ANALYSIS

DANMARKS NATIONALBANK

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FINANCIAL STABILITY — 1ST HALF 2023

Interest rate hikes affect the banks and their customers

Rising interest rates and consumer prices are draining the resilience of homeowners
Rising interest rates and consumer prices mean that 36,000 more homeowners are expected to have expenses that exceed their incomes in 2023. However, the wealth accumulated by homeowners can help limit the banks' direct losses.

Prospects of higher bank earnings
The banks have raised interest rates more on loans than on deposits, which contributes to increased earnings in 2023. The earnings may counter the effect from higher impairment charges, which can be the result of the higher interest rates in the long term.

Some institutions should increase their excess eligible liabilities relative to MREL requirement
The need for sound risk management was underlined in March 2023 when a few foreign banks' problems weakened confidence internationally. A necessary part of sound risk management in banks is to have sufficient eligible liabilities relative to the regulatory requirements.

CONTENTS

Danmarks Nationalbank publishes the biannual analysis *Financial stability*, which summarises Danmarks Nationalbank's assessments and recommendations regarding financial stability in Denmark.

One of Danmarks Nationalbank's overall objectives is to contribute to a stable financial system, which is a prerequisite for enabling the financial sector to perform its tasks that are critical to society. These tasks include supporting financing and savings as well as handling secure and efficient payments and contributing to ensuring that Denmark has a robust economy.

The analysis assesses whether conditions related to credit institutions' credit lending, liquidity management and capital planning may lead to vulnerabilities in the financial system. The analysis also presents the results of Danmarks Nationalbank's biannual stress test, which contributes to the assessment of whether the largest credit institutions have sufficient capital to handle an economic recession. The analysis may also focus on other factors of relevance to financial stability such as pension and life insurance companies, digitalisation in the financial sector, cyber threats, or the impact of climate change on the financial sector.

Summary and assessment

FINANCIAL MARKETS

Declining but still high inflation
Inflation remains high, but has been falling in the United States, the euro area and Denmark in the past six months. The decrease is especially due to lower energy prices, and core inflation is now higher than overall inflation in Denmark. High inflation has resulted in declining purchasing power for consumers. Subsequently, wage growth has increased in the United States, the euro area and Denmark.

Higher interest rates and growth slowdown
Monetary policy tightening in 2022 has continued into 2023, and the key interest rates of the Federal Reserve Bank and the European Central Bank (ECB) have risen significantly. With the central banks' interest rate increases, yields have also risen significantly on both long-term and short-term government, corporate and mortgage bonds since the start of 2022. The monetary policy tightening is expected to result in a slowdown in growth in the Danish economy in the course of 2023.

Problems in a few foreign banks briefly affected risk perception of the banking sector
In March 2023, a few regional US banks faced problems due to inadequate risk management. These problems meant that investors perceived the banking sector as more risky, resulting in falling prices of banks' equities and debt issuances. The problems for the specific banks did not trigger systemic stress in the financial sector, and market prices have risen again since April.

LIQUIDITY AND FUNDING

The banks meet regulatory requirements for liquidity and funding, and their liquidity situation is robust
The systemic banks continue to have a solid liquidity situation and comply with the regulatory requirements for liquidity coverage ratio (LCR) and net stable funding ratio (NSFR) by some margin. All Danish banks will be able to comply with the LCR in a very hard scenario where 80 per cent of their deposits above the deposit guarantee from large corporates is deducted.

Spillover effects underline the need for sound risk management
The turbulence in the financial markets in March 2023 led to very low issuance volumes in the following weeks, stressing that uncertainty about one bank can quickly spread across the whole sector and across borders. It is therefore important that the institutions focus on sound risk management, including ensuring sufficient buffers to regulatory requirements, to enable them to withstand situations in which the debt markets are fully or partially closed.

Parts of systemic banks' deposits are less stable
Unlike the situation during the financial crisis, the banks have had a deposit-to-loan surplus since 2013. Seen in isolation, the banks' deposit funding surplus makes them less vulnerable to closed funding markets. However, to ensure a robust liquidity position, it is important that the individual bank knows the stability of its deposits and ensures that this is taken into account in its liquidity management. The stability of the deposits is generally lower among systemic banks, which places higher demands on these institutions' liquidity management.

HOUSING CREDIT

Rising interest rates and consumer prices are draining the resilience of household customers
Since the beginning of 2022, homeowners have been hit by significant increases in consumer prices and interest rates. Danmarks Nationalbank expects that from 2021 to 2023, 36,000 more homeowners will have a budget deficit, i.e. their expected income is insufficient to maintain a modest consumption and to service their debt. These homeowners' loans correspond to only just under 3 per cent of the total housing debt, which limits the institutions' total credit risks from homeowners with a budget deficit. Households that reduce their consumption will instead reduce the revenue of the institutions' corporate customers.

Falling house prices have reduced homeowners' home equity and increased the number of technically insolvent homeowners
Housing market activity slowed significantly in 2022, and house prices have dropped markedly after

peaking in February 2022. The drop in house prices increases the number of technically insolvent homeowners and homeowners with high loan-to-value ratios. Especially these homeowners may result in the institutions incurring losses if they come under financial pressure and have difficulties paying their debt.

BUSINESS CREDIT

Declining turnover may reduce retail and service industries' ability to pay
The large increases in consumer prices and interest rates are currently eroding consumer purchasing power and dampening private consumption growth. This is reflected in real turnover, which has decreased in large parts of the retail and service industries. Other things being equal, declining turnover makes it harder for retail and service businesses to meet their liabilities. The banks' direct exposure to the retail and service industries is relatively limited, but the development may spread to other types of businesses.

Commercial real estate has previously resulted in large losses
Lending to the commercial real estate industry has previously resulted in banks incurring large losses. The rising interest rates are currently increasing the return requirement for commercial real estate, and this may lead to sharp price falls. Falling prices may result in the collateral pledged on the loans not being sufficient to cover the full exposure. This may lead to losses in the institutions in the event of default on the loans. At the same time, rising interest rates and economic downturn increase the risk that businesses in the real estate industry will not be able to service their debt.

EARNINGS

Higher interest rates increase the institutions' core earnings
Systemic credit institutions' core earnings increased in 2022. The increase is a result of higher interest rates and an increase in interest margins, which overall increase the institutions' net interest income. In 2023, net interest income will increase due to a full financial year with a higher level of interest rates.

Loan impairment charges are still low
The systemic credit institutions' impairment charge ratio remained low in 2022. Relative to 2021, the majority of the institutions have maintained or increased their additional impairment charges from management estimates.

CAPITAL AND STRESS TESTS

Some institutions should increase their excess eligible liabilities relative to MREL requirement
Danmarks Nationalbank's stress test shows that some systemic credit institutions will not be able to meet their total minimum requirement for eligible liabilities (MREL) during a one-year period with limited possibility of issuing new debt instruments. The institutions should avoid this vulnerability by building up sufficient excess liabilities relative to the requirement and ensuring a sufficiently even and long maturity profile for their debt issuances. All the systemic institutions had excess liabilities relative to their MREL requirement at the end of the 1st quarter of 2023.

