banks increasingly cited the poorer outlook on the residential real estate market as a reason for their tighter credit standards. In 2023 so far, however, it appears that lending standards are stabilising somewhat. The tightening that has taken place since the beginning of the year has been considerably more moderate than that seen in 2022. Moreover, according to the BLS, banks have no plans to further tighten their lending standards to any significant degree for the time being.⁶⁹ From mid-2023, demand for loans also stabilised, though at a significantly lower level than in the previous year (see Chart 2.2.9 on p. 50).

Households put down larger amounts of equity when purchasing residential real estate. On the one hand, this was probably due, in part, to the tightened credit standards. On the other hand, however, it is also beneficial for buyers: when interest rates are higher, contributing more equity means that they will pay less interest. According to data provided by the mortgage broker Interhyp, the average loan-to-value (LTV) ratio for new borrowers sank further from the second half of 2022 onwards (see Chart 2.2.13). From mid-2022, the average loan amounts for new residential real estate loans also declined as a result of the rise in interest rates, which has meant that the debt-to-income (DTI) ratio has improved in aggregate terms. In mid-2022, new borrowers were taking out residential real estate loans amounting to seven times their annual income; by the first half of 2023, these loans amounted to around five and a half times their annual income. Nevertheless,

⁶⁵ For more information on the interactions between the credit cycle and residential real estate markets as well as their implications for financial stability, see Muellbauer (2022).

⁶⁶ See Deutsche Bundesbank (2023a).

⁶⁷ See Hafemann (2023). For more information on the impact of the previous low interest rate environment on the current situation in the residential real estate markets, see also Dieckelmann et al. (2023).

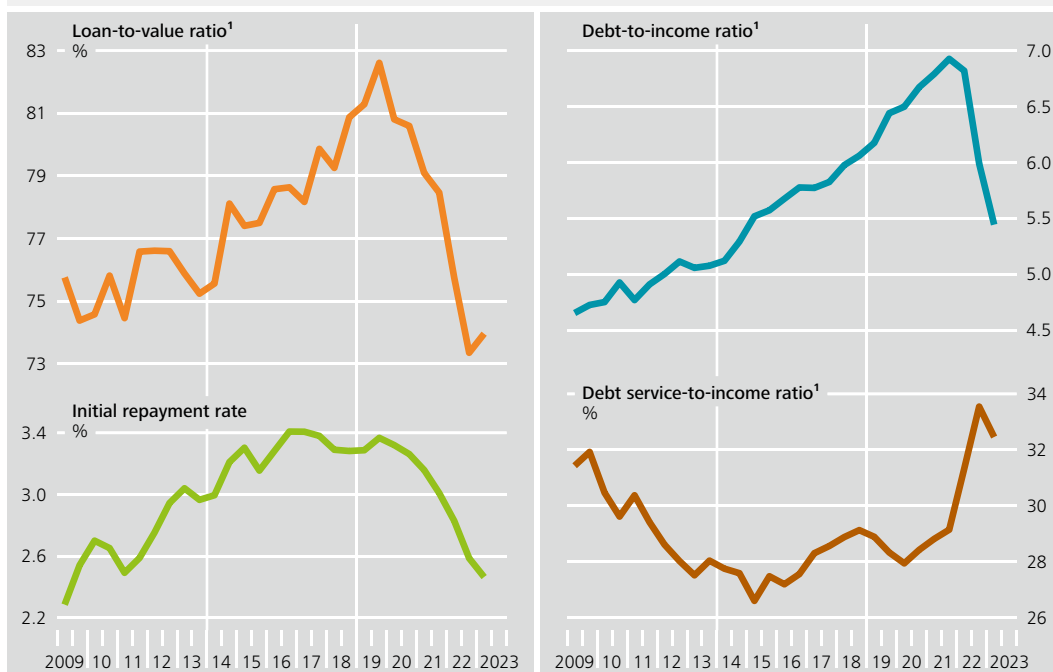
⁶⁸ For Germany, the BLS captures qualitative data on the lending business of – at present – 33 banks.

⁶⁹ July results of the BLS for Germany.

Key indicators of residential real estate financing

Chart 2.2.13

Volume-weighted means, semi-annual data



Source: Bundesbank calculations based on data provided by Interhyp Group. ¹ Weighted using data from the Socio-Economic Panel (SOEP).

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the higher interest rates meant that, at first, debt service capacity deteriorated further. In this context, the rise in the debt-service-to-income (DSTI) ratio would have been even greater if loan maturities had not been extended and repayment rates had not been lowered further from mid-2022.⁷⁰

Higher unemployment in the wake of an economic downturn could lead to higher defaults on residential real estate loans. The observed losses from lending to households have so far been small. Between 2007 and 2020, when interest rates were low, loss provisions for residential real estate loans decreased over a period of several years and remained low by longer-term standards in 2023, too (see Chart 2.2.11 on p. 52). However, previous phases of weakness in the German residential real estate market suggest that, in the event of persistently rising unemployment, defaults on real estate loans are also likely to increase.⁷¹ As residential real estate loans account for almost half of the banking system's gross lending to households and firms, an increase in credit defaults in this segment would have significant repercussions for the situation among lenders. However, both the household sector and the labour market have proved largely robust overall so far.

⁷⁰ Owing to the mathematics of annuity loans – which are the most common type of loan in Germany – a lower initial rate of repayment at a higher rate of interest does not necessarily mean that the absolute repayment amount will be smaller.

⁷¹ See Barasinska et al. (2023).

New data disclosure requirements relating to residential real estate financing (WIFSta) enhance the information base for macroprudential supervision in this area.

Until now, Germany did not have any data on the lending standards for residential real estate loans to households that was sufficiently harmonised for the needs of macroprudential policymaking. Reporting entities started providing these data on their residential real estate lending to households as of the Q1 2023 reporting period.⁷² Lenders with volumes of residential real estate lending business that exceed the thresholds set out in the reporting requirements are obligated to report on a quarterly basis.⁷³ From a technical perspective, the commencement of data collection has been a success. There was, however, some discrepancy between lenders with regard to how they implemented certain definitions. Some adjustments are thus needed in order to achieve a harmonised set of results. These issues have been discussed in close cooperation with the reporting entities, which will now be required to make improvements. The data are to be used in the near term as a basis for risk assessment as well as for calibrating macroprudential instruments, should it be deemed necessary to activate them. The collection of data also helps to ensure compliance with European recommendations.⁷⁴ Selected aggregate metrics are to be provided to the European Systemic Risk Board (ESRB) and the ECB for use in cross-country comparisons and risk analyses.

Debt sustainability in the corporate sector stable

Interest expenditure has increased much more sharply among companies than among households. Unlike households, companies often take out loans with shorter interest rate fixation periods. For example, 27% of their outstanding loan volume is subject to variable or mixed interest rates.⁷⁵ Most of these loans have an interest rate fixation period of no more than three months, which means they are adjusted to the market level at regular intervals. A further 28% are fixed rate contracts that allow for an adjustment of the interest rate before the end of the term.⁷⁶ Higher market interest rates can therefore pass through more quickly and more forcefully to existing corporate loans than to existing

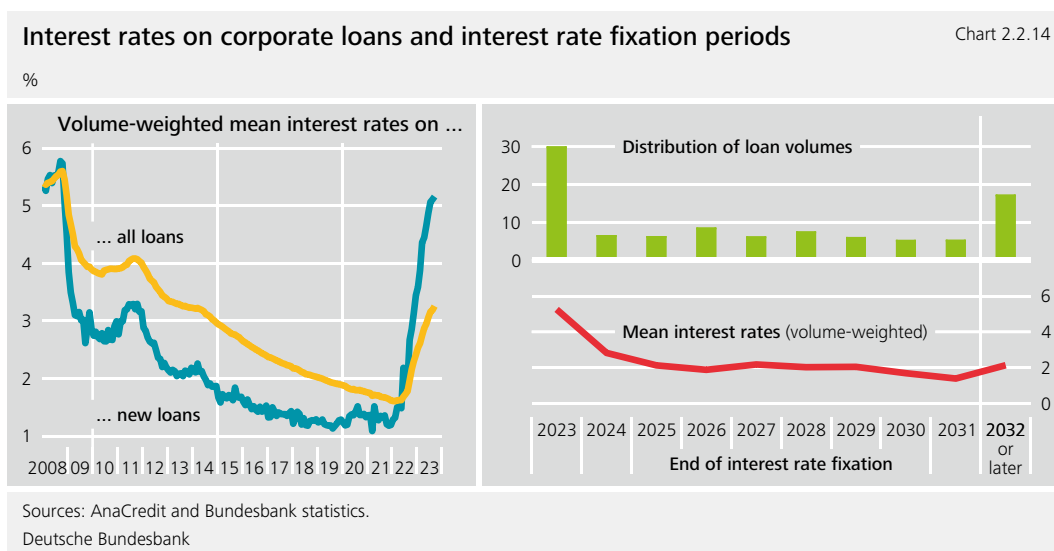
⁷² In line with their relative shares in lending business, the vast majority of these reporting entities are banks, but the data collection also covers other lenders, such as insurers. The full quarterly reporting group comprises 298 lenders at present.

⁷³ In addition, as of the beginning of 2024, smaller to medium-sized lenders will start reporting on an annual basis and with a partially reduced reporting scope. For more information on the reporting requirements, see Data collection on housing loans (WIFSta).

⁷⁴ See European Systemic Risk Board (2016) and European Systemic Risk Board (2019). The ESRB's recommendation on medium-term vulnerabilities in the residential real estate sector in Germany also pointed to significant data gaps. See European Systemic Risk Board (2021a).

⁷⁵ Mixed interest rate loans are loans where fixed and variable interest rates apply in turn.

⁷⁶ In the case of fixed interest loans, the interest rate is often fixed for only part of the loan's term. After this period has elapsed, the fixed interest rate can be adjusted. Data source: Anacredit, as at June 2023.



residential real estate loans. The average interest rate on loan agreements allowing interest rate adjustments up to the end of 2023 was 5% in June 2023, which was roughly the same as for new lending (see Chart 2.2.14). Loans falling into this short range of interest rate fixation periods account for around one-third of existing lending and have predominantly variable rates. In July 2023, the average interest rate across the total loan portfolio increased by 1.4 percentage points on the year to around 3%.

Nevertheless, in aggregate terms, companies kept their debt service ratio largely constant, as they were able to increase their income. A study conducted by the ifo Institute suggests that some companies used the inflationary environment to introduce significantly higher prices for their own products and to expand their profits.⁷⁷ Following the sharp slump in 2020 and 2021, corporate profitability improved and, all in all, almost returned to pre-pandemic levels in 2022.⁷⁸ Figures for listed companies also show that the distribution of debt service capacity in 2022 was similar to that in 2019 (see Chart 2.2.15). Moreover, according to the latest preliminary figures for 2021, companies' capitalisation levels were high.⁷⁹ Overall, debt sustainability appears robust.

Increased risks from the corporate sector

Companies' interest expenditure could rise further if longer-term loans need to be refinanced. In June 2023, the interest rates on loans with interest rate fixation periods

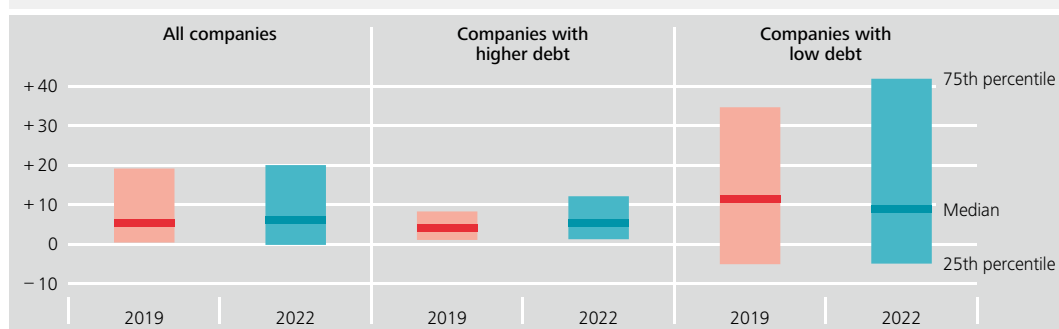
⁷⁷ See Ragnitz (2022). The study shows the growth in profits for the first half of 2022.

⁷⁸ Profitability is measured as the ratio of operating surplus to total non-financial liabilities, according to data taken from the national accounts.

⁷⁹ Data source: Financial statement statistics (extrapolated results), as at December 2022.

Interest coverage ratios of listed companies*

Chart 2.2.15



Source: Refinitiv (LSEG). * The 2022 sample covers 480 German companies; the 2019 sample covers 462 German companies. The interest coverage ratio is the ratio of earnings before interest and taxes (EBIT) to interest expenditure. Companies with higher debt are companies whose ratio of debt to equity exceeds the median value for the year in question; companies with low debt are those with levels of debt relative to equity that are below that year's median.

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ending in 2024 or later were only around 2% on average (see Chart 2.2.14). Most of these predominantly fixed rate loans were taken out on very favourable terms prior to the market-wide rise in interest rates. Based on the distribution of the interest rate fixation periods, it can be assumed that interest rates will be adjusted for just over 5% of the current outstanding loan volume each year over the coming years, provided that the loans are refinanced and the total volume of loans remains the same.

The potentially higher borrowing costs should be manageable for the vast majority of companies. Some, however, could run into difficulties, especially those with both higher debt and low profits. Among listed companies, for which relatively up-to-date data are available, relatively few companies fulfil both of these criteria. For example, fewer than one-quarter of more highly indebted companies had an interest coverage ratio of less than 1 in 2022 (see Chart 2.2.15).⁸⁰ This proportion did not change significantly compared with 2019. An interest coverage ratio of 1 is a critical threshold, as the enterprise's annual earnings before interest and taxes would then be insufficient to cover its interest expenditure.⁸¹

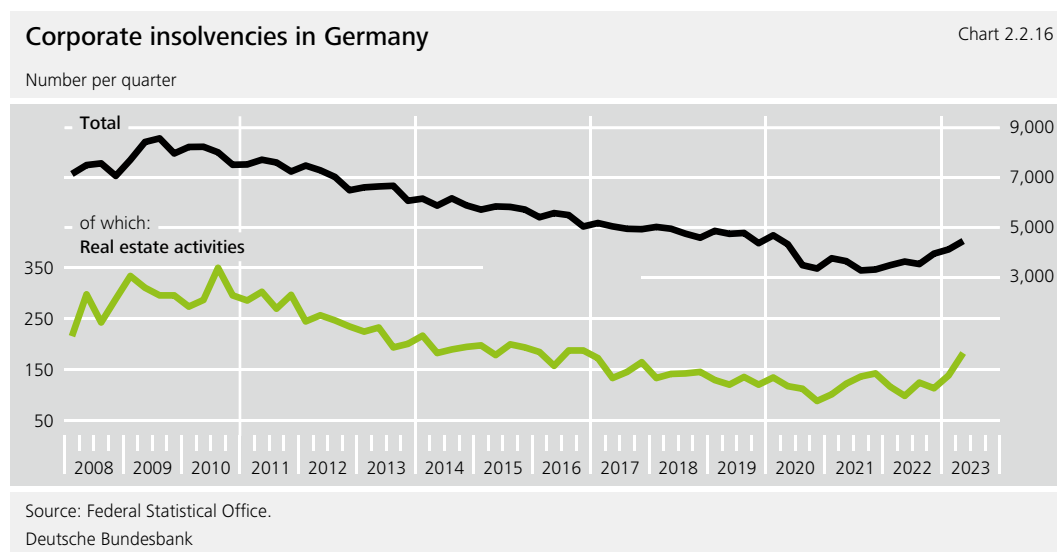
Lending to companies has declined since the fourth quarter of 2022, following strong growth between the end of 2021 and the third quarter of 2022. The Euro-system's quarterly Bank Lending Survey indicates that demand for loans has fallen sharply since October 2022. One reason for this could be that companies raised capital on a large scale in 2022 in anticipation of rising interest rates and now have lower borrowing needs as a result. In addition, the higher interest rate level, weak economic activity and heightened uncertainty regarding economic developments are also likely to be contributing to a decline in the demand for loans. However, supply-side factors are also playing a role.