In Denmark and the rest of the EU, there are rules for crisis management of failing institutions
One of the objectives of the rules for crisis management of failing institutions is to ensure that failing credit institutions can be handled without significant negative effects on financial stability. For all Danish systemic credit institutions, the crisis management strategy is that the whole group must be recapitalised and continued, so that critical functions can be upheld. The credit institutions' obligation to meet the minimum requirement for eligible liabilities (MREL) forms part of the crisis management framework.

Some institutions should increase their capital towards the phasing-in of the banking package
The European Commission's banking package is expected to enter into force on 1 January 2025. The banking package proposes a revision of the European Capital Requirements Regulation (CRR) and the Capital Requirements Directive (CRD). Some systemic institutions do not have sufficient excess capital relative to their capital buffer requirements to comply with increases from the revised regulation in a severe recession scenario.

CYBER THREAT

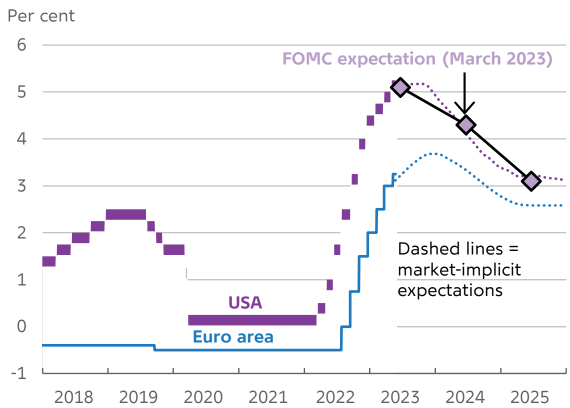
The cyber threat remains significant
For a number of years, the Danish financial sector has targeted work at strengthening resilience against cyberattacks. The cyber threat cannot be eliminated, and there is still a need to increase cyber resilience. The reason for this is that the best hackers are continuously becoming more specialised and sophisticated in their methods. At the same time, the war in Ukraine is changing the threat landscape. It is important that the financial sector continues to target work at increasing cyber resilience and limiting the impacts of cyberattacks.

Large interest rate increases and prospects of growth slowdown

High inflation and accompanying sharp monetary policy tightening in 2022 have continued into 2023. The key interest rates of the Federal Reserve Bank (Fed) and the European Central Bank (ECB) have been hiked by 5.0 and 3.75 percentage points, respectively, see chart 1. The markets expect the ECB to raise interest rates further in 2023. While the market expectation is that the Fed will lower interest rates towards the end of 2023, the Fed's own expectations indicate that interest rates will remain around the current 5 per cent on average for 2023.[1] With the large interest rate increases by the central banks, yields have also risen significantly on both long-term and short-term government, corporate and mortgage bonds since the start of 2022.

Markets expect key interest rates to be very close to peaking

Chart 1



Note: Dotted lines indicate market-implicit expectations for money market interest rates in the USA and the euro area as of 23 May 2023. Market-implicit expectations for the Fed interest rate are based on US fed funds futures. The expected ECB interest rate is derived from the EUROIS yield curve.
Source: Scanrate RIO, Macrobond.

Prospects of low growth

The global economy is set for a growth slowdown in 2023. In the spring forecasts from the OECD and the IMF, growth is projected to be significantly lower in 2023 than in 2022, especially in the euro area, see chart 2. In Denmark, Danmarks Nationalbank also expects lower future growth as the impact of the central banks' raising of interest rates increases. Among other effects, the interest rate increases are expected to dampen growth in Denmark's export

1 See the economic projections of Federal Reserve Board and Federal Open Market Committee from March 21-22 FOMC meeting (*link*).

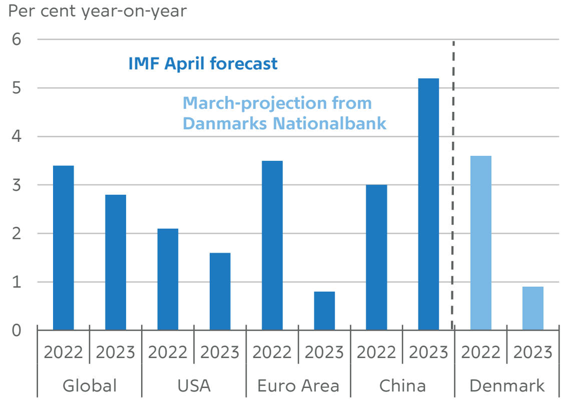
markets, which is projected to lead to a slowdown in growth in 2023 from a high level of economic activity.[2]

Inflation is declining but remains high
Inflation is still high, but has been declining in the United States, the euro area and Denmark over the past six months, see chart 3. The decline has especially been driven by falling energy prices. The rate of inflation[3] in the euro area and Denmark was thus 7.0 per cent and 5.6 per cent, respectively, year-on-year in April. Core inflation[4] is now higher than the overall inflation in the euro area and was 7.3 per cent year-on-year in April. High inflation has resulted in declining purchasing power for consumers. Subsequently, wage growth has increased in the United States, the euro area and Denmark.[5]

High market volatility may further increase funding costs
Market expectations for future interest rates have been characterised by large fluctuations during the period in which monetary policy has been tightened. Positive economic indicators and high inflation have helped raise expectations for the key interest rates in early 2023. Conversely, the turbulence in the banking sector in March resulted in a significant lowering of expectations, see the next section.

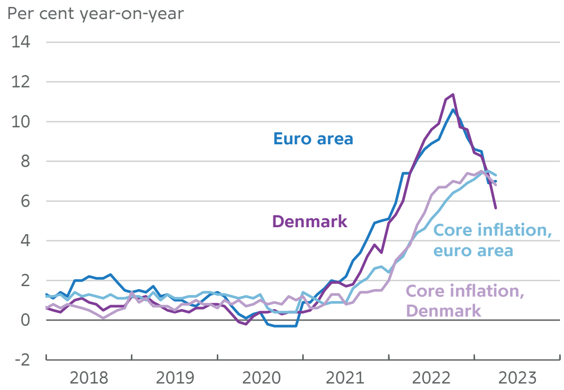
The widely changing expectations for the central banks' key interest rates have also resulted in large fluctuations in government and mortgage bond yields. The day-to-day changes in yields for German government bonds have thus been significantly higher than in the years before 2022, see chart 4. The yield on Danish variable-rate mortgage bonds has seen large day-to-day changes of up to 0.4 percentage points in a single day.[6]

Prospects of low growth in 2023 Chart 2



Note: IMF estimates are from the April 2023 forecast. GDP growth in Denmark is based on Danmarks Nationalbank's projection of 15 March 2023.
Source: IMF and Danmarks Nationalbank.

Inflation is declining but remains high Chart 3



Note: Core inflation is defined as HICP, i.e. inflation excluding energy and unprocessed foods. The most recent observations are from April 2023.
Source: Macrobond.

2 See Danmarks Nationalbank, Declining but still high inflation, *Danmarks Nationalbank Analysis (Outlook for the Danish economy)*, no. 4, March 2023 (*link*).