⁸⁰ An interest coverage ratio of less than 1 means that a company is unable to settle its interest expenses from its current revenue.

⁸¹ The resulting loss would reduce equity capital, including any hidden reserves.

For example, banks have tightened their credit standards since the second half of 2022. They are now giving greater weight particularly to the factors that influence their risk assessment. These include, for example, the economic situation as well as firm-specific and sector-specific factors. Data from the Bundesbank Online Panel – Firms (BOP-F) indicate that, in terms of approving requested credit amounts, banks have been barely more restrictive in credit negotiations in 2023 than in previous years. According to the survey results, it is instead their terms and conditions that have become more restrictive.

The number of insolvencies has increased markedly overall over the past two years, following very low levels of insolvencies in 2020 and 2021 (see Chart 2.2.16). After support measures from the coronavirus pandemic were phased out, corporate insolvencies increased somewhat in 2022 and have continued rising significantly this year.⁸² However, they remain at a low level. The rise in insolvencies varies quite considerably between sectors. It is more pronounced in the real estate activities sector, which is especially dependent on interest rate developments. This sector is significant for the financial system (see the section entitled “Increased risks from commercial real estate markets” on pp. 62 f.), as around 30% of the outstanding bank loans to companies were granted to this sector.⁸³ Against the backdrop of structural challenges and the uncertainty that these entail, corporate insolvencies could continue to rise in future, too (see the section entitled “Introduction and overview” on pp. 9 ff. and the special article entitled “Risks arising from structural change using the decarbonisation of the economy as an example” on pp. 91 ff.).

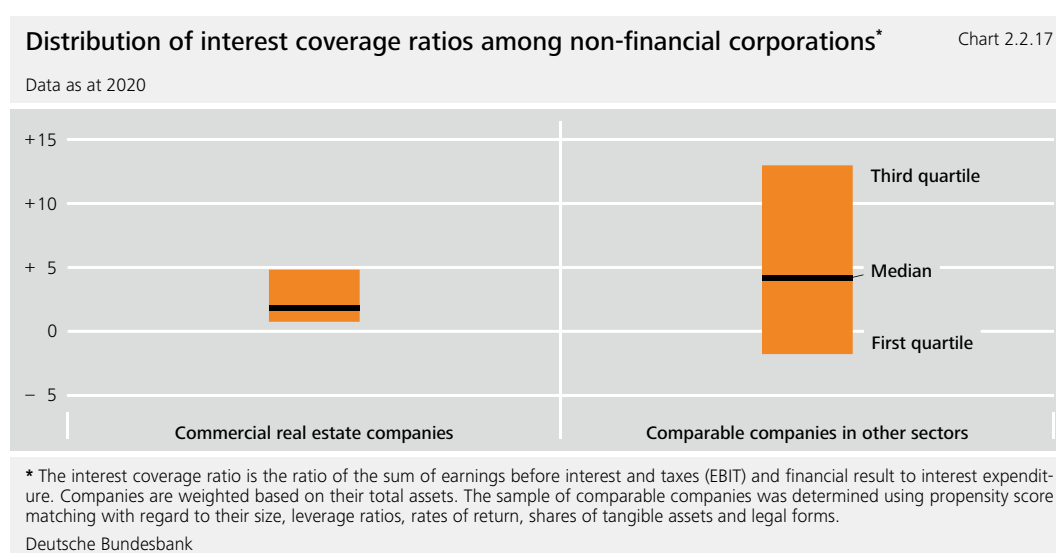


⁸² Data source: Federal Statistical Office.

⁸³ Data source: Borrowers statistics.

Increased risks from commercial real estate markets

The systemic risks from developments in the commercial real estate markets have continued to grow as interest rates have risen. Real estate companies have comparatively low interest coverage ratios (see Chart 2.2.17), making them more vulnerable to rises in interest rates. In addition, profits have declined due to falling real estate prices and the corresponding recognised valuation losses. Around one-third of commercial real estate loans could be subject to significant adjustments in their interest rates over the next three years. This could cause credit defaults and credit losses to rise more sharply, as the value of loan collateral has been falling for some time. Starting from a low level, a slight increase in credit defaults is already perceptible. Nevertheless, the increased risk emanating from the commercial real estate market has thus far not led to net outflows from the real estate fund sector as a whole. This may also be partly due to strict minimum holding and notice periods.

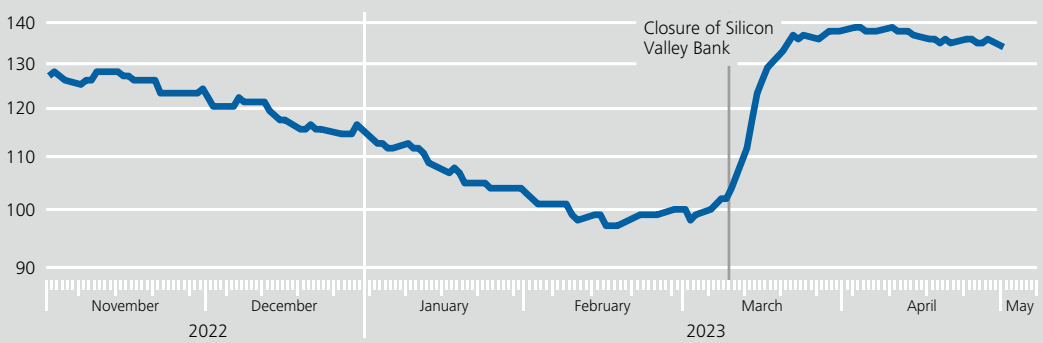


Risk premia for commercial real estate risks have risen sharply, especially in the United States. The outstanding volume of loans granted by the German banking system to the US commercial real estate market is comparatively small, but relatively concentrated at individual banks. In the wake of the disruptions surrounding Silicon Valley Bank, there was a sharp uptick in both media interest in the US commercial real estate market as well as the risk premia in the US securitisation market for commercial real estate loans (see Chart 2.2.18). Given the persistently elevated interest rates and the structural challenges in the commercial real estate market, such short-term disruptions cannot be ruled out in future, either.

Risk premia for US commercial mortgage-backed securities*

Chart 2.2.18

End-February 2023 = 100, log scale



Source: Bloomberg Finance L.P. * A commercial mortgage-backed security (CMBS) is a tradable security created through securitisation that is backed by a pool of loans for commercial real estate and multi-family dwellings (rental housing).

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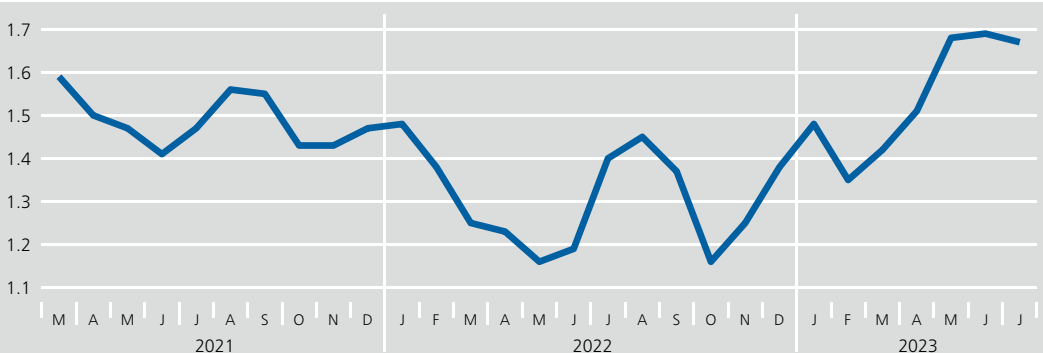
Higher risk premia can also be observed in the loans granted by German banks.

Interest rates on commercial real estate loans have risen more sharply than risk-free interest rates (see Chart 2.2.19). Banks therefore appear to be pricing the increased risk into their new lending.

Interest rate spreads on commercial real estate loans in Germany*

Chart 2.2.19

Percentage points



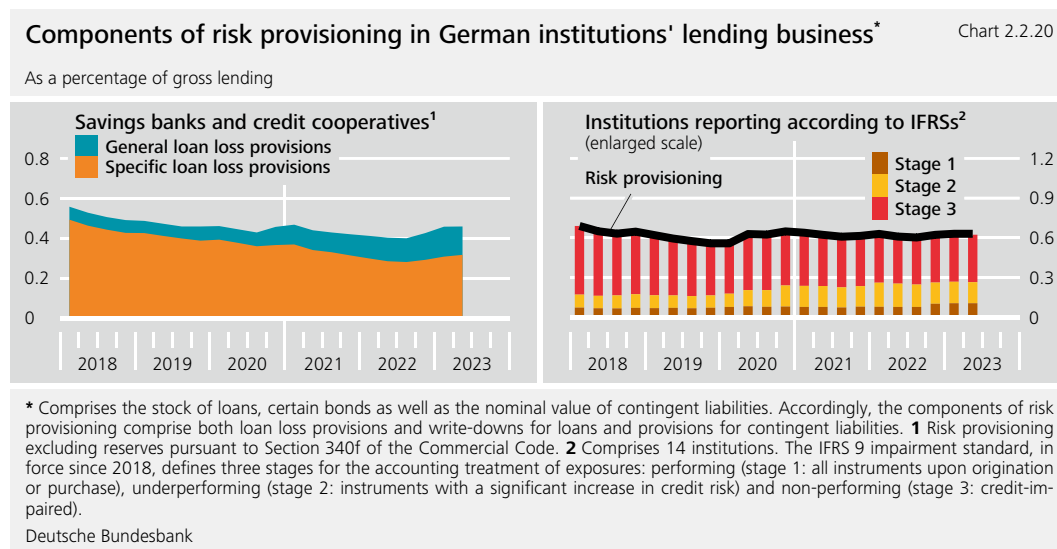
Sources: AnaCredit and Bundesbank calculations. * Median of the interest rate spreads relative to a risk-free interest rate with the same maturity. Only euro-denominated lending is taken into account.

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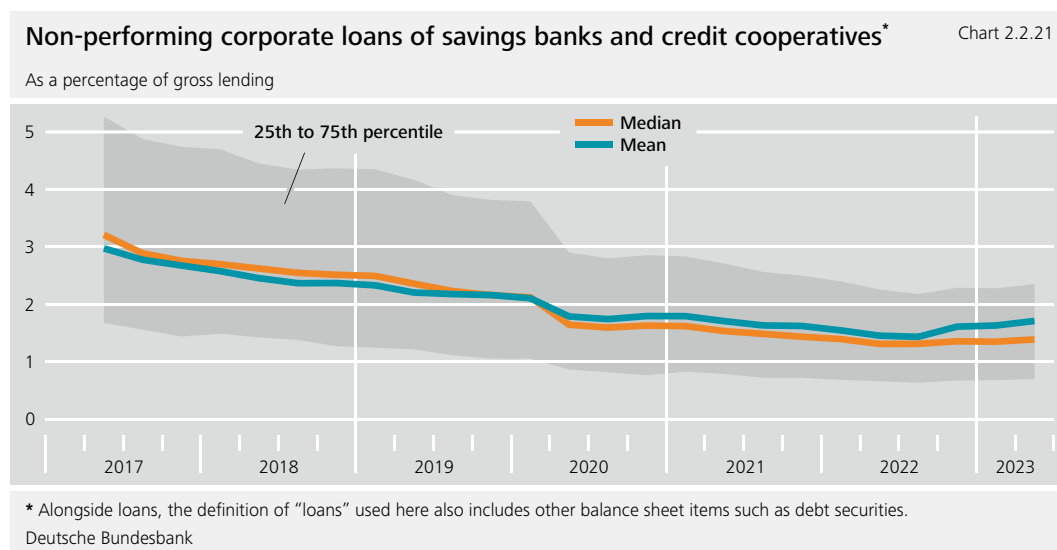
Increasing risk of losses in banks' credit portfolios

The changed macro-financial environment contributed to the increase in non-performing corporate loans in the first half of the year. In 2023, savings banks

and credit cooperatives, in particular, have again significantly increased their risk provisioning, i.e. the sum of their specific and general loan loss provisions, although this increase has occurred from a very low level (see Chart 2.2.20). After a long period of virtually continuous decline in credit risk, this is now bottoming out and potentially even turning around. One indication of this, amongst others, is that savings banks and credit cooperatives have increased their specific loan loss provisions again for the first time since 2004. Specific loan loss provisions are recognised mainly in the case of non-performing loans, whereas general loan loss provisions only cover latent credit risks. Credit risk has evidently increased in a tangible and sustainable manner.



The increase in non-performing loans appears to signal the end of the long period of unusually low default risk. Since mid-2022, there has been an increase in the proportion of non-performing corporate loans (see Chart 2.2.21). In the period of low interest



Macroprudential perspective: cross-border contagion effects and systemically important banks

Microprudential stress tests – such as that conducted this year by the EBA and the ECB – measure the impact that hypothetical adverse scenarios would have on the resilience of banks. The predefined scenarios used for these tests frequently depict longer periods of low growth, elevated interest rates and high inflation. The focus of the microprudential stress tests is on how the scenarios affect the individual banks under examination.

In addition to the direct effects of the stress scenario on the banks in question, the banks' linkages with other banks may lead to second-round effects that amplify the initial shock. Quantifying contagion effects is not part of the microprudential stress tests. From a macroprudential perspective, however, it is important to take account of contagion effects – especially those from abroad – particularly since German systemically important banks have strong linkages with foreign banks.¹

In order to quantify such contagion effects, the banking system loss model is used.² This is a network model that, in addition to banks' credit losses and market value losses, also factors in contagion effects via the interbank market. For credit linkages on the interbank market, the model quantifies the impact of a deterioration in the borrower bank's creditworthiness on both the capital – via depreciation and write-downs – and risk-weighted assets of the lender bank.³ Since each bank can be both a borrower and a lender, contagion cascades through the system. Alongside German banks, the application of the model discussed here also includes 90 European big banks from the euro area. As a result, the majority of interbank linkages within the euro area are covered.

¹ The systemically important German banks account for around two-thirds of German banks' claims on the foreign European big banks considered here. Measured in terms of their common equity tier 1 (CET1) capital, these exposures are around four times larger at the systemically important banks compared with the other German banks.

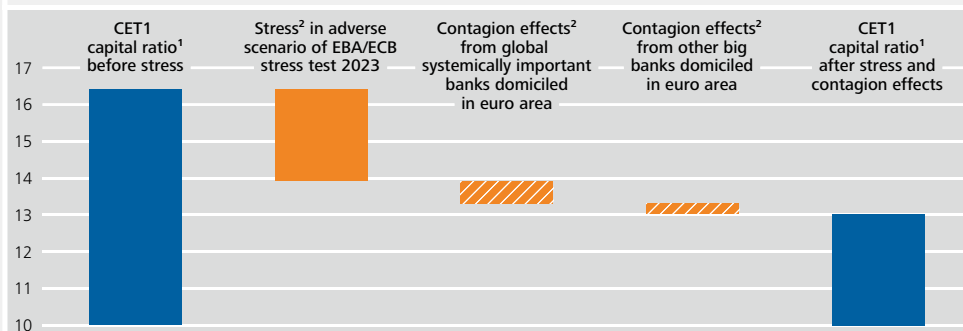
² See Fink et al. (2016).

³ The imposed shock takes the form of the decline in capital ratios in the adverse scenario of the stress test in the period from the end of 2022 to the end of 2025. In the model, banks must fulfil regulatory minimum requirements regarding risk-weighted capital ratios, including Pillar 2 requirements (P2R), and a leverage ratio (LR) of 3%. In the EBA and ECB stress test, by contrast, there are no threshold values that determine whether a bank passes or fails. The model does not take account of any changes to the structure of the interbank market over time.

The starting point for the analysis is the results of this year's EBA and ECB European stress test for the hypothetical adverse scenario, which assumes a **severe economic downturn**.⁴ As a result of the assumed adverse shock, German banks' common equity tier 1 (CET1) capital ratio falls from 16.4% to 13.9% (see the chart).⁵

Decline in CET1 capital ratio in the German banking system

As at Q4 2022, %



¹ Ratio of common equity tier 1 (CET1) capital to risk-weighted assets (RWAs) before stress (blue, left) and after stress and contagion effects (blue, right). ² Decline in CET1 capital ratio due to stress (orange) and contagion effects (hatched orange).

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Since there is a decline in the solvency of foreign big banks in the euro area, as measured by the stress test, there are repercussions for the German banking system.⁶ Overall, due to cross-border contagion effects in the banking system loss model, the adverse shock leads to an additional reduction in German banks' CET1 capital ratio of around 1 percentage point.⁷ The decline in the CET1 capital ratio of 2.5 percentage points measured in the stress test is thus amplified through contagion effects by around 40%. Foreign banks contribute to this to varying degrees. For instance, the largest cross-border contagion effects affecting German banks are caused by the global systemically important banks (G-SIBs) domiciled in the euro area. These banks account for around two-thirds of the cross-border contagion effects quantified here. This corresponds to a decline in the CET1 capital ratio in the German banking system of around 0.6 percentage point.

⁴ For more information on the assumptions and results of the 2023 EBA stress test, see European Central Bank (2023) and <https://www.eba.europa.eu/risk-analysis-and-data/eu-wide-stress-testing>

⁵ In the banking system loss model, all German banks are included in the capital ratios. It is not limited to the banks participating in the EBA and ECB stress test. The results already take account of the IFRS 17 accounting standard. However, compared with the outcomes based on accounting in accordance with IFRS 4 – the accounting standard that was applicable on the reference date of the stress test (31 December 2022) – this makes a significant difference only for a few individual banks. See European Central Bank (2023).

⁶ Specifically, the CET1 capital ratio of the foreign banks concerned falls from 15.2% to around 10.4%.

⁷ Banks' adjustment responses, such as balance sheet reductions, and stabilisation measures are abstracted.

The inclusion of second-round effects via the interbank market is an important addition for assessing banks' resilience. It takes account of the strong cross-border linkages at major German banks. During crisis scenarios, the impact of cross-border contagion effects on the German banking system can be significant. For this reason, it is important to identify adverse developments at an early stage in order to be able to estimate possible second-round effects on German banks.

rates, institutions may have underestimated their medium-term credit risk because they considered a rapid rise in interest rates to be unlikely. Their underestimation of the risk of losses was probably also attributable, in part, to the fact that the impact of past recessions was mitigated considerably by additional monetary and fiscal policy measures. This led, inter alia, to banks granting more loans to relatively riskier companies. Depending on the economic situation, this could now contribute to a stronger rise in loan loss provisions over the coming quarters. Overall, however, the loan loss provisions of all banks combined are still at a very low level.⁸⁴ Taken in isolation, an expected significant increase in credit defaults would therefore also be manageable for most institutions. This is also shown by the European stress tests conducted this year by the European Banking Authority (EBA) and the ECB.⁸⁵

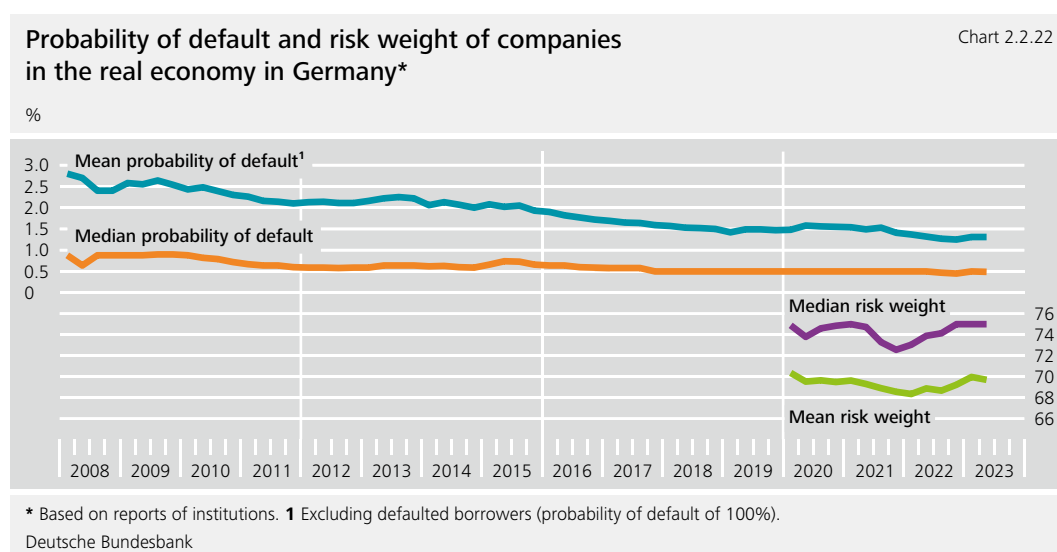
In an adverse scenario with a very sharp decline in economic output of 6.4% over three years, the aggregate common equity tier 1 (CET1) capital ratio of the German banks par-

⁸⁴ In the case of small and medium-sized credit institutions that prepare their financial statements in accordance with the Commercial Code, loan loss provisions include specific and general loan loss provisions. In the case of large, systemically important banks that prepare their financial statements in accordance with IFRSs, loss allowances are recognised from stages 1, 2 and 3.

⁸⁵ The 57 largest euro area banks participated in the stress test coordinated by the EBA. These included 14 German institutions. In parallel, the ECB examined other medium-sized institutions under its direct supervision that did not participate in the EBA stress test. Generally speaking, this test is similar to the EBA stress test, although some methodological aspects were simplified for the 41 banks examined by the ECB – eight of which were German institutions. Together, these 98 banks cover around 80% of all banking sector assets in the euro area.

icipating in the stress tests would fall by 5.6 percentage points to 10.2% between the end of 2022, the base year of the stress tests, and 2025. In this scenario, a significant proportion of the banks would fall short of the overall capital requirements, including the combined buffer requirements. This result indicates that there are still stability risks at German banks. The institutions concerned will be subject to increased scrutiny by supervisors. The results of the stress test also feed into the banks' non-binding Pillar 2 guidance (P2G). This microprudential stress test only partially captures systemic effects. For example, German institutions are highly interconnected with other European banks, which would also suffer considerable losses. This could cause the CET1 capital ratio to fall by around another percentage point (see the box entitled "Macroprudential perspective: cross-border contagion effects and systemically important banks" on pp. 65 ff.).

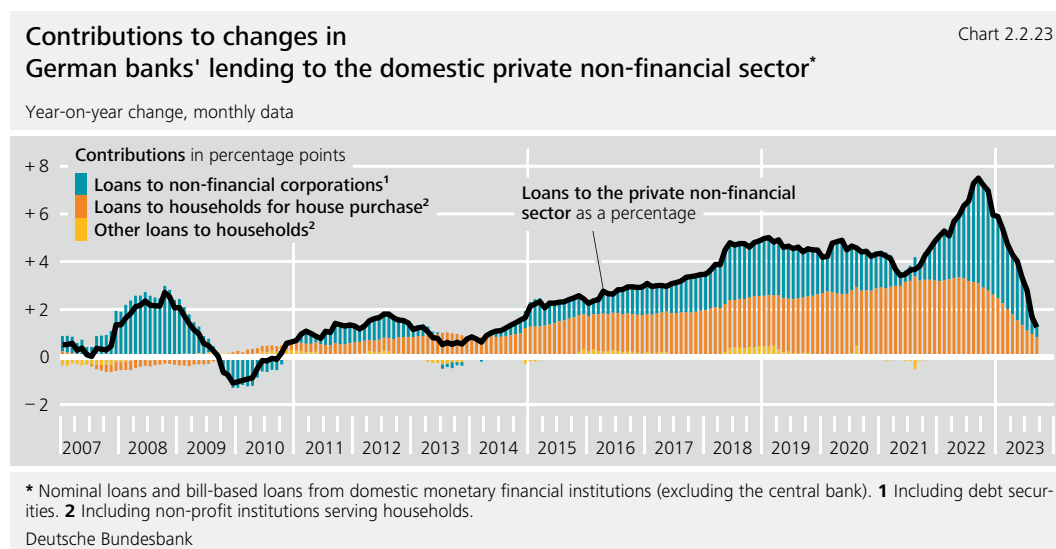
Increasing default risks are likely to push up banks' capital requirements. This applies, in particular, to the large, systemically important banks that use internal models to calculate their capital requirements. In order to make these calculations, they estimate the probabilities of default for their loans, which are important input parameters for the risk weights used to determine their capital requirements. For the group of institutions concerned, a slight increase in the average probability of default has been observed on aggregate since the fourth quarter of 2022 (see Chart 2.2.22). However, it is still below the level



seen in 2021. Probabilities of default are expected to increase further in future in line with the changed risk environment. In the past, an increase of 1 percentage point in companies' interest expense ratio alone led, on average, to an increase of just under 0.1 percentage point in their probability of default.⁸⁶ Combined with weak economic activity, probabilities of default could rise even more sharply.

⁸⁶ See Deutsche Bundesbank (2022).

Owing to increasing risks, banks have already tightened their credit standards significantly in corporate banking, too. According to the BLS, this tightening has primarily taken the form of widening margins and increased collateral requirements. As a result, growth in lending fell sharply at the beginning of the year (see Chart 2.2.23). New lending to companies fell particularly sharply, following a strong increase in 2022. Lending to households for house purchase also declined and persists at a low level.



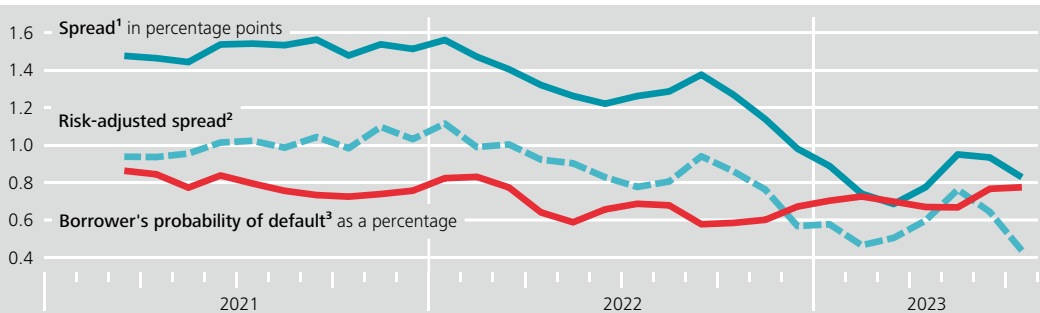
The spreads on lending rates have continued to narrow slightly over the course of the year. The spread, which is calculated as the average difference between lending rates and yields on risk-free Federal bonds with the same maturity, compensates banks for, inter alia, their expected losses from credit defaults in their loan portfolios (see Chart 2.2.24). The risk-adjusted spread, which is the spread after the expected loss has been deducted, is also at a comparatively low level.⁸⁷

⁸⁷ The expected loss is the statistical expected value of the loss for the lending operation in question. It is the product of the probability of default (PD) and the expected loss given default (LGD). For LGD, a value of 45% was assumed here. This value is used in the IRB foundation approach for LGD. Under the IRB foundation approach, eligible institutions can calculate their capital requirements using their own models.

Probability of default and spread in new lending to non-financial corporations in Germany

Chart 2.2.24

Volume-weighted averages of the respective last three months



Source: AnaCredit. **1** Lending rate less interest rate of listed Federal securities with the same interest rate fixation period. **2** Spread less 0.45 * probability of default. **3** According to the latest report from the lender.

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■ Resilience of the German financial system

Resilience of the banking system should be strengthened further

The German banking system currently exhibits a high level of solvency as measured by the common equity tier 1 (CET1) capital ratio, i.e. the ratio of CET1 capital to risk-weighted assets (RWAs). The increase in the CET1 capital ratio in 2023 is due primarily to a rise in CET1 capital, while RWAs rose only slightly in the same period.⁸⁸ The CET1 capital ratio currently stands at 17.4% for large, systemically important banks (4.4% relative to total assets), 15.8% for savings banks and credit cooperatives (9.3% relative to total assets), and 19.1% for other banks (7.2% relative to total assets) (see Chart 2.2.25).⁸⁹

The resilience of the banking system is measured, in particular, by the size of its capital reserves.⁹⁰ Capital reserves refer to the share of CET1 capital that banks hold in

⁸⁸ RWAs are assets that are weighted according to their level of risk.