3 Measured using the EU harmonised index of consumer prices (HICP).

4 Core inflation is defined as HICP, i.e. inflation excluding energy and unprocessed foods.

5 In Denmark, wage growth in industry is expected to be 4.7 per cent in 2023. See Danmarks Nationalbank, Declining but still high inflation, *Danmarks Nationalbank Analysis (Outlook for the Danish economy)*, no. 4, March 2023 (*link*).

6 Since 2021, the average day-to-day change in absolute values has been 0.02 percentage points.

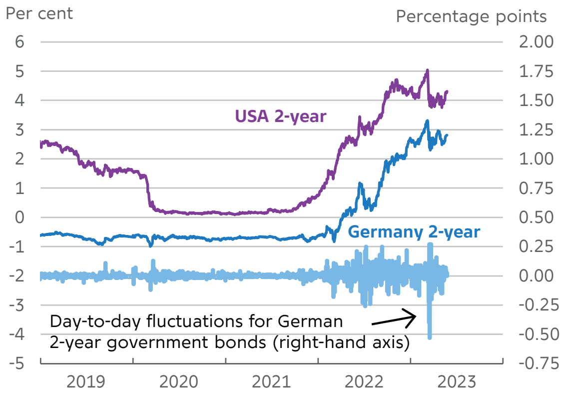
High volatility in the markets may in itself increase financing costs for businesses and households. For example, it can contribute to increasing the term premium[7], thus raising the interest rate on debt with a long fixed-interest period or fixed interest rate. At the same time, it may be more difficult for institutions to obtain market financing, see also the section on liquidity.

Problems in a few foreign banks briefly affected risk perception of the European banking sector

In March 2023, a few regional US banks faced problems due to inadequate risk management. These problems were enhanced by a lack of confidence in the banks' viability, which led to rapid withdrawals of deposits from the banks. For Silicon Valley Bank, the problems were triggered by the bank being forced to realise losses on its "hold-to-maturity"-holdings of long-term government bonds, see also the section on capital and stress tests. Signature Bank and Silvergate Bank experienced problems derived from the banks' pronounced exposures to failed companies engaged in crypto-asset activities. These incidents have demonstrated how crypto markets can impact traditional financial markets. Danmarks Nationalbank assesses that crypto-assets do not currently pose a risk to financial stability in Denmark, see box 1.

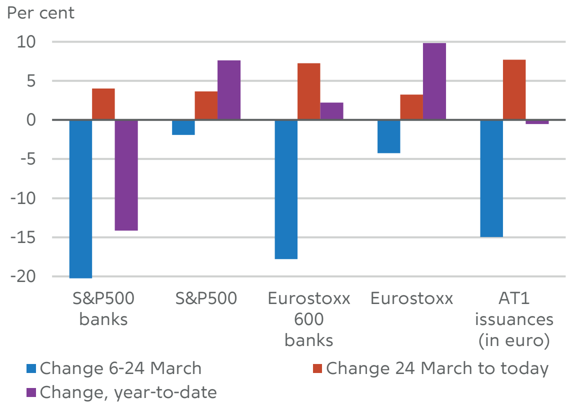
The problems in the US banks spread to the banking system in Europe and the United States. The markets' risk perception of the banking sector increased, resulting in rising costs of market financing and falling prices of the banks' equities and debt issuances, see chart 5 and the section on liquidity. Especially prices of the banks' AT1 issuances[8] fell markedly after the Swiss bank Credit Suisse's issued AT1 debt was written down. The write-down was part of the Swiss authorities' intervention and the acquisition of Credit Suisse by the bank UBS. Since April, however, prices have increased again, reflecting the rapid shifts in risk perception.

Government bond yields have increased significantly and seen large day-to-day fluctuations Chart 4



Note: The yield on 2-year US and German benchmark government bonds. Day-to-day fluctuations are stated in percentage points. The most recent observations are from 24 May 2023.
Source: Macrobond.

Problems in individual banks resulted in significant price falls on banks' equity and capital issuances in March Chart 5



Note: AT1 issuances refer to the price of the Markit iBoxx EUR Contingent Convertible AT1 index, covering all euro AT1 issuances with an outstanding volume above EUR 150 million and a remaining maturity of more than one year. The most recent observations are from 24 May 2023.
Source: Bloomberg.

7 See speech by Philip Lane, ECB, *The Transmission of Monetary Policy*, October 2022 (*link*).

8 AT1 issuances are converted into Common Equity Tier 1 capital if the CET1 capital ratio falls below a predetermined level. This makes AT1 a possible supplement to Common Equity Tier 1 capital. See Danmarks Nationalbank, *Financial stability 1st half 2014*, June 2014 (*link*).

Market conditions for the non-financial sector were only affected to a limited extent by the banking sector turmoil and saw only minor price falls in broader equity indices and limited widening of credit spreads, see chart 5 and chart 6.

Problems in a few foreign banks have not led to systemic stress in financial sector

The turmoil in the banking sector enhanced existing challenges in the Swiss bank Credit Suisse, with declining deposits and loss of market confidence, but there have been no signs of systemic stress in the European financial sector as a whole, see chart 7. The other European banks have not had liquidity problems, and although the banks' market financing costs increased markedly during the turmoil in March, they are back below autumn 2022 levels, see the section on liquidity and funding.

Interest rate increases will gradually be passed through to households

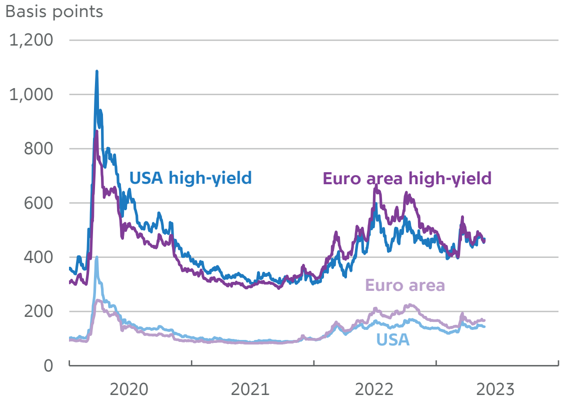
The pass-through from higher market rates to borrowers' interest payments is gradual due to fixed interest periods for adjustable-rate loans and fixed-rate loans. As more households adjust the interest rate on their loans and new homeowners take out mortgages, average interest costs will rise.[9] Even if underlying bond yields were to fall again, the fixed interest period for adjustable-rate loans means that it will take time for households' interest costs to decrease again.

In Denmark, mortgage loans account for almost 80 per cent of lending to households and businesses. The tightening of financial conditions is therefore especially passed through mortgage rates. Yields on both fixed-rate and variable-rate mortgage bonds have increased by more than 3.5 percentage points since the start of 2021, see chart 8.

For businesses, which generally have shorter fixed interest periods than households, the average interest rate has increased by 1.2 percentage points since 2021. Over the same period, the average interest rate on households' outstanding mortgage loans has increased by approximately 1 percentage point.