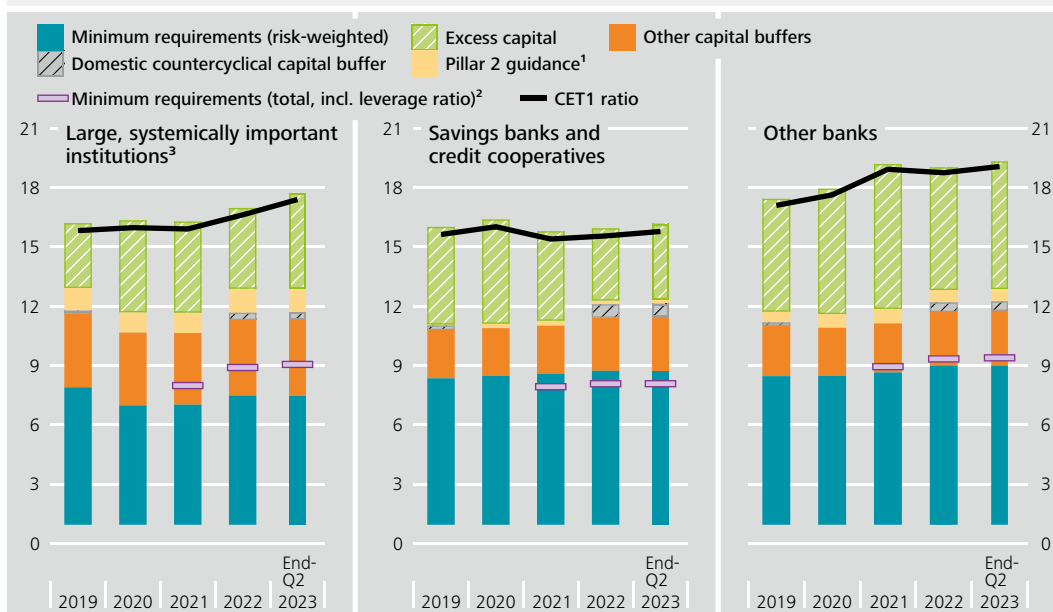
⁸⁹ CET1 capital comprises paid-in equity instruments, which have to meet specific requirements, in addition to disclosed reserves. Both components must be available to institutions for unrestricted and immediate use to cover risks or losses. See also <https://www.bundesbank.de/en/tasks/banking-supervision/individual-aspects/own-funds-requirements/own-funds/own-funds-622952>. The four other systemically important institutions (O-SIIs) that relocated their business to Germany because of Brexit were not included until the end of 2021. For this reason, the group of large, systemically important institutions includes only 12 of the 16 O-SIIs up to 2021.

⁹⁰ See Deutsche Bundesbank (2022). Other factors also have an impact on institutions' resilience, e.g. their level of liquidity and investment in IT and cybersecurity.

German banks' CET1 capital

Chart 2.2.25

As a percentage of risk-weighted assets; year-end data



1 Capital recommendations under Pillar 2 (P2G) included after taking into account existing netting options. **2** Banks are required to meet either the risk-weighted Pillar 1 and Pillar 2 requirements for CET1 capital or the unweighted requirements for CET1 capital (leverage ratio, applicable from Q2 2021), whichever are greater. Where the unweighted requirement is binding, the usability of the combined buffer requirements is limited. **3** Comprises 16 other systemically important institutions (O-SIIs), with the four institutions that re-located a significant share of their banking business to Germany following Brexit only being included as of 2022.

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excess of the total minimum regulatory requirements. The first and smallest component of the capital reserves consists of the package of macroprudential measures amounting to €24 billion. This corresponds to 0.7% of RWAs (see the box entitled “Impact of the package of macroprudential measures on the resilience of German banks” on pp. 73 ff.). The second component comprises the other regulatory capital buffers and amounts to €100 billion, or 3% of RWAs. Excess capital constitutes the third component of the capital reserves. This is the portion of CET1 capital that banks voluntarily hold in excess of the overall minimum requirements and capital buffers. In mid-2023, excess capital stood at approximately €160 billion, or 4.7% of RWAs (see Chart 2.2.25). Together with the capital buffers, banks therefore have capital reserves totalling €280 billion, or 8.3% of their RWAs. These reserves enable banks to absorb losses during periods of stress without breaching the minimum requirements.⁹¹ The larger the capital reserves, the lower the pressure on the banking system to scale back RWAs in the event of losses. A sharp reduction in RWAs could contribute to an undesirable decline in the supply of credit. For this reason, sufficiently large capital reserves are desirable from a macroprudential perspective.

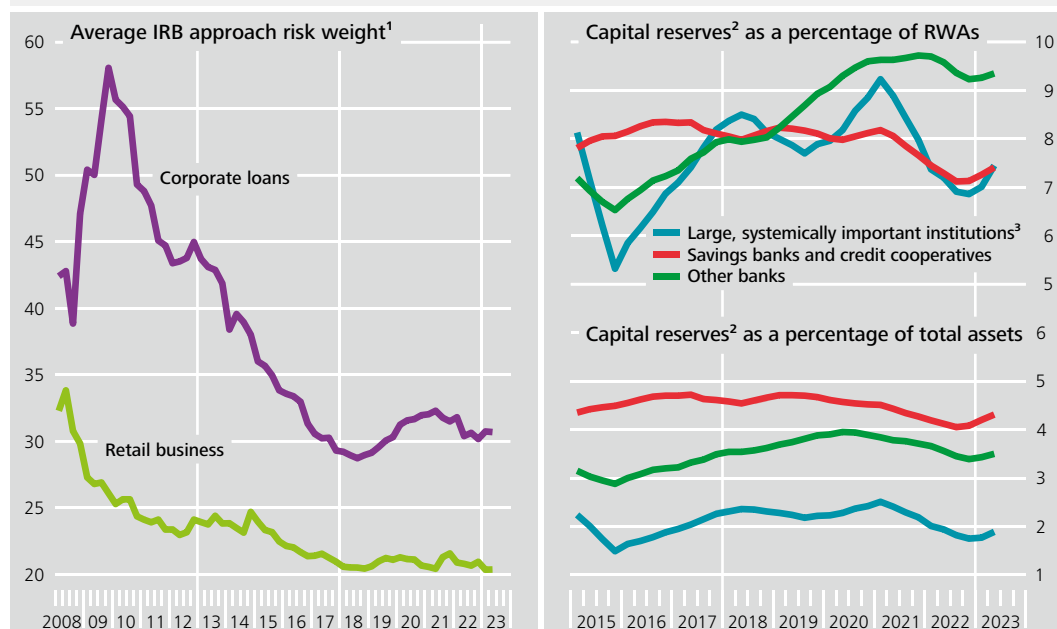
⁹¹ It should be noted that capital reserves only factor in the share of excess capital and the countercyclical capital buffer (CCyB) that is not constrained by parallel regulatory capital requirements and that banks can therefore utilise in full to absorb losses during periods of stress. These parallel requirements include, in particular, the leverage ratio and the minimum requirement for own funds and eligible liabilities (MREL). For the effects that these regulations have on the usability of the capital buffers, see Basel Committee on Banking Supervision (2022).

Current capital reserves would be considerably lower if unrealised losses were to be realised. Due to rising interest rates, the value of banks' asset holdings fell significantly in 2022. Based on the applicable accounting standards, banks were required to report only part of this loss. In addition, banks have been able to avoid reporting losses to a certain extent by reclassifying their asset holdings from current to long-term assets (see the section entitled "Risks arising from interest rate developments" on pp. 35 ff.). There are good reasons why banks are not required to recognise certain assets at their market value. In particular, accounting standards are intended to prevent temporary fluctuations in value from having an effect on capital. In certain circumstances, however, temporary depreciations in value can have an adverse effect on banks' stability. If the banks had been required to report the losses in value in full, their CET1 capital, and therefore also their capital reserves, would have been considerably lower. In addition, capital reserves have been bolstered by the sharp increase in net interest income. Higher interest expenditure could push net interest income back down again in the future.

If credit risks continue to rise, the ratio of capital reserves to RWAs could decline going forward. This mostly affects banks following the internal ratings-based approach (IRBA). They calculate their risk weights themselves using their own risk models. The IRBA is followed by large, systemically important banks, in particular. At present, their models assess credit risk, and consequently risk weights, as relatively low despite the slowdown in economic activity (see Chart 2.2.26). One reason for this may be the fact that, in aggre-

German banks' average IRB approach risk weights and capital reserves

Chart 2.2.26



¹ Measured by RWA density, which is calculated as the ratio of RWAs to respective gross exposures. The calculation also takes account of regulatory provisioning adjustments made in reportable capital when the IRB approach is used. ² Difference between the CET1 capital ratio and minimum CET1 capital requirements. ³ Comprises 16 other systemically important institutions (O-SIIs), with the four institutions that relocated a significant share of their banking business to Germany following Brexit only being included as of 2022.

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Impact of the package of macroprudential measures on the resilience of German banks

Since February 2023, banks in Germany have had to meet the capital requirements of the countercyclical capital buffer (CCyB) and sectoral systemic risk buffer (sSyRB). These capital buffers are the key components of the package of macroprudential measures announced by the Federal Financial Supervisory Authority (BaFin) in January 2022. The CCyB was raised from 0% to 0.75% of risk-weighted assets (RWAs) on domestic exposures and an sSyRB of 2% of RWAs on loans secured by residential real estate was introduced. The package of measures has strengthened the resilience of the banking system by conserving €23.9 billion in common equity tier 1 (CET1) capital as at the end of the first half of 2023. If there is a risk of the credit supply being restricted excessively, the CCyB can be released by BaFin.¹ Releasing conserved capital would enable banks to hold the necessary capital against additional loans totalling over 15% of annual new lending to domestic non-financial corporations and households.²

The Bundesbank regularly reviews the impact of the package of macroprudential measures on the banking system. Overall, less than 15% of banks' original excess capital is conserved via the buffers. Only a few small institutions have so far failed to meet the requirements of the package of measures using their excess capital. The package of measures has not been observed to have had any negative macroeconomic effects on the supply of credit. Interest rates on new loans have more or less tracked the general level of interest rates. Although credit growth has slowed this year, this is mainly the result of a contraction in demand for loans (see the section entitled "Risks from the household and corporate sectors" on pp. 49 ff.).³

The package of measures can give banks an additional incentive to build up CET1 capital. This incentive ought to have been especially great for banks that

¹ In principle, the CCyB can also be used to cover losses without being released. Loss coverage means that capital can be reduced in the event of losses. However, a general release prevents individual banks from being stigmatised for needing to use their buffers to cover losses. Stigmatisation could result in these banks restricting their lending rather than using their capital.

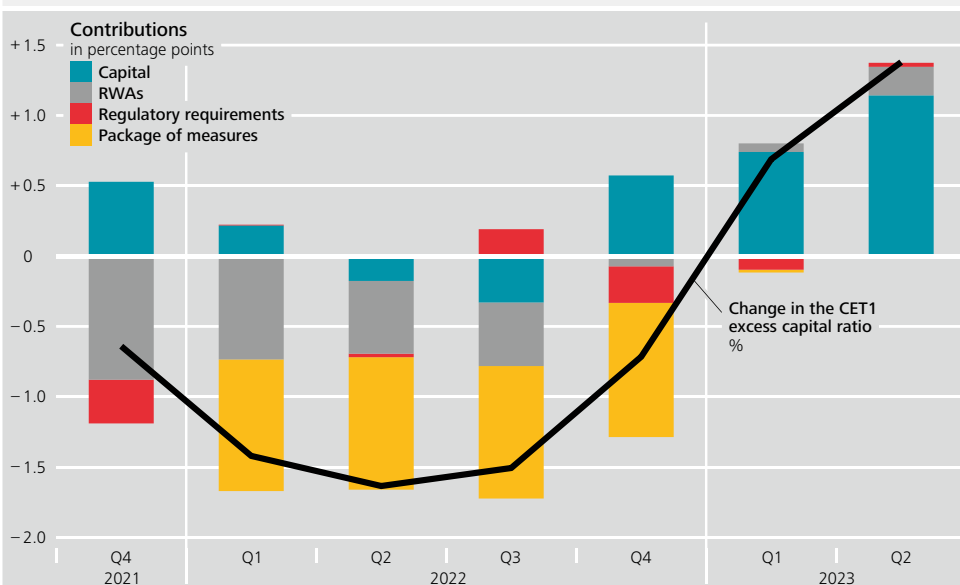
² Banks need to back new loans with capital, the amount of which depends on loan volume, risk weight and their capital requirements. The analysis assumes constant capital requirements and a counterfactual increase of five percentage points in bank-specific risk weights, which could occur in a hypothetical period of stress.

³ Developments in the banking system as a whole are consistent with other analyses showing that, as long as banks generate profits or have sufficient excess capital, an increase in capital requirements has only a minor effect on the aggregate supply of credit and thus on new lending volumes and interest rates; see Lang and Menno (2023).

were unable to meet the buffer requirements using existing excess capital. Measured in terms of total assets, the market share of institutions that did not hold sufficient excess capital to meet the requirements of the package of measures in at least one quarter of 2022 is somewhat over 1%.⁴ In order to reduce the shortfall compared with capital requirements and to increase their excess capital ratio, i.e. the ratio of excess capital to RWAs, banks generally have two options: build up CET1 capital or scale back their RWAs. In addition, the excess capital ratio increases when nominal capital requirements fall. Changes in the excess capital ratio can be decomposed into these three contributing factors (see the chart). The share of the package of measures is taken into account from the point in time at which the package of measures was announced in the first quarter of 2022 and presented separately from the other regulatory requirements.

Decomposition of contribution to the excess capital ratio of capital-constrained banks*

Change against same quarter of previous year



* These are banks that were unable to meet the capital requirements in at least one quarter of 2022. The excess capital ratio is calculated as the difference between CET1 capital as a percentage of RWAs and minimum CET1 requirements (from Pillar 1 and Pillar 2, including leverage ratio) together with combined buffer requirements. The capital buffers from the package of measures announced in February 2022 are taken into account from Q1 2022. Pillar 2 guidance is not deducted from the excess capital ratio.

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The excess capital held by relatively weakly capitalised institutions has risen since the first quarter of 2023, after initially falling following the announcement of the package of measures (see the chart). This development has been

⁴ If Pillar 2 guidance is also taken into account as a capital requirement, the institutions affected are still only small banks with a market share of 2.5%.

driven by the rise in CET1 capital, which is significantly higher than it was one year ago, even compared with the banking system as a whole. This is due, first, to capital increases, a number of which had already been planned prior to the package of measures being announced. Second, these banks have been able to accumulate additional revenue reserves in recent quarters. There is no evidence that they have refrained from distributing profits in order to do so.

gate terms, firms have been able to keep their debt service ratio roughly steady despite rising interest rates on account of having been able to increase their income (see the section entitled “Risks from the household and corporate sectors” on pp. 49 ff.). If risk weights start to increase from their current low level, RWAs in existing business would grow rapidly, especially among large banks. By contrast, in the standardised approach, which is used by the majority of small and medium-sized banks, risk weights are largely predefined and therefore not subject to change over time.⁹²

Banks’ liquidity remains strong; however, potential contagion effects are, by their nature, difficult to gauge. In the second quarter of 2023, the liquidity coverage ratio (LCR) stood at 148% for large, systemically important institutions (see Chart 2.2.27), 166% for savings banks and credit cooperatives and 183% for other banks. This means that the LCR for all categories of bank is well above the regulatory threshold of 100%.⁹³ However, although a good level of liquidity is necessary, it is not sufficient to ensure that institutions remain solvent. The bank failures in the United States and Switzerland have once again highlighted that, in addition to a sound capital and liquidity base, good liquidity manage-

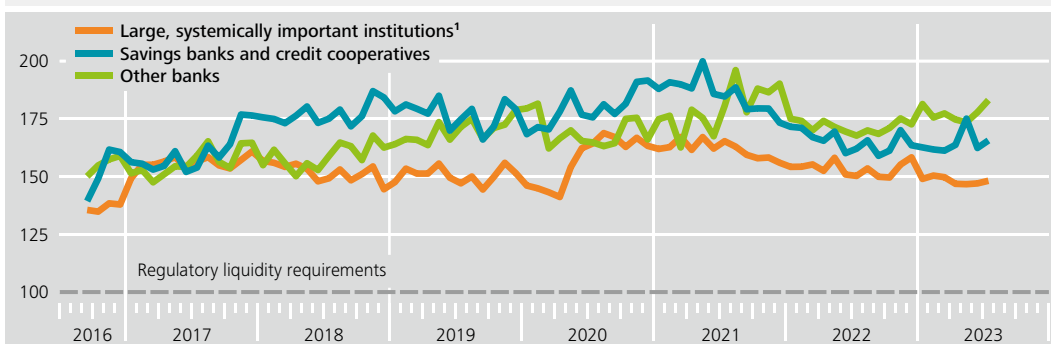
⁹² In the standardised approach, the risk weights for corporate loans are determined where possible using ratings by external credit assessment institutions. However, the majority of the borrowers at small and medium-sized banks in Germany do not have a rating. Fixed risk weights are defined for these borrowers.

⁹³ The LCR is a regulatory measure that determines the ratio of liquid assets to short-term liquidity outflows expected during a period of stress. Institutions must adhere to a threshold of 100%.

German banks' liquidity coverage ratio*

Chart 2.2.27

%, weighted average



* Ratio of liquid assets to liquidity outflows in a stress scenario lasting 30 calendar days. ¹ Comprises 16 other systemically important institutions (O-SIIs), with the four institutions that relocated a significant share of their banking business to Germany following Brexit only being included as of 2022.

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ment is vital. In this regard, German banks are in a considerably better position than US banks, which were beset by liquidity problems in the second quarter of 2023. This is especially true with respect to the former's comparatively high share of covered deposits. Also, maturity transformation is not as extreme as in the case of the distressed banks in the United States. The establishment of a digital euro could create additional demand for liquidity in the German banking system in the future. But given present liquidity levels and the holding limits currently under discussion, any additional demand is likely to be manageable (see the box entitled "Digital euro: holding limits and their potential impact on the liquidity of German banks" on pp. 77 ff.).

Resilient insurers and investment funds may have a stabilising effect

Measured in terms of their solvency ratios according to Solvency II, the resilience of German life insurers remains high. At just under 600% in the second quarter of 2023, the median prudential solvency ratio, i.e. the ratio of own funds to capital requirements, is approximately 200 percentage points higher than at the end of 2021 (see Chart 2.2.28 on p. 80). The main reason for this is the rise in risk-free interest rates. When interest rates increase, recognised liabilities decline more sharply in value than assets because of their longer maturities. Major differences can be seen between the individual insurers. This is illustrated by the gap between the 10th percentile and the 90th percentile. All in all, resilience – as with banks – is reduced by unrealised losses (see the section entitled "Risk situation in the insurance sector improved despite unrealised losses and liquidity risks" on pp. 43 ff.).

Digital euro: holding limits and their potential impact on the liquidity of German banks

On 18 October 2023, the ECB Governing Council decided to move to the first stage of the preparation phase for the possible introduction of the digital euro. This decision was preceded by a two-year investigation phase. The ECB's plans for the digital euro reflect the growing trend of the economy going digital. As an additional payment method using central bank money, the digital euro would be available alongside cash and complement it with digital functions.

If the digital euro is introduced, users resident or established in the euro area will be able to exchange cash or bank deposits for digital euro. The exchange of bank deposits would lead to an outflow of liquidity from banks. In order to rule out any possible negative impact on the banking system and financial stability, the European Commission's current legislative proposal on the digital euro stipulates that the ECB may place limits on use of the digital euro as a store of value. To this end, there should be a maximum limit for holdings of central bank digital currency. A €3,000 holding limit per person is currently being discussed.¹

It is important to assess the potential impact of the digital euro's introduction on German banks' liquidity. The following statements describe possible effects arising from the use of the digital euro as a substitute for deposits. Four scenarios are examined, which differ in terms of the assumed scale of deposit withdrawals. The number of potential users of the digital euro varies in these scenarios, as does the size of the deposits exchanged for digital euro. Very restrictive assumptions are deliberately selected for the analysis. For example, it is presupposed that users of the digital euro exchange their deposits for the digital currency immediately after it is introduced and that individual banks have not made any advance adjustments to their liquidity management. It is also assumed that the Eurosystem does not take any accompanying measures to support the introduction.

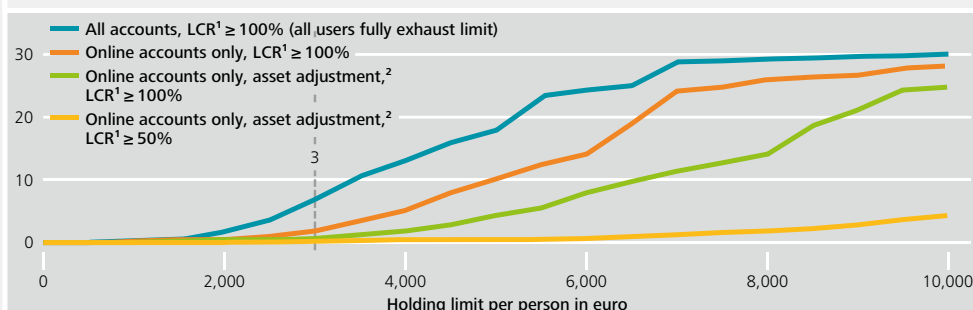
¹ See Bindseil (2020).

The starting point for the analysis is banks' excess liquidity, which is derived from the numerator and denominator of the liquidity coverage ratio (LCR).² This liquidity, calculated under conservative assumptions, is supplemented by additional collateral that, although not classified as high-quality liquid assets, can be used for central bank refinancing operations. As many banks in the German banking system are part of a banking network, additional liquidity available in the networks is also taken into account.³ The liquidity of individual banks is contrasted with the possible withdrawal of deposits upon introduction of the digital euro.

In an extreme scenario, in which all potential users exchange their deposits for digital euro up to the maximum holding limit of €3,000 immediately after the digital currency's establishment, around 7% of the German banking system would no longer have spare liquidity (see the chart).⁴ However, taking into consideration that, initially, it would largely be technically literate users already in possession of an online account who would use the digital euro and that some of the population would be unable to fully exhaust the holding limit owing to lower account balances, the share of liquidity-constrained banks would shrink markedly.⁵ If, as a

Effects of establishing the digital euro: share of banks with liquidity restrictions in different usage scenarios

%, weighted by total assets, as at 31 December 2022



¹ Liquidity coverage ratio. ² Asset adjustment is a flat 25% decrease to account for people who do not fully exhaust the holding limit.

³ Holding limit currently under discussion.

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² LCR excess liquidity is the difference between a bank's high-quality liquid assets and its projected net cash outflows. Based on empirically observed values, a haircut of 40% is applied to the additional liquid assets.

³ Additional liquidity available in the networks comprises short-term liquidity within the respective network, i.e. short-term claims on affiliated credit cooperatives and savings banks or their central institutions less short-term liabilities.

⁴ The share is measured in terms of total assets.

⁵ The share of users with an online account is determined based on the number of online settlement accounts. It is assumed that 25% of the population never use the digital euro and that all others fully exhaust the limit. Given people's income and asset situation, the percentage of people who do not fully exhaust the limit in reality is likely to be significantly higher than 25%. However, those individuals could very well exchange deposits for digital euro below the holding limit.

measure accompanying the establishment of the digital euro, it were temporarily permissible to fall short of the LCR, a sizeable portion of the German banking system would only be constrained in its liquidity if holding limits were very high.⁶

In certain scenarios, liquidity could be scarce at the individual bank level, but the impact on the German banking sector as a whole is likely to be rather small. This is all the more the case if it is assumed that user uptake is gradual rather than abrupt, the Eurosystem takes accompanying support measures and the banks make adjustments before the digital euro is established.

⁶ It is assumed that the LCR is temporarily lowered to 50%.

A resilient insurance sector can make countercyclical investments and have a positive effect on financial stability during periods of stress. Thanks to their long-term investment horizons, insurers can offset sharp declines in the prices of securities by buying undervalued securities and selling overvalued securities. For instance, life insurers with sufficient own funds took a countercyclical approach in the first quarter of 2020 by investing in riskier bonds, the risk premia on which had increased and the prices of which had dropped as a result.⁹⁴

Open-end investment funds are considered resilient if liquidity risks are limited.⁹⁵ Frequently, investors can redeem shares in open-end investment funds within a day. Aside from liquid assets, these funds also hold illiquid assets. Procyclical behaviour on the part of fund investors can amplify price shocks during periods of stress if they react to falling prices by redeeming fund shares. If investment funds do not have sufficient liquid assets with which to service the redemption of fund shares, they are forced to sell assets.⁹⁶ These sell-offs may trigger or amplify a downward trend in the prices of the assets affected. This may lead to contagion effects among banks and other market participants holding similar securities.

⁹⁴ See Deutsche Bundesbank (2020a, 2021).

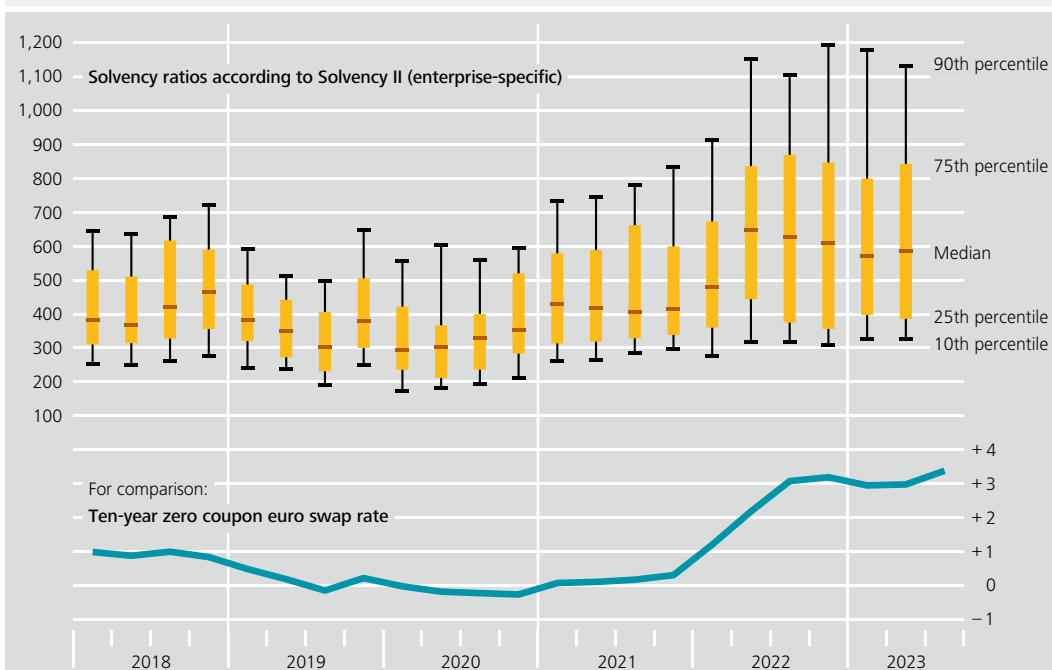
⁹⁵ See Financial Stability Board (2022).

⁹⁶ See Deutsche Bundesbank (2019).

Solvency ratios of German life insurers according to Solvency II*

Chart 2.2.28

%, quarter-end data



Sources: Federal Financial Supervisory Authority and Bundesbank calculations. * Shown here are the solvency ratios of the 63 life insurance companies for which reports are available throughout.

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To date, the German fund sector has rarely used price-based instruments as a means of liquidity management. Liquidity management tools can be deployed to limit redemptions of fund shares during periods of stress, thereby also reducing risks to financial stability caused by contagion effects.⁹⁷ Where liquidity problems have already arisen, restrictions on the redemption of fund shares may protect the fund from closure. By contrast, price-based instruments that pass on the costs of redeeming shares in full to the investor redeeming them are a suitable way of preventing liquidity problems from arising in the first place.⁹⁸ The Financial Stability Board recommends increasing the use of such price-based instruments.⁹⁹ Compared to other European fund locations, few German funds have so far incorporated price-based instruments into their terms of investment.¹⁰⁰

⁹⁷ See Deutsche Bundesbank (2021).

⁹⁸ In the case of swing pricing, the value of a share in a fund, for example, is modified in such a way that the costs of redeeming the shares are passed on to the investors who have incurred them. Selling assets following share redemptions may result in transaction costs and have an effect on the market prices of the assets held in the fund. In the absence of swing pricing, the costs of redeeming the shares would be passed on to the remaining investors in the fund, thus creating an incentive for investors to redeem their shares before other investors; see Deutsche Bundesbank (2021).

⁹⁹ See Financial Stability Board (2023)

¹⁰⁰ A survey of all capital management companies with open-end investment funds conducted by the Federal Financial Supervisory Authority in June 2022 found that, while 74% of open-end retail funds have arrangements in place to restrict the redemption of shares, less than 1% allow for swing pricing. By contrast, by way of example, data compiled in 2020 show that 65% of all open-end retail securities-based funds in Luxembourg had incorporated swing pricing into their terms of investment.

OVERALL ASSESSMENT AND IMPLICATIONS FOR MACROPRUDENTIAL POLICY

Macro-financial environment remains challenging for German financial system

Despite the existing vulnerabilities, the German financial system has thus far proven stable in the new macro-financial environment. Financial intermediaries have coped well thus far with the market price losses triggered by the rise in interest rates, partly on account of their solid capital base. However, unusually high earnings and balance sheet reclassifications of securities also played an important role in compensating for losses on securities (see the section entitled “Risks arising from interest rate developments” on pp. 35 ff.). Despite subdued economic activity, credit defaults were rare, not least as a result of fiscal support measures to compensate for higher energy prices for enterprises and households. Falling prices and rising rents for residential real estate may help to further reduce existing overvaluations in the real estate market (see the section entitled “Risks from the household and corporate sectors” on pp. 49 ff.). Moreover, the Eurosystem’s balance sheet reduction has had only a limited impact on liquidity in the financial markets so far.

The years ahead will remain challenging for the German financial system, however. Firms’ debt sustainability is likely to decline amid higher financing costs and subdued economic activity. Although the number of insolvencies has risen only slightly overall up to now, default risk is already elevated in parts of the corporate sector, especially the commercial real estate sector. By contrast, longer interest rate fixation periods are still generally shielding households from higher burdens stemming from the rise in interest rates. Here,

there will probably be a longer delay before the rise in interest rates leads to an increase in credit risk (see the section entitled “Risks from the household and corporate sectors” on pp. 49 ff.).

The financial system could suffer large losses in the event of adverse developments.

Future supply shocks, for instance from escalating geopolitical tensions, could lead to a marked downturn in the economy, involving rising inflation and higher interest rates as well as an abrupt decline in asset prices in the markets. As a result, credit defaults could trigger substantial losses in the financial system. This could lead to excessive restrictions in new lending.