Limited widening of corporate bond credit spreads following turmoil in the banking sector

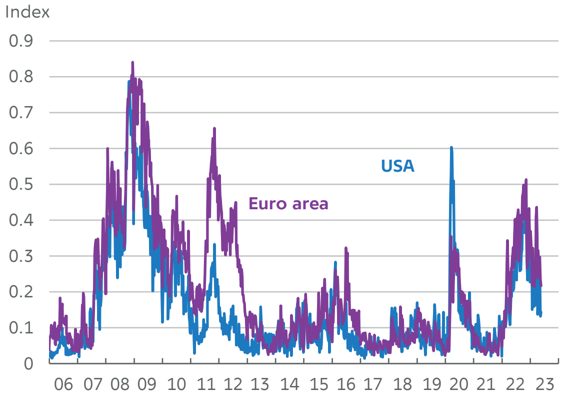
Chart 6



Note: The chart shows the options-adjusted corporate bond spread against a spot yield curve for US and euro-denominated government bonds, respectively. The most recent observations are from 25 May 2023.
Source: Refinitiv Eikon.

Composite indicator of systemic stress in euro area and the US

Chart 7



Note: The financial stress indicator aggregates the level of stress in the money, foreign exchange, stock and bond submarkets as well as in the banking sector. The level of stress for each submarket is measured on the basis of various indicators such as volatility and liquidity. The calculation of the overall stress indicator takes account of the fact that simultaneous stress in several submarkets is a greater challenge to the financial system than periods of stress in individual submarkets. The most recent observations are from 19 May 2023.
Source: Macrobond.

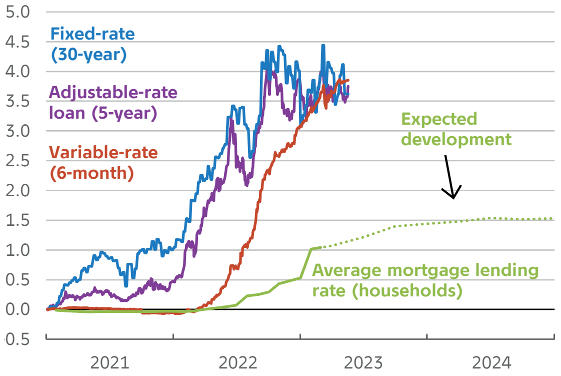
9 See Danmarks Nationalbank, Monetary policy will cool down the economy, *Danmarks Nationalbank Analysis (Monetary and financial trends)*, no. 3, March 2023 (*link*).

Although the average interest rate only rises moderately, the individual household may experience a large increase in relation to forthcoming interest rate adjustments. Households that have to adjust interest rates in the coming quarters can still expect the interest rate on their mortgage loans to rise by several percentage points.

Interest rate increases are gradually passed through to households

Chart 8

Change since 4 January, percentage points



Note: The long mortgage bond rate is an average rate on issuances. The interest rates on adjustable-rate loans are estimated par rates. The change in the variable interest rate is calculated on the basis of the change in the reference rate (CIBOR 6m) assuming a constant interest rate spread between the variable interest rate on the mortgage bond and CIBOR 6m. Interest rates on outstanding mortgage lending are calculated as an average of interest rates paid by households and are only available on a monthly basis. The expected development in mortgage lending rates is calculated based on the assumption that the current forward rates from 19 May 2023 apply on future pay dates. The most recent observations are from 19 May 2023.

Source: Refinitiv Eikon, Nordea Analytics, Danmarks Nationalbank and own calculations.

Financial stability in Denmark is currently not threatened by crypto-assets

Box 1

There are currently no indications that developments in the crypto-asset market have had spill-over effects on the financial sector or on the real economy in Denmark. However, that may change in the future. Crypto-assets can threaten financial stability in Denmark if the market reaches a significant size or if the assets become closely linked to the traditional financial sector. Therefore, the upcoming pan-European regulation is an important first step towards curtailing risks in the crypto-asset market.

Most recently, the development in the crypto-asset market has had consequences for the so-called cryptobanks[1] Signature Bank and Silvergate Bank in the United States, which were shut down by federal regulators and voluntarily liquidated, respectively, in spring 2023. Both failures were triggered by turbulence in the crypto-asset market, which led to a growing concern about the banks' financial outlook. A run on the banks resulted in large realised losses on the banks' securities holdings in 4th quarter 2022 to obtain liquidity to cover the withdrawals.

Crypto-assets are associated with risks

The use of crypto-assets is associated with risks that can impact financial stability. Some risks are well known and stem from the use of crypto-assets for non-regulated financial purposes. In addition, fluctuations in the market price of crypto-assets expose investors to market risks, which is amplified by the fact that, unlike traditional financial assets, the value of crypto-assets is not supported by an underlying income flow or a productive value. Getting access to make highly leveraged investment products is relatively easy on many crypto trading platforms[2]. In addition, sudden withdrawals of deposits in reserve-based stablecoins[3] may cause fire sales of the underlying reserve assets, such as government bonds. Risks are pronounced by a lack of reliable data on the market participants' exposures and standards for risk management.

Overall, these are among the risks that could pose a potential threat to financial stability if the crypto-asset market grows to a significant size, integration with the traditional financial sector increases or appropriate regulatory measures are not implemented and enforced.

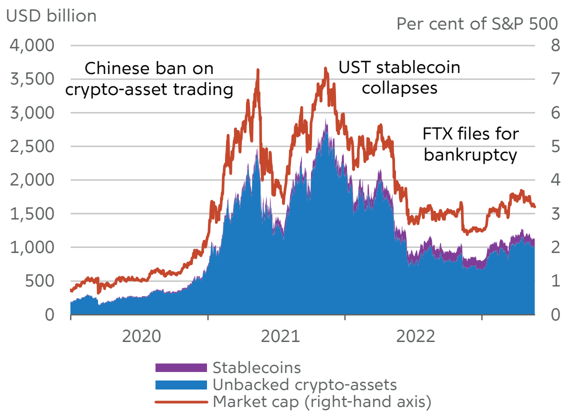
The global crypto-asset market is still small and interconnectedness with the Danish financial sector is limited

The size of the global crypto-asset market is currently limited. The market capitalisation of crypto-assets has declined significantly since the end of 2021, see chart. The decline should be seen in the context of several failures of significant entities in 2022 such as the stablecoin TerraUSD (UST) and the crypto trading platform FTX. The total market capitalisation for crypto-assets, including stablecoins, was around 1,120 billion dollars in May 2023, equal to around 3 per cent of the market value of the US S&P 500 index. This is 61 per cent below the historical peak from November 2021.

There are indications that the uptake of crypto-assets is small in Denmark relative to other European countries.[4] The interconnection between the crypto-asset market and the financial sector in Denmark is similarly to be very limited. This is among others reflected in the fact that the largest Danish banks abstain from offering crypto trading to their clients.[5] However, this does not prevent risks from the crypto-asset markets from spreading to Denmark, as the Danish financial sector is closely interlinked with the global financial markets. If risks from the crypto-asset markets materialise and affect financial markets abroad, for example through fire sales of assets, this may impact the financial system in Denmark.

Continues ...

The market value of the global crypto-asset market is characterised by considerable fluctuations



Note: The chart shows the total market capitalisation of unbacked crypto-assets and stablecoins. Unbacked crypto-assets represent the market value of all crypto-assets less the market value of Tether, USDC and BUSD and can be seen as a measure of the value of unbacked crypto-assets. Tether, USDC and BUSD are listed as the three largest stablecoins measured by market capitalisation. The most recent data in the chart are from 21 May 2023.