The accelerated structural change towards a net-zero economy will probably place additional burdens on enterprises and households. For German banks, this will result in credit risk that may not be fully reflected in their risk models at present (see the special article entitled “Risks arising from structural change using the decarbonisation of the economy as an example” on pp. 91 ff.).

Sufficient resilience is key

Sufficient resilience in the financial sector is needed to deal with the risks of heightened uncertainty and structural change. The financial system should have sufficient levels of capital and liquidity even during periods of stress, and should arm itself against cyber and political risks. All relevant players should address the heightened uncertainty by preparing for various scenarios as a preventive measure.

At present, capital adequacy in the banking system is high; however, banks have dissolved a considerable volume of hidden reserves. These are no longer available to offset losses going forward. For the banking system as a whole, hidden reserves have even turned into unrealised losses, which will take time to be reduced again. Any further losses on securities will therefore not be cushioned by hidden reserves and could thus put a direct strain on equity capital, especially if losses occur in securities held in the liquidity reserve, which are valued according to the strict lower of cost or market principle.

The banking system could become less resilient in the future. Given that deposit rates are rising, banks’ net interest income is unlikely to support their profitability to the same extent as this year (see the section entitled “Resilience of the German financial system” on pp. 70 ff.). Credit risk will probably rise further if economic developments continue as expected and interest rates remain high. The downturn in the commercial real estate mar-

ket, in particular, is likely to have a growing impact on the quality of German banks' loan portfolios. The ratio of non-performing commercial real estate loans has already risen slightly of late. It is important for banks to properly factor these developments into their risk management and credit processes and ensure timely and appropriate risk provisioning.

Operational risk also remains highly significant. The risk of operational disruptions caused by cyberattacks has increased again in view of the geopolitical environment. At the same time, outdated IT systems and security standards are creating vulnerabilities at banks.

Given the challenges described here, banks should continue to strengthen their resilience. Large, systemically important institutions, in particular, should ensure that they distribute profits moderately and with an eye to future burdens. Moreover, banks should maintain and step up their efforts to increase their resilience to operational risk. The digital transformation and demographic change are putting pressure on banks' business models and making it more difficult for them to ensure sufficient specialist expertise.

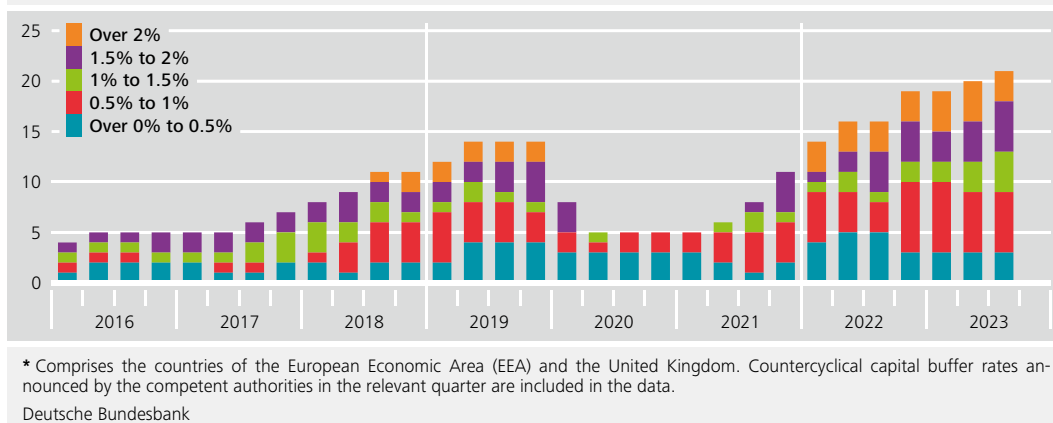
In addition to the microprudential perspective, which focuses on individual institutions, macroprudential supervision encompasses the systemic perspective. Distressed market participants can endanger the functioning of the system. This may be the case if a market participant is very large or closely interconnected with other market participants. Through this channel, adverse developments can be transmitted to the financial system as a whole, impairing its stability. Macroprudential supervision also monitors the emergence of similar or strongly correlated risks among market participants and contagion effects stemming from the interconnectedness of banks in the transmission of shocks (see the box entitled "Macroprudential perspective: cross-border contagion effects and systemically important banks" on pp. 65 ff.).

The package of macroprudential measures plays a key role in strengthening the resilience of the banking system. If there is a risk of the credit supply being restricted excessively during a period of stress – caused, for example, by large losses in the banking system – supervisors can lower the countercyclical capital buffer rate to zero percent. This would mean that €18 billion of capital previously tied up by the buffer would become surplus capital, directly easing any balance sheet constraints that might arise from losses or rising risk weights. In the light of major vulnerabilities in the financial system, other European countries have also raised the countercyclical capital buffer, with many countries having previously lowered the buffer requirements during the COVID-19 pandemic (see Chart 2.3.1).¹⁰¹ Nonetheless, the share of the countercyclical capital buffer in relation to the total capital requirements is very small in most countries.

¹⁰¹ See Deutsche Bundesbank (2022).

Number of European countries with a positive countercyclical capital buffer rate*

Chart 2.3.1



The resilience of the German fund sector should be strengthened using available liquidity management tools. These tools can be used to limit redemptions of fund shares during periods of stress, thus also reducing risks to financial stability through contagion effects. In Germany, fund managers should therefore incorporate price-based liquidity management instruments into their investment conditions on a larger scale.

Regulatory framework should be developed further

To ensure the stability of the banking system, it is important to develop the international regulatory framework further. The banking turmoil in the United States highlighted shortcomings, particularly with regard to the identification of risks posed by specific business models and a lack of rigour in enforcing supervisory concerns at banks.¹⁰² In some cases, interest rate risk was backed by insufficient capital. In future, interest rate risk could therefore be factored into the minimum requirements, i.e. the first pillar of the Basel framework. This would ensure internationally consistent and adequate capital backing. Moreover, the banks affected by the turmoil experienced larger and significantly faster outflows of deposits than assumed by the liquidity regulation during periods of stress. It would therefore be advisable to review the calibration of the liquidity coverage ratio and the net stable funding ratio (NSFR) in terms of the assumptions regarding the stability and reliability of deposit funding. In addition, the role and design of additional tier 1 (AT 1) capital should be reviewed, particularly in terms of how to improve its transparency and

¹⁰² See Basel Committee on Banking Supervision (2023).

loss-absorbing capacity and reduce complexity. There have been doubts for some time over whether these capital instruments can fulfil their expected loss-absorbing capacity in a crisis.¹⁰³ In addition, efforts could be made to broaden and clarify the scope of application of the Basel rules. The internationally agreed rules on banking regulation should be applied consistently and without major concessions to all institutions that could pose a risk to global financial stability.

The supervisory toolkit should be expanded to include internationally standard instruments in the area of residential real estate financing that are still missing.

Although BaFin can set minimum requirements on equity which households have to provide when buying a property and amortisation requirements for residential real estate loans, it is not yet authorised to impose caps already widely available in other countries for income-based lending standards such as the debt-service-to-income ratio or the debt-to-income ratio of new borrowers. Both ratios are important indicators for assessing borrowers' default risk.¹⁰⁴ With the full set of instruments, in future, it could focus on limiting risks to financial stability that accumulate in an environment in which house prices are rising sharply, housing loans are recording dynamic growth and lending standards are deteriorating.¹⁰⁵ Going forward, the new data collection on lending standards for housing loans will provide the data basis needed to assess risks from new lending.

Specific provisions on liquidity risk management should be introduced for insurers so as to reduce the risk of procyclical investment behaviour during periods of stress.

The use of derivatives markets or an increase in terminated insurance policies, for example, can result in liquidity risk for insurers, especially when interest rates are on the rise (see the section entitled "Risks arising from interest rate developments" on pp. 35 ff.).¹⁰⁶ If such liquidity risks were to occur during periods of stress, insurers' investment behaviour could amplify declines in the prices of securities and thus losses in the financial system. The regulatory framework for insurers in Europe, Solvency II, does not yet contain any specific provisions on liquidity risk management aimed at preventing such amplification effects.¹⁰⁷ The current review of Solvency II envisages improvements in this area. With regard to liquidity risk, one of the proposals put forward by the European Commission is to oblige insurers to conduct internal liquidity stress tests.¹⁰⁸ To help the national and European supervisory authorities better identify and address insurers' liquidity risks in the future, the proposed adjustments should be incorporated into the regulatory framework without any changes.

¹⁰³ See Deutsche Bundesbank (2018b).

¹⁰⁴ See German Financial Stability Committee (2015).

¹⁰⁵ See Deutsche Bundesbank (2022).

¹⁰⁶ See Deutsche Bundesbank (2022).

¹⁰⁷ See Buch (2023).

¹⁰⁸ The European Commission's draft directive on the review of Solvency II is currently the subject of trilogue negotiations between the European Parliament, the Council and the European Commission; see European Commission (2021) and European Systemic Risk Board (2021b, 2021c).

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SPECIAL ARTICLE:

RISKS ARISING FROM STRUCTURAL CHANGE USING THE DECARBONISATION OF THE ECONOMY AS AN EXAMPLE

The need to keep climate change in check makes it necessary to pursue structural change that puts the economy on a path towards climate neutrality. To achieve this, fossil fuel-based production, heating and transportation technologies will have to be replaced, and that comes at a cost to firms and households. Because enterprises and households are interlinked financially with the financial system, structural change also has an impact on the risk situation in the financial system.

To allow us to analyse and assess these risks in a more comprehensive and granular manner than hitherto, we have extended the analytical framework used in the 2021 Financial Stability Review along multiple dimensions. Amongst other things, we investigate the impact of updated climate action

objectives and economic conditions, account for the firm-level effects of climate action, and also gauge the resilience of financial intermediaries.

Insights from these additional analytical avenues reveal that potential risks to the German financial system from orderly long-term structural change towards a net-zero economy are somewhat higher than presented in the 2021 Financial Stability Review. In particular, the climate action and economic conditions have changed, and this presents mounting challenges. These potential risks are probably still well manageable, however. Note that the analyses are subject to model uncertainties and that the risks might be greater if structural change plays out in a disorderly fashion.

For this reason, it is advisable to follow a dependable climate action trajectory that is as predictable as possible. Financial intermediaries need to be mindful of risks that decarbonising will involve, and bolster their resilience, where necessary, such that they can take even unexpected developments in their stride. Furthermore, disclosure requirements along with suitable microprudential and macroprudential instruments can help in pinpointing and responding to climate-related risks in the financial sector.

■ Overview

To mitigate the scale of climate change, the economy needs to be decarbonised to a point at which it is climate-neutral. Structural change will be necessary to drive the decarbonisation of the economy, and that comes at a macroeconomic cost. But in global terms, the macroeconomic cost will, in all likelihood, be far smaller than the climate change-induced losses this will prevent.¹ In this regard, carbon pricing – a mechanism that puts a price tag on greenhouse gas emissions – is seen as an efficient means of achieving climate neutrality.² The relatively higher price of high-emission goods creates incentives to embrace and develop cleaner technologies. In Germany, revenues from European and national emissions trading are credited in full to the Climate and Transformation Fund.³ This carbon pricing revenue can be channelled to the general public and businesses in the form of fiscal transfers and the like, but even so, firms and individuals whose carbon emissions are particularly high will be confronted by net costs. Though impacting on firms and households initially, these will ultimately take their toll on the wider financial system as well via loans, bonds and shares.

Many advanced economies have shifted their climate action ambitions up a gear lately, with a desire to reduce their dependence on energy imports probably playing into those decisions. Analyses by the International Energy Agency show that the climate action and energy policy measures announced worldwide in 2022 are more ambitious than the objectives staked out in 2021.⁴ However, more action will be needed to meet the 1.5°C target.⁵ This year, for example, saw the European Union (EU) intensify and expand the EU Emissions Trading System (ETS) and create ETS 2, a separate ETS for the building and road transport sectors. In Germany, the version of the Renewable Energy Sources Act (*Erneuerbare-Energien-Gesetz*, or EEG) currently in force in 2023 has raised the target for the percentage of power sourced from renewable energies from 65% to 80% by 2030.⁶ The increased rollout of climate action instruments across the globe is likely to accelerate the pace of structural change towards a net-zero economy. This comes at a cost to the aggregate economy – for example, in the form of higher costs for carbon emissions, write-downs on the “brown” capital stock, or additional capital expenditure on replacing high-emission technologies.

¹ See Network for Greening the Financial System (2022), International Energy Agency (2022) and International Monetary Fund (2020).

² Carbon pricing mechanisms like the EU Emissions Trading System (EU ETS) usually cover greenhouse gases such as methane as well as carbon emissions, with emissions being priced in euro per tonne of carbon (tCO₂) or per tonne of carbon equivalent.

³ European (EU ETS) and national emissions trading (nETS).

⁴ See International Energy Agency (2022).

⁵ See International Energy Agency (2023).

⁶ See Federal Ministry for Economic Affairs and Climate Action (2022).

Our analysis illuminates the implications of decarbonising the economy and the potential risks to the German financial system. Put simply, it is assumed that there is an unexpected global increase in the carbon price. Some of the carbon revenue thus generated is recycled to finance investment supporting the transition, with the remainder being used to fund tax cuts. The analysis follows on from the carbon price sensitivity analysis presented in the 2021 Financial Stability Review, and features an expanded methodology and updated climate action measures and economic conditions.⁷ The main changes made to the model outlined in the 2021 Financial Stability Review are shown in Table 3.1.

Main changes to the analytical framework*			Table 3.1
	2021 analysis	2023 analysis	
NGFS scenario vintage	Phase II (2021)	Phase III (2022) Aligned with new climate action measures, technological advances accounted for, quicker transmission of input prices to general price effects, stronger monetary policy response	
Analytical goals	Estimate losses in intermediaries' securities/loan portfolios	Estimate losses in intermediaries' securities/loan portfolios and gauge banking and insurance sector resilience	
Application of climate scenario effects to real economy	Sectoral	Sectoral, firm-level (where possible)	
Modelling of market price effects for bonds (risky components, term structure)	Spread dependency of financial market variables, duration approach	Spread dependency of macro and financial market variables, discounted cash flow approach	
Presentation of losses from climate-related market risk	Losses at market prices	Banking sector: balance sheet losses, non-bank sector: losses at market prices	
* See Frankovic et al. (2023). Deutsche Bundesbank			

Analyses of the effects of decarbonising the economy are fraught with considerable uncertainty. For one thing, different modelling approaches can be used to gauge the implications of transitioning to a carbon-neutral economy. For another, the assumptions made – such as those concerning energy substitution as a response function of carbon prices – have a major bearing on whether a transition to climate neutrality is achieved, what side effects it has, and what costs it entails. One feature common to all the simulations, though, is that a journey to climate neutrality implies a fundamental restructuring of the economy which might have repercussions that are far more complex than the immediate effects of a change in the price of carbon.

⁷ See Deutsche Bundesbank (2021).