Source: Macrobond and own calculations.

Financial stability in Denmark is currently not threatened by crypto-assets

Box 1

... continued

Risks must be addressed through regulation and international cooperation
International cooperation and coordination are necessary to ensure effective regulation that can address the financial stability risks of crypto-assets. In the EU, the Markets in Crypto-assets Regulation (the MiCA Regulation) will formally enter into force in July 2023. However, provisions on stablecoins and crypto-assets service providers will start applying from 2024 and 2025, respectively. The object of the MiCA Regulation is to regulate businesses that issue and provide services related to crypto-assets. In addition, the Basel Committee has published a global standard for the capital treatment of banks' exposure to crypto-assets. These requirements aim to ensure that banks are sufficiently cushioned to absorb losses from holdings of crypto-assets. Danmarks Nationalbank is monitoring the development closely, including the implementation of the MiCA Regulation and the Basel standards in European law.

1. Crypto banks are traditional financial institutions specialising in providing financial services to companies engaged in crypto activities.
2. The crypto trading platform Binance offers certificates with a leverage ratio of up to 125 times the fluctuations of the underlying asset, see ECB, Decrypting financial stability risks in crypto-asset markets, *Financial Stability Review*, May 2022 (*link*).
3. A reserve-based stablecoin is a claim against a central player, such as a commercial undertaking, where the funds generated by issuance are placed in the assets the value of which the stablecoin follows.
4. See, for example, *The Chainalysis 2022 Geography of Cryptocurrency Report (link)*. It should be noted that there is significant uncertainty associated with calculating the geographical distribution of activity in the crypto market.
5. See, for example, Danske Bank, *Danske Bank's position on cryptocurrencies*, June 2021 (*link*).

Interest rate increases and spillover effects require extra focus on liquidity management

Danish banks have a solid liquidity position, and most banks can handle even a very hard risk scenario.

Banking is based on lending to customers. Banks finance this lending through equity, market funding or deposits. If funding from these sources disappears to a sufficiently large extent, the bank will not be able to continue its operations. It may, for example, pose a significant risk to the bank's continued operations if its customers quickly make large withdrawals, for example due to a lack of confidence. It is therefore important that institutions have sufficient liquidity management, which includes adjusting their liquidity position based on adequate liquidity stress tests, which is also required of banks in the EU.

In Danmarks Nationalbank's hardest stress scenario, all the systemic banks have a survival horizon with positive excess liquidity of at least three months. In the scenario, access to funding markets is assumed to be closed, while loan facilities for customers increase and deposits fall significantly.[10]

The LCR Regulation[11] assumes that 40 per cent of deposits from large corporate customers are withdrawn from the bank within a 30-day hard liquidity stress scenario, if the deposits are not covered by the deposit guarantee scheme. All Danish banks will be able to withstand twice this percentage, i.e. withdrawals of 80 per cent of these deposits, and still comply with LCR.[12] Few banks will have problems complying with LCR if all their large corporate

10 For a method description of Danmarks Nationalbank's sensitivity analysis, see page 26 of Danmarks Nationalbank, Lower excess capital for the banks, *Danmarks Nationalbank Analysis (Financial Stability)*, no. 25, November 2019 (*link*).

11 See the LCR Regulation (*link*).

12 In the event of a liquidity withdrawal from a Danish bank, the liquidity will remain in the Danish system, as the Danish banking system is a closed system. If deposits are withdrawn from one bank, they will be placed with another bank. Deposits and liquidity can be moved between the banks, but they cannot disappear from the system. If a bank has large excess liquidity, it can, for example, choose to lend the liquidity to another bank or customers, buy bonds or place the liquidity with Danmarks Nationalbank.

customers withdraw their entire deposits that are not covered by the deposit guarantee scheme. However, such a large liquidity withdrawal has not been observed before, and would therefore be a very hard scenario.

The events surrounding specific foreign banks in recent months have shown that withdrawals of deposits can occur very quickly if the customers lose confidence in the bank. It is important that liquidity management and regulation reflect the actual circumstances and risks that may affect the institutions.

Spillover effects across banks and national borders underline the need for sufficient liquidity management

The institutions generally issued debt with shorter maturities in 2022 relative to the previous years. This has increased the concentration in the institutions' maturity profiles and thus the dependence on open funding markets when they need refinancing. The liquidity situation in the Danish institutions is generally assessed to be robust, but some institutions may, however, face challenges in maintaining sufficient eligible liabilities relative to the MREL requirement if the funding markets close or the institution cannot make issuances for other reasons, see the section on capital and stress tests.

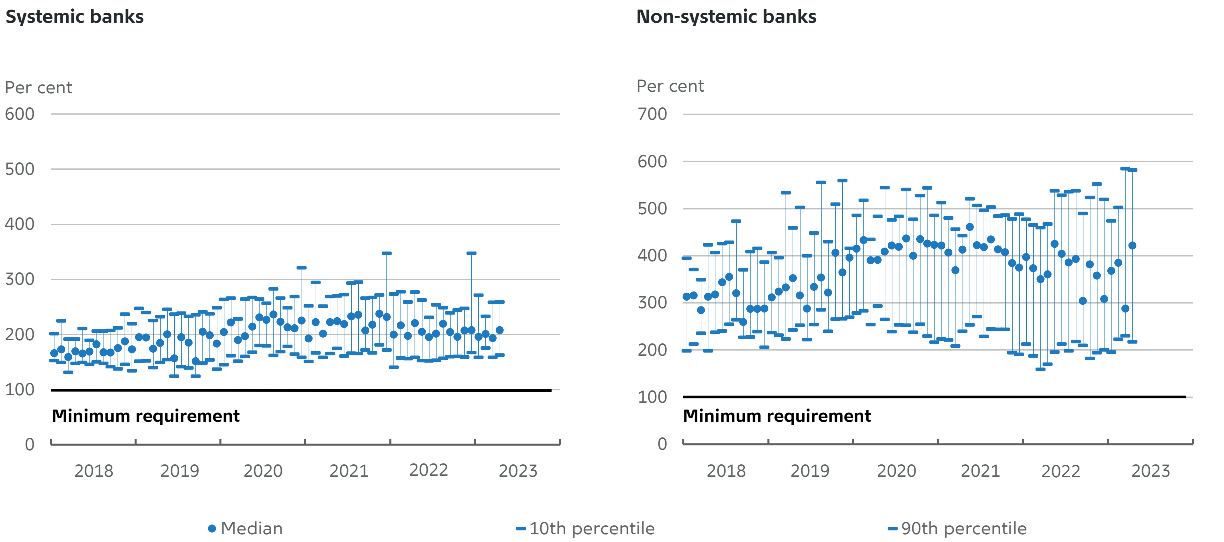
The turmoil in the financial markets in March 2023 led to very low issuance volumes in the following weeks, underlining that uncertainty about one bank can quickly spread across the whole sector and across borders. It is therefore important that the institutions focus on sufficient risk management, including ensuring adequate buffers to regulatory requirements to enable them to withstand situations where the debt markets are fully or partially closed – also as a result of events beyond their own control.

Banks meet regulatory liquidity and funding requirements

Both the systemic and the non-systemic banks meet the regulatory minimum requirement for liquidity (Liquidity Coverage Ratio (LCR)), see chart 9, and funding (Net Stable Funding Ratio (NSFR)) by some margin. The introduction of the LCR and NSFR after the financial crisis has contributed to making banks better equipped to manage liquidity and funding risks, see box 2.

The regulatory requirements LCR and NSFR help strengthen the individual bank's liquidity position, but cannot stand alone in ensuring a resilient liquidity position. This also requires that the institutions have good liquidity management.

Banks' LCR remains at a high level Chart 9



Note: The LCR is calculated as the bank's liquid assets divided by outgoing net cash flows over a 30-day stress period. The most recent observations are from end-April 2023.
Source: Danmarks Nationalbank.

The majority of Danish banks have deposits surpluses

The Danish banks' primary source of funding is deposits. Since 2013, the banks have had an overall deposit surplus, unlike during the financial crisis, when the Danish banks had a large deposit deficit, see chart 10. Only a few banks still have a deposit deficit. If a bank has a large deposit surplus, it can choose to lend the liquidity to another bank or to customers, buy bonds or place the liquidity with Danmarks Nationalbank.

Parts of systemic banks' deposits are less stable

Seen in isolation, the banks' deposit surplus makes them less vulnerable to closed funding markets. However, to ensure a robust liquidity position, it is important that the individual bank knows the stability of its deposits and ensures that this is taken into account in its liquidity management. The stability of the deposits depends on several interdependent factors, including deposit type and customer group, as well as whether the deposits are covered by the deposit guarantee scheme[13]. This is reflected in the LCR Regulation, where the stability of deposits is defined according to the three conditions[14]. The deposit composition in the systemic bank makes them more vulnerable to deposit outflow, which sets higher demands on liquidity risk management in these institutions.

Just under 90 per cent of systemic banks' deposits and 80 per cent of non-systemic banks' deposits are demand deposits, i.e. deposits that the customer can withdraw immediately, see chart 11. In the event of a lack of confidence in the bank, these loans will, all else equal, become less stable than if the deposits had been tied up for an agreed period, as they can be withdrawn within one day[15]. Approximately 45 per cent of the banks' time deposits are tied up for less than 30 days.

LCR and NSFR

Box 2

The LCR, Liquidity Coverage Ratio, ensures that credit institutions have a sufficient amount of liquid assets to handle a 30-day hard liquidity stress scenario[1]. The LCR was introduced in 2015 when it became clear during the financial crisis that many banks did not hold sufficient assets that could quickly be converted into liquidity in a crisis situation.

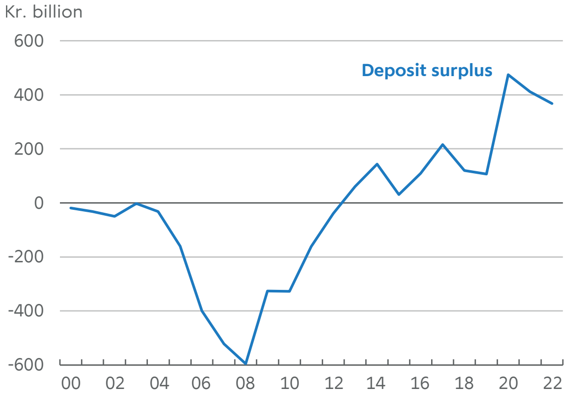
The NSFR, Net Stable Funding Ratio, ensures that credit institutions have a sufficient amount of stable funding to finance their assets, which reduces the institutions' refinancing risk. The NSFR was introduced in 2021 as result of banks deposit deficits during the financial crisis and e.g., used short term unstable market funding to finance their lending.

Source: Danmarks Nationalbank.

1. The 30-day liquidity stress test entails that the institutions do not have access to new market financing. This means that all market financing, derivatives and repo transactions fall due and are not renewed. It is also assumed that deposits are withdrawn from the bank. The draw on the various deposits depends on the stability. In addition, it is assumed that there are increased draws on credit and liquidity facilities as well as haircuts in liquidation of liquid assets.

Since 2013, banks have had a deposit surplus

Chart 10



Note: Banks in the Danish Financial Supervisory Authority's groups 1-3. Since 2017: Excluding Nordea. The most recent observations are from end-December 2022.
Source: Danmarks Nationalbank.

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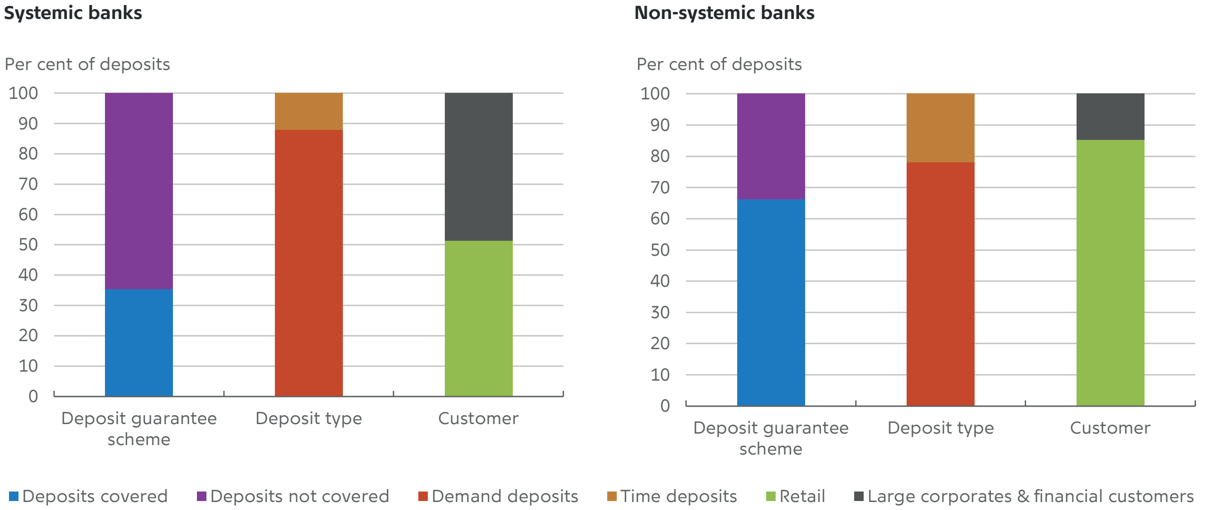
13 Deposits are covered up to 100,000 euro. See Finansiel Stabilitet, *Danish Guarantee Fund* (*link*) (in Danish only) and the Danish Executive Order on the Cover for Depositors and Investors under the Guarantee Fund (*Bekendtgørelse om Garantiformuens dækning af indskydere og investorer*) (*link*) (in Danish only).

14 In Articles 24-28 of the LCR Regulation, the stability of deposits is defined in relation to the deposit guarantee scheme, deposit type and customer type.