NGFS climate scenarios used to investigate effects

Our exercise investigates the risks to the financial system from a long-term and orderly process of decarbonisation. It is assumed that financial market participants are surprised initially by the announcement of the additional climate action efforts that will be needed to achieve that transition.⁸ This shock is triggered by shifted market expectations that the carbon price will increase more briskly than hitherto. Risks are analysed using various models linked up within a model chain (see Chart 3.1), with an (expected) baseline scenario featuring no additional carbon emission savings being compared with an (initially unexpected) climate action scenario that models the targeted carbon emission savings. Amongst other things, the carbon price pathways used in these two scenarios are the outcome of the underlying assumptions about socioeconomic developments and technological progress.⁹ In addition, both scenarios assume that no climate action instruments other than the carbon price are used. To gauge the risks to financial stability, the decarbonisation scenario has to be a substantially different, yet plausible version of the uncertain transition pathway as it currently stands.

Scenarios devised by the Network for Greening the Financial System (NGFS) are used to describe the macroeconomic effects for both the baseline and climate action scenarios. Our exercise compares the NGFS's "Net Zero 2050" scenario as the climate action scenario simulating the transition to climate neutrality with the NGFS's "Current Policies" scenario, which serves as the baseline.¹⁰ In this model framework, the carbon price is an endogenous variable for achieving a given climate objective. In the "Net Zero 2050" scenario, the gradual carbon price increase through to the year 2050 is the result of a reduction in global net carbon emissions to close to zero by 2050.¹¹ In the "Current Policies" scenario, by contrast, emissions actually increase moderately between now and 2050, with the result that the carbon price remains almost unchanged at a little more than zero over the coming decades.¹²

In the baseline scenario, the carbon price pathway is estimated from the approximate current global level computed from pre-existing trading and taxation systems

⁸ For a detailed account of the methodological framework used for this analysis, see Frankovic et al. (2023).

⁹ See Deutsche Bundesbank (2021).

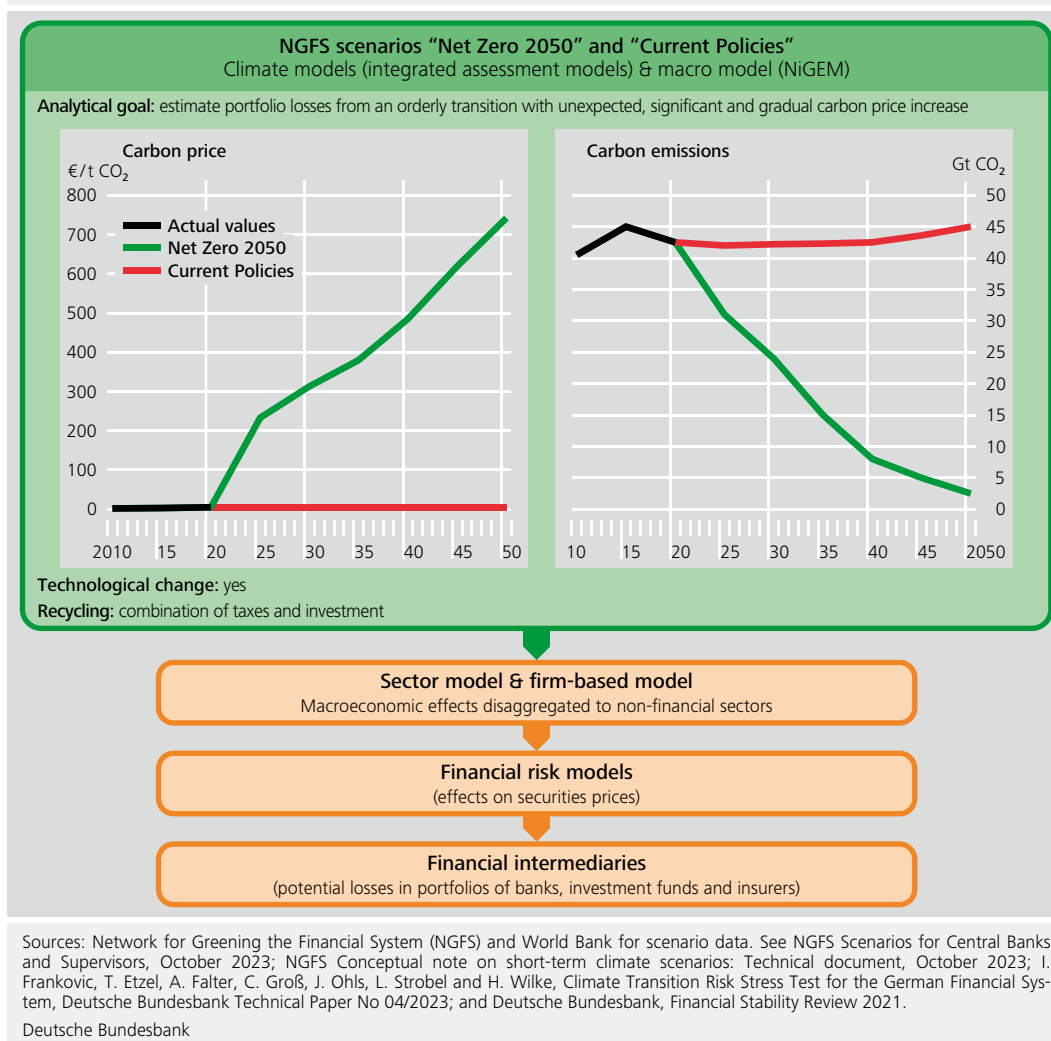
¹⁰ Scenarios computed with the MESSAGE-GLOBIOM integrated assessment model (IAM) were used because these produce the steepest carbon price pathways for the "Net Zero 2050" scenario; see Frankovic et al. (2023).

¹¹ "Short-term scenarios" can also be used as an alternative. These allow even unexpected interactions between climate action and the financial system to be modelled. The NGFS is currently developing narratives for short-term scenarios; see Network for Greening the Financial System (2023). A modelling approach based on a dynamic climate equilibrium model is one of a number of options; see Frankovic and Kolb (2023). See Frankovic et al. (2023) for a deeper dive into the methodology and a use case for scenario analysis based on a short-term scenario.

¹² At this point, only the effects induced by climate action are examined (transition risks), not the physical climate risks, which are less significant for the German financial system; see Deutsche Bundesbank (2021).

Model chain: effects of an unexpected change in climate action on the financial system

Chart 3.1



and the required payments they entail. For around 23% of global carbon emissions, prices currently stand at around €22/tCO₂ on average. Applied to the world's entire carbon emissions – i.e. also to the emissions that are not currently subject to carbon pricing – the global average price comes to around €5/tCO₂.¹³ The "Net Zero 2050" scenario simulates a gradual increase in the carbon price up to a level of around €700/tCO₂, reaching that price after approximately 30 years (see Chart 3.1). In light of today's global carbon prices, that increase is thus considerable. To analyse the impact on the financial system, the carbon price pathways in the "Current Policies" scenario and the "Net Zero 2050" scenario are first fed into a macroeconomic model as a means of quantifying the effects

¹³ See https://carbonpricingdashboard.worldbank.org/map_data

on key macroeconomic variables for financial markets.¹⁴ It is assumed that the financial system is not expecting any increase in carbon prices at the outset. Only when the shock materialises does the future carbon price pathway in each scenario become known. This approach allows us to simulate the largest possible losses under the given model assumptions.¹⁵

Because higher carbon prices affect economic sectors and enterprises with different magnitudes, the next step is to disaggregate the scenario pathways mapped out by the aforementioned models to the economic sector and firm level. We begin by using a sector model to determine the extent to which individual economic sectors are affected, in terms of their value added and enterprise values, by the emission prices simulated in the scenarios.¹⁶ Emission intensities are highly heterogeneous across enterprises within the same economic sector, however,¹⁷ so firm-level effects are also calculated for enterprises for which emission data are available.¹⁸ This involves determining the impact on production costs, sales and other firm-level metrics in the two scenarios in light of changes in carbon and energy prices and in sectoral demand. By incorporating firm-level effects into the exercise, we improve on the methodology presented in the 2021 Financial Stability Review because we are now in a position to gauge the risks to German financial intermediaries at a more granular level.

The final step is to compute value adjustments in the corporate lending business and losses on shares, corporate bonds and government bonds. Changes in credit default rates are determined using a model based on past relationships between probabilities of default and firm-level variables.¹⁹ By investigating the scenario-specific effects on firm-level metrics, we thus gain insights into changes in credit default probabilities. Sectoral losses on shares are immediately evident from the scenario in question. Where possible, the repricing of individual firms' shares is estimated as well, taking account of firm-level greenhouse gas emissions.²⁰ The scenarios' effects on financial and non-financial bond spreads are derived from scenario-dependent developments in sectoral variables,

¹⁴ These variables are computed using the National Institute Global Econometric Model (NiGEM), a macroeconomic model developed by the National Institute of Economic and Social Research. This semi-structural global macroeconomic model (see <https://www.niesr.ac.uk/nigem-macro-economic-model>) replicates key output variables of climate models (IAMs) and uses historical relationships as inputs to calculate additional macroeconomic and financial variables, primarily inflation, (key) interest rates and enterprise values.

¹⁵ If these carbon prices are fully or partially expected, they will already be priced into today's asset prices, meaning that any increases in emission prices would produce smaller losses.

¹⁶ See Frankovic (2022). Sectoral effects have already been analysed, not only in the 2021 Financial Stability Review but also with a dynamic equilibrium model that takes climate change considerations into account; see Deutsche Bundesbank (2021, 2022).

¹⁷ See Frankovic et al. (2023) and Groß et al. (2024).

¹⁸ There are large gaps in the data on enterprises' emissions, especially for small and medium-sized firms. Firm-level data are available for only 10.5% of German banks' loans to enterprises. Yet those firms account for around 85% of greenhouse gas emissions in the German corporate sector (including the energy, industry, agricultural, commercial residential and waste management sectors).

¹⁹ See Frankovic et al. (2023).

²⁰ See Weth et al. (2024).

the interest rate, and bond-specific metrics such as ratings and terms.²¹ Given that government bonds are assumed to be risk-free, only movements in interest rates affect their prices here.

Macroeconomic effects of a change in climate action

In the “Net Zero 2050” scenario, a rise in emission prices leads to a reduction in German economic output and enterprise value losses relative to the “Current Policies” scenario. The macroeconomic consequences of emission price increases are reported relative to a baseline scenario which features no notable increase in carbon prices. The focus here is on the impact on Germany’s real and financial sectors. However, the global impact of the shock is likewise taken into consideration as foreign assets are also carried on the balance sheets of German financial intermediaries.

The macroeconomic effects are moderate in the “Net Zero 2050” scenario. In terms of gross domestic product (GDP), the maximum effect is reached after five years and economic output falls by 2.3% relative to the baseline scenario (see Chart 3.2). The higher emission price leads to rising production costs and consequently to higher sales prices and a reduction in demand and production. This diminishes corporate profits and has a correspondingly negative impact on the average enterprise value, which reflects the discounted present value of future profits. In the “Net Zero 2050” scenario, enterprise values fall by 14% against the baseline scenario in the first year and then remain reduced for years given the continued rise in the carbon price and the adverse impact on profits thereof. High-emission sectors such as the manufacture of coke and refined petroleum products, agriculture and mining are particularly affected.²²

Carbon prices also affect inflation and the risk-free interest rate. The initial result is a significant effect on inflation, which rises by just under 1.5 percentage points relative to the baseline scenario (see Chart 3.2). In the “Net Zero 2050” scenario, inflationary pressures will also remain elevated in subsequent years given the continued rise in the carbon price. The risk-free interest rate accordingly continues to go up via the monetary policy reaction function.²³

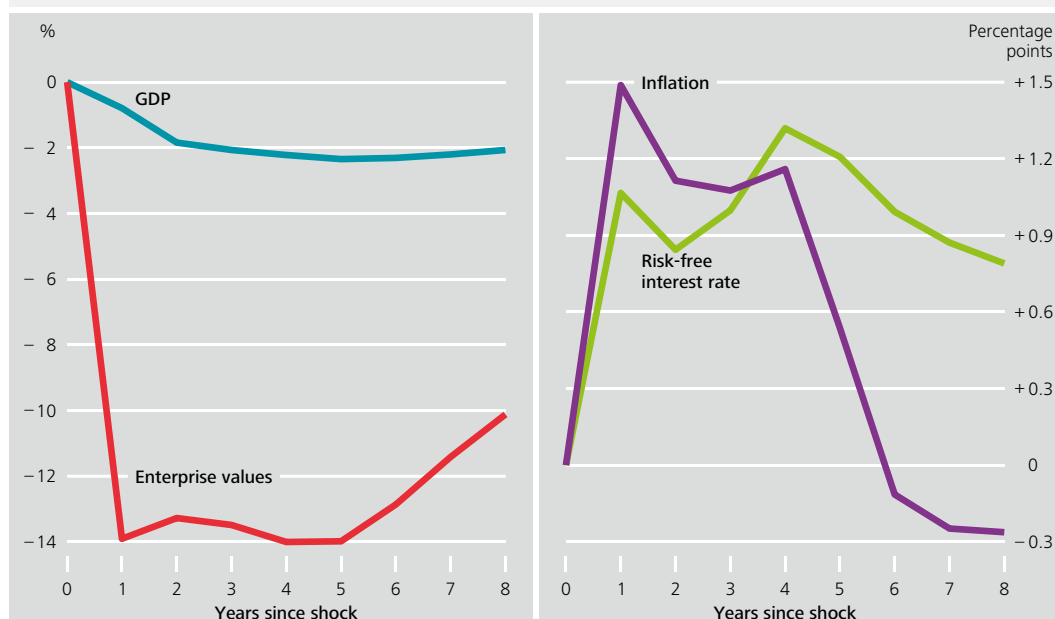
²¹ See Frankovic et al. (2023).

²² See Frankovic et al. (2023).

²³ Owing to the complex recalibration of the economic structure, deflationary developments are also conceivable. For example, the evolution of risk in carbon-intensive versus low-carbon technologies owing to emission pricing or also stricter regulation influences the possibilities of across-the-board price increases during the transition. See Meinerding et al. (2023).

Impact of the NGFS's "Net Zero 2050" scenario on macroeconomic variables in Germany*

Chart 3.2



Source: Bundesbank calculations based on the scenarios of the Network for Greening the Financial System (NGFS). * The NGFS's "Net Zero 2050" scenario (global climate neutrality in 2050) sees the price of carbon rising gradually to €300/t in year 8. The impact is shown relative to the NGFS's "Current Policies" scenario, which is a scenario without any notable increase in the price of carbon.

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The impact is different from earlier NGFS scenarios previously used to analyse transition risks.²⁴ The updated scenarios lead to changes in macroeconomic outcomes and more adverse effects on financial markets. The faster increases in carbon prices result in the more rapid onset of GDP effects and greater inflation stimuli in the "Net Zero 2050" scenario compared with the "Current Policies" scenario. The assumptions take into account the more rapid pass-through of price increase effects. As a result, the risk-free interest rate rises by up to 130 basis points in the "Net Zero 2050" scenario and, in the updated scenarios, is a major driver of financial market price developments, especially regarding bond prices. In addition, risk premia are also an important driver of financial market valuations in the new vintage of scenarios. Although the macroeconomic GDP effects and the effects on enterprise values are only slightly greater than those of the preceding NGFS scenario vintage, they unfold more quickly. This suggests a more rapid and moderately higher impact on the default risk of securities and loans.