15 Customers can withdraw demand deposits of up to kr. 500,000 daily per customer.

Less stable deposits demand more of the liquidity risk management in the systemic banks

Chart 11



Note: The most recent observations are from end-March 2023.
Source: Danmarks Nationalbank.

About half of systemic banks' deposits come from large corporate and financial customers, while these only represent around 15 per cent of non-systemic banks' deposits, see chart 11. Deposits from large corporate and financial customers are generally less stable, as these are typically professional customers with focus on earnings and return on their funds. These customers will therefore typically react quickly to a loss of confidence in a bank's ability to remain a going concern.

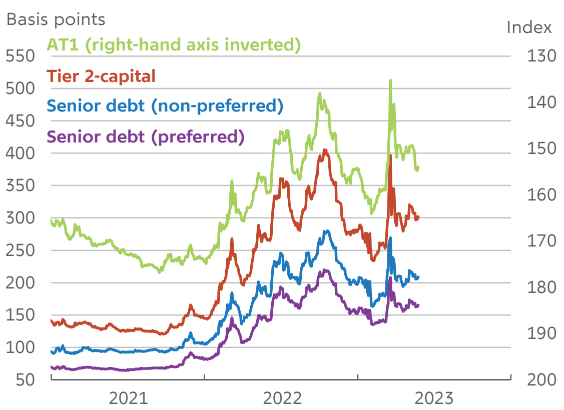
Large parts of non-systemic banks' deposits are covered by the deposit guarantee scheme, see chart 11 on the right. Conversely, less than half of systemic banks' deposits are covered by the deposit guarantee scheme, although with considerable variation between the banks. A high degree of uncovered deposits places extra high demands on liquidity risk management, as deposits of this type have a greater risk of withdrawal if doubts arise about the bank's survival.

Large movements in credit spread on banks' capital and debt instruments

There have been large movements in the credit spreads on the banks' capital and debt instruments since the 2nd half of 2022, see chart 12. Following a decrease in credit spreads in the funding markets

Large fluctuations in the spreads between capital and debt issuances by European banks

Chart 12



Note: Z-spread for iBoxx index for investment grade euro-denominated issuances for senior debt, non-preferred senior debt and subordinated debt. Index price of iBoxx liquid contingent convertible bonds. Index price of AT1 is not directly comparable to z-spread. The most recent observations are from 28 April 2023.
Source: Refinitiv Eikon.

from October 2022 to February 2023, credit spreads increased in March 2023 across Danish and foreign banks' unsecured funding instruments. This occurred as a result of an increased risk perception of the banking sector due to problems in specific foreign banks, see also the section on financial markets.

Together with the large fluctuations in bank financing credit spreads, credit spreads have generally been higher since January 2022. At the same time, tighter monetary policy and rollback of the ECB's asset purchase programmes may have an impact on levels and volatility in the prices of banks' capital and debt instruments, see box 3.

Funding structure in euro area changes with maturities of ECB loans

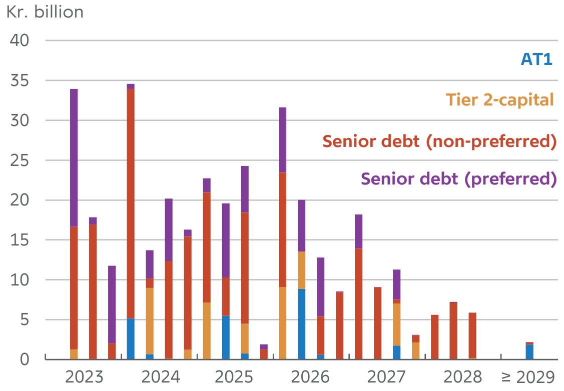
The ECB announced the third series of its targeted long-term refinancing operations (TLTRO) programme in 2019. The aim was to maintain favourable conditions for bank lending and ensure smooth monetary policy transmission.[16] A large share of European institutions' TLTRO loans fall due in June 2023. The repayment of the loans means that stable financing of approximately 477 billion euro, corresponding to approximately kr. 3,550 billion, falls due in the institutions.

The institutions will be able to repay their TLTRO loans in full or in part by drawing on their liquidity buffer and thus reducing buffers to regulatory liquidity requirements. However, buffers differ across the institutions, and some institutions must therefore obtain new funding, in the form of either deposits or market funding. This may potentially increase the Danish banks' market funding costs.

Danish institutions still need to issue market funding in 2nd half of 2023 to have excess liabilities relative to MREL requirement

Danish institutions issued debt securities at the start of 2023, when credit spreads had narrowed from the high levels in October 2022. The systemic credit institutions issued just under kr. 52 billion in non-preferred and preferred senior debt from January to mid-May 2023. In the same period, however, kr. 13 billion fell due. During the rest of the year, an additional kr. 60 billion will fall due. The institutions thus

Maturity of debt and capital instruments issued by SIFIs Chart 13



Note: The chart shows the maturity profile of Danish SIFIs' issuances of Additional Tier 1 capital (AT1), Tier 2 capital, preferred and non-preferred senior debt. For instruments with an embedded call option, the determination of the maturity date is based on the first call date. Based on reports from the end of March 2023.

Source: Reports to the Danish Financial Supervisory Authority and own calculations.

need to further issue approximately kr. 21 billion in 2023 to meet the total debt maturing for the year. In addition, several institutions are expected to issue higher amounts to ensure higher buffers to regulatory requirements. In addition, the requirements for newly appointed SIFIs[17] are being phased in, which increases these banks' capital needs.

16 See the ECB's press release, *Monetary policy decisions*, 7 March 2019 (*link*).

17 See appendix 1.

Market makers' capacity to dampen volatility has been reduced

Box 3

In 2015, the ECB started buying government bonds in the secondary market on a massive scale. The purchases were part of the accommodative monetary policy and were aimed at further reducing long-term interest rates to ease financial conditions and thereby increase the low inflation.[1] The asset purchase programmes were introduced during periods of high bond market volatility. Krishnamurthy and Vissing-Jorgensen have shown how these programmes can dampen market fluctuations, including by acting as a signal that interest rates will remain low for a long period of time.[2] At the same time, investors were reassured that there was always a major buyer in the market – also during periods with high volatility. When the ECB has purchased European government bonds, volatility in the prices of, for example, German government bonds has decreased, see chart A. High volatility in prices of German government bonds also leads to high volatility in Danish government and mortgage bonds. The ECB has now stopped its purchases and, since March 2023, it has instead reduced its bond holdings by around 15 billion euro per month and expects to discontinue reinvestments under one of the banks purchase programmes which further increases the reductions to around 25 billion euro per month.

Private investors' bond purchases are often made through so-called market makers. This may, for example, be banks that have bonds in their holdings and set bid and offer prices at which investors can trade.

Market makers contribute to the liquidity of securities markets and can reduce volatility by periodically meeting high selling and buying pressures. The large Danish banks act as market makers for Danish government and mortgage bonds. Since 2014, these banks' bond trading portfolios have been reduced significantly, while the outstanding market value of mortgage bonds has grown, see chart B. The market makers' capacity to dampen volatility has therefore been reduced relative to before the asset purchase programmes. This may be of importance to bond price volatility.

Chart A: ECB bond purchases have helped dampen volatility

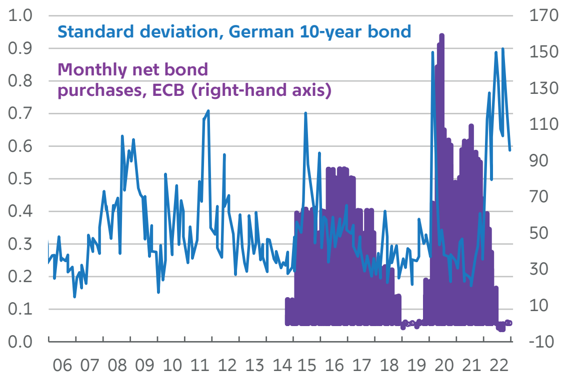
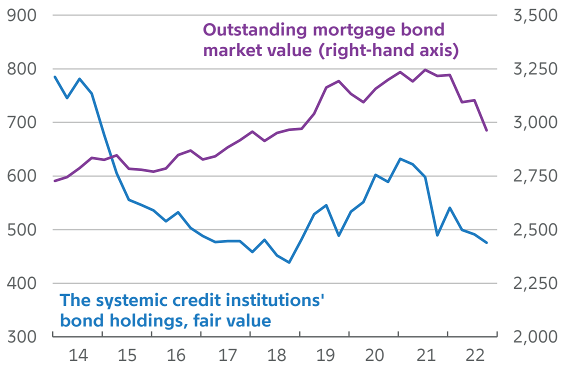


Chart B: Market makers hold fewer bonds for trading than previously



Note: Chart A: Standard deviation in the price change of 10-year German bond. Net purchases by the ECB are actual purchases less any redemptions of maturing bonds. Chart B: Outstanding holdings of mortgage and government bonds at market value on banks' balance sheets are a measure of their trading portfolio, which is calculated at market value. Bond holdings calculated at fair value are used as an indicator of the trading holdings of government and mortgage bonds.

Source: Refinitiv Eikon, Macrobond, the ECB, reports to the Danish Financial Supervisory Authority, Danmarks Nationalbank and own calculations.

1. See ECB, *Decision ECB/2015/10*, 4 March 2015 (*link*).
2. See Krishnamurthy and Vissing-Jorgensen, *The Effects of Quantitative Easing on Interest Rates: Channels and Implications for Policy*, 2011 (*link*).

Housing interest rates and consumer prices are draining the resilience of homeowners

Since the beginning of 2022, homeowners have been affected by significant increases in consumer prices and interest rates. Rising interest rates affect homeowners with delay due to different interest rate fixation periods, and the largest interest rate pass-through will affect homeowners during 2023, see the section on financial markets.

Overall, Danish homeowners are by the end of 2023 expected to spend around kr. 850 million more per month on debt servicing than in 2021.[18] The majority of the homeowners can reduce consumption if their debt servicing obligations increase and disposable income decreases. These homeowners pose a less direct risk to the institutions. However, there may be indirect risks, as lower consumption may reduce the revenue generated by the institutions' corporate customers, see the section on business credit.

Danmarks Nationalbank expects that, in 2023 relative to 2021, 36,000 more households will have a budget deficit[19] with income being insufficient to cover a modest living standard, pay fixed costs and servicing debt[20], see chart 14. On average, these homeowners have debt of kr. 1.3 million within a Danish credit institution.

A limited number of homeowners face budget deficits due to soaring unemployment

Especially two factors have led to losses and impairment charges on household debt in credit institutions:

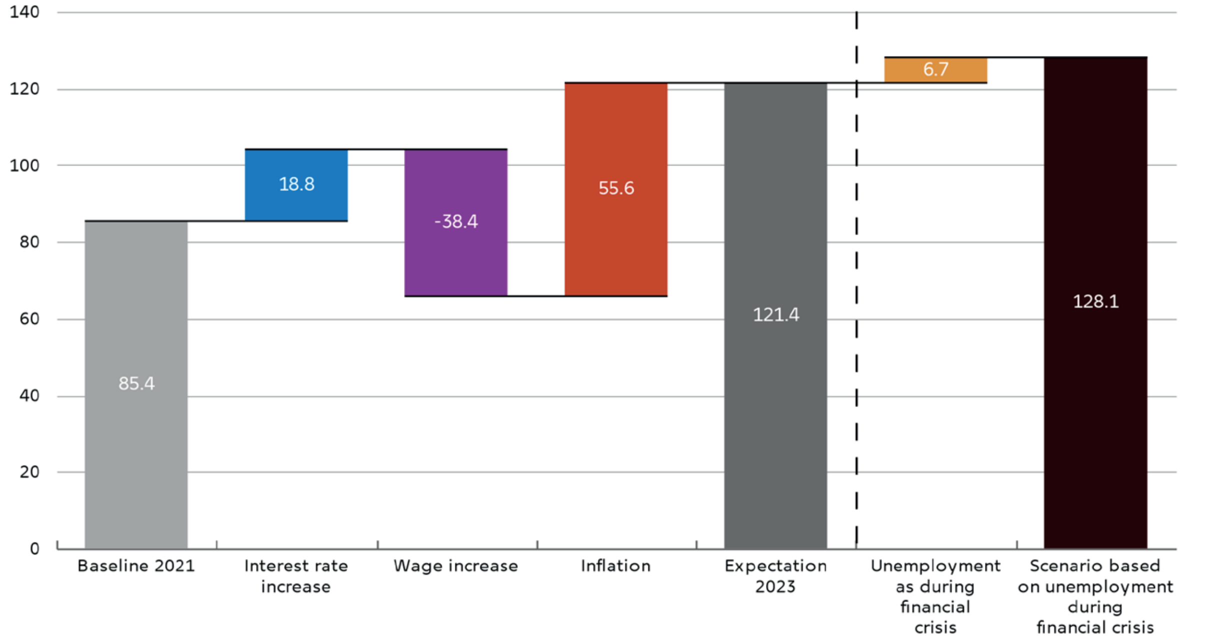
18 Difference between total (after tax) debt payments for homeowners in 2021 and expected 2023 payments.

19 Based on Danmarks Nationalbank's expectations for consumer price and wage increases and the market expectations for the development in interest rates in 2023. See box 4 and Martinello, Meyer and Nissen, Homeowners' budgets and debt servicing capacity projections, *Danmarks Nationalbank Economic Memo,* no. 4, June 2023 (*link*), for a further explanation of the method. Reference to 2021 reflects the latest available data.

20 Around 85,000 homeowners already have an estimated budget deficit in 2021. This is not necessarily the result of accommodative credit granting. For 45,000 homeowners, the deficit represents less than 10 per cent of their monthly budget. Of the remaining homeowners, 10,000 homeowners have liquid assets to cover their monthly deficit for at least ten years. Of the remaining homeowners, 23,000 have raised their loan at least three years earlier and may have been credit-rated on a different basis.

Rising interest rates and high inflation increase the number of homeowners with a budget deficit despite high wage increases

Chart 14



Note: The first bar of the chart shows the number of homeowners with housing