²⁴ See Deutsche Bundesbank (2021).

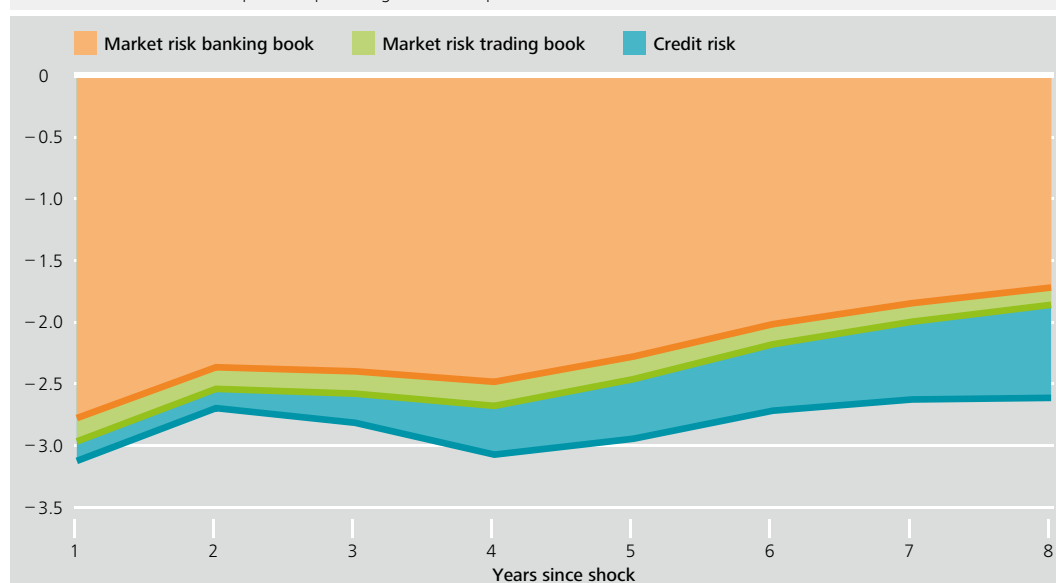
■ Impact on the German financial system

In the “Net Zero 2050” scenario, the German financial system is resilient to the risks of an orderly transition with a gradual increase in the carbon price. The banking system sustains losses amounting to a maximum of 3.2% of common equity tier 1 (CET1) capital (see Chart 3.3). The scenario-induced market price movements will have an immediate impact on mark-to-market portfolios, whereas the maximum losses from loan write-downs only occur over time.

Vulnerabilities of German banks to climate-related transition risks: credit and market risk in a scenario of the economy transitioning to “Net Zero 2050”*

Chart 3.3

Cumulative balance sheet impact as a percentage of CET1 capital



Sources: Centralised Securities Database, Bundesbank statistics and Bundesbank calculations based on the scenarios of the Network for Greening the Financial System (NGFS). * Potential effects of scenario-dependent loan loss allowances and market price changes in the NGFS's “Net Zero 2050” scenario compared to the NGFS's “Current Policies” scenario. The portfolios under analysis (corporate loan portfolio; portfolios of banking book securities; trading books of banks supervised by the Single Supervisory Mechanism (SSM)) together represent 47% of the total assets of the German banking sector.

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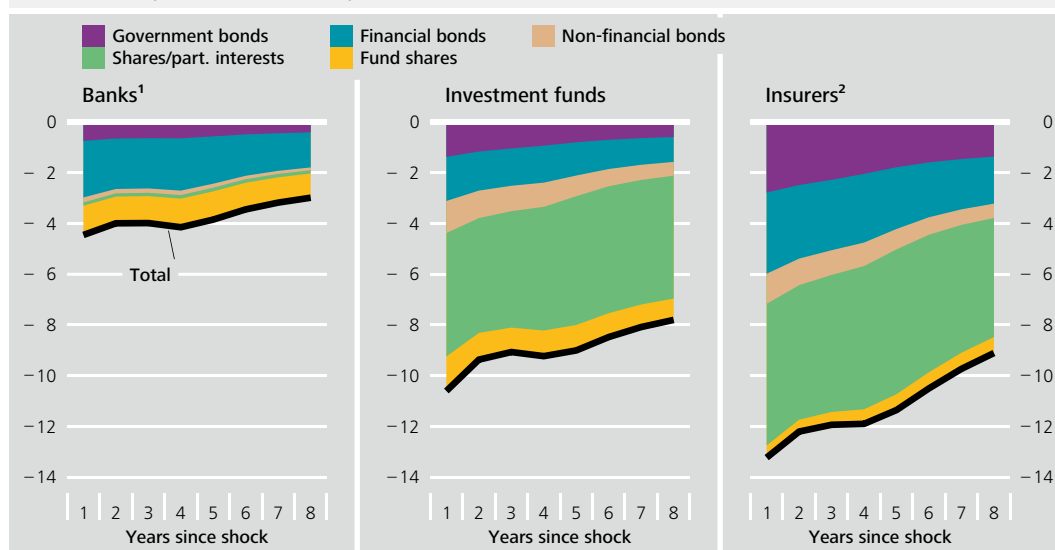
Thus, in the first year after the shock, the maximum balance sheet losses from market risk amount to 3.0% of CET1 capital, composed of trading losses of 0.2% and write-downs on banking book securities amounting to 2.8%. Since banks currently report a significant percentage of their securities portfolio in the banking book at amortised cost, the maximum on-balance-sheet securities write-downs would be smaller than market price losses – in terms of the securities portfolio, balance sheet losses come to 1.4%, whereas market price losses amount to 4.5% (see Chart 3.4).

The maximum losses from loan write-downs during the period under review increase over time and amount to 0.8% of CET1 capital or 0.2% of the loan portfolio. The slow increase

Vulnerabilities of German financial intermediaries to climate-related transition risks: market risk by asset class in a scenario of the economy transitioning to “Net Zero 2050”*

Chart 3.4

Cumulative changes in value as a percentage of stressed securities portfolios



Sources: Centralised Securities Database, Bundesbank statistics and Bundesbank calculations based on the scenarios of the Network for Greening the Financial System (NGFS). * Potential effects of scenario-dependent market price changes in the NGFS's “Net Zero 2050” scenario compared to the NGFS's “Current Policies” scenario. ¹ Losses at market prices as a percentage of the securities in the banking book. ² Insurers' holdings of German investment fund shares are assigned to the asset class of the securities held by the funds. The fund shares category itself only includes the portion for which this is not possible (e.g. foreign investment fund shares).

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in the calculated default risks of firms left worse off by the transition reflects the lagged process of adjusting to economic changes.

The distribution of losses within the banking sector is not indicative of additional contagion risk. Though some individual banks are more affected – the 25% of banks with the highest CET1 losses lose 7.3% of their CET1 capital – they have sufficient excess capital to cope with the simulated climate-related losses.²⁵ In addition, banks with lower levels of excess capital over and above the minimum requirements see that margin narrow less as a result of climate-related losses than banks carrying more excess capital. This suggests that precisely those banks which currently have a smaller amount of excess capital are less vulnerable to climate-related risks. The margin against the minimum requirements is also an indicator of the probability of second-round effects: if, for banks that already have little excess capital to begin with, the margin against the minimum requirements were to see a particularly sharp further narrowing as a result of climate-induced losses, this would also indicate an increased likelihood of second-round effects, such as a curtailment of lending or fire sales of securities. This is not suggested by the results, however. Existing contagion risk is thus not being disproportionately amplified by climate-related risks.

²⁵ Excess capital is defined as CET1 capital above the minimum capital requirements, including the Pillar 2 requirement (P2R) and buffer requirements, but excluding Pillar 2 guidance (P2G).

The losses for the German banking sector can be described *ceteris paribus* as being manageable, including in comparison with past developments. In 2022, for example, the interest rate hikes led to balance sheet losses on banking book securities (see the section entitled “Risks arising from interest rate developments” on pp. 35 ff.). For the banking sector as a whole, these amounted to 5.4% of CET1 capital. In a supervisory stress test conducted in 2022, the aggregate losses relating to the credit risk of small and medium-sized banks and savings banks in the adverse scenario amounted to 3.0 percentage points of the CET1 ratio,²⁶ whereas the calculated climate-related losses from loan loss allowances amount to a maximum of only 0.2 percentage point of the CET1 ratio.

In the first year after the carbon price shock, insurers and funds face significant mark-to-market losses of 13.2% and 10.6% of their respective securities portfolios, while banks post comparatively low mark-to-market losses not exceeding 4.5% (see Chart 3.4). Banks’ losses are concentrated particularly on bonds, which account for 80% of banks’ securities portfolios. Although shares sustain relatively more severe losses, they make up only a small weight of 2.0% of banks’ portfolios. German funds, by contrast, are more heavily invested in shares. Insurers are particularly affected by transition risk through participating interests in financial corporations, but also through bonds. The mark-to-market losses sustained by insurers and funds here are considerable. In the fund sector, they could lead to fund share redemptions.²⁷ Insurers’ mark-to-market losses in fact represent 63% of regulatory capital. However, the significant rise in risk-free interest rates in the “Net Zero 2050” scenario would have an alleviating impact on the liabilities side, especially for German life insurers, whose liabilities tend to be long-dated (see the section entitled “Resilience of the German financial system” on pp. 70 ff.). Even in the absence of this liabilities-side relief, no insurer would fall short of its solvency requirements owing to the calculated mark-to-market losses. Life insurers’ liquidity risk, meanwhile, would continue to rise as the increase in risk-free interest rates in the “Net Zero 2050” scenario would lead to unrealised losses on the assets side and greater incentives for policy lapses (see the section entitled “Risk situation in the insurance sector improved despite unrealised losses and liquidity risks” on pp. 43 ff.).

By retrospective comparison to the results based on the earlier vintage of NGFS scenarios used in the 2021 Financial Stability Review, financial intermediaries’ loss given default is considerably higher. Although potential loan portfolio losses are up only moderately, losses on market portfolios are nearly double their previous level. Against the background of the changed scenario framework, this is due mainly to the accelerated

²⁶ The 2022 LSI stress test included not only corporate credit portfolios but also retail loans, real estate loans, bank loans and loans to the public sector. See Deutsche Bundesbank and Federal Financial Supervisory Authority (2022).

²⁷ See Fricke and Wilke (2023).

pace at which the real economic effects unfold as well as to the larger and more sustained rise in the risk-free interest rate.

Dependable and predictable climate action trajectory is important

Risks to the German financial system from emission pricing schemes in the event of an orderly long-term transition are likely to be manageable, ceteris paribus. A higher carbon price will trigger considerable, but still manageable first-round losses. Banks can use their excess capital to absorb the losses, and insurers would not undershoot their solvency requirements, either. Where emission price increases have already been expected and priced in by market participants, the potential losses would actually be lower.

Intermediaries should be mindful of risks arising from decarbonisation and, where necessary, further enhance their resilience. Emission prices put pressure on the real and financial sectors for a longer period of time since there will either be emission costs to bear or emission reduction measures to fund. While the real economy is in the process of structural change, it is therefore less resilient to further shocks. The recent past, featuring the outbreak of the coronavirus pandemic and the Russian invasion of Ukraine, has shown that major shocks can indeed occur.

By staking out a dependable climate action trajectory, policymakers can reduce the risks posed by the transition to a low-emission economy. Uncertainty about climate action makes it more difficult for agents in the real economy to take investment decisions and can thus impede key investments in low-emission technologies. Furthermore, the divide between the stated climate targets and the measures taken to date harbours the potential for sudden adjustments in financial market participants' expectations – a situation which it is important to avoid. Moreover, disclosure requirements for non-financial corporations, but also for financial intermediaries in a suitable framework, can be of use. They are an additional key policy and supervisory instrument for reducing the costs of transition through transparency.²⁸

In addition, microprudential and macroprudential supervisors are looking into suitable instruments to address, in a targeted way, climate-related risks in the financial

²⁸ See Frankovic and Kolb (2023). With regard to non-financial corporations, there are numerous disclosure initiatives. The International Sustainability Standards Board (ISSB) and the European Commission play a central role as standard setters and regulators. See <https://www.ifrs.org/groups/international-sustainability-standards-board/> and https://finance.ec.europa.eu/publications/sustainable-finance-package-2023_en

sector.²⁹ Use of such instruments primarily aims at regulating risks and not at steering financial flows. Therefore, each deployable instrument has to be analysed in terms of its benefits versus the potential associated costs and side effects before its activation can be considered.

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LIST OF ABBREVIATIONS

AT1	Additional tier 1
BaFin	Federal Financial Supervisory Authority
BLS	Bank Lending Survey
BOP-F	Bundesbank Online Panel – Firms
BOP-HH	Bundesbank Online Panel – Households
CCyB	Countercyclical capital buffer
CET1	Common equity tier 1
CRD	Capital Requirements Directive
CRR	Capital Requirements Regulation
DSGE model	Dynamic stochastic general equilibrium model
DSTI	Debt-service-to-income ratio
DTI	Debt-to-income ratio
EBA	European Banking Authority
EBITDA	Earnings before interest, taxes, depreciation and amortisation
ECB	European Central Bank
EEA	European Economic Area
EEG	Renewable Energy Sources Act (<i>Erneuerbare-Energien-Gesetz</i>)
EIOPA	European Insurance and Occupational Pensions Authority
ESRB	European Systemic Risk Board
EU	European Union
EU ETS	European Union Emissions Trading System
FDIC	US Federal Deposit Insurance Corporation
FINREP	Financial reporting
FSB	Financial Stability Board
GDP	Gross domestic product
G-FSC	German Financial Stability Committee
G-SIBs	Global systemically important banks
HGB	German Commercial Code (<i>Handelsgesetzbuch</i>)
HQLA	High-quality liquid assets
IFRSs	International Financial Reporting Standards
IMF	International Monetary Fund
IRBA	Internal ratings-based approach

LCR	Liquidity coverage ratio
LGD	Loss given default
LR	Leverage ratio
LSIs	Less significant institutions
LTV	Loan-to-value ratio
MREL	Minimum requirement for own funds and eligible liabilities
NGFS	Network for Greening the Financial System
NiGEM	National Institute Global Econometric Model
NSFR	Net stable funding ratio
OCI	Other comprehensive income
OECD	Organisation for Economic Co-operation and Development
O-SIIs	Other systemically important institutions
P2G	Pillar 2 guidance
P2R	Pillar 2 requirement
PD	Probability of default
RWAs	Risk-weighted assets
SCR	Solvency Capital Requirement
SREP	Supervisory Review and Evaluation Process
SSM	Single Supervisory Mechanism
sSyRB	Sectoral systemic risk buffer
SVB	Silicon Valley Bank
US GAAP	United States Generally Accepted Accounting Principles
vdp	Association of German Pfandbrief Banks
VVG	Insurance Contract Act (<i>Versicherungsvertragsgesetz</i>)
WIFSTa	Collection of data on housing loans

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ISSN 1861-8995

The German original of this Financial Stability Review went to press on 21 November 2023.

Reproduction permitted only if source is stated.

The Financial Stability Review is published by the Deutsche Bundesbank, Frankfurt am Main.

This is a translation of the original German-language version, which is the sole authoritative text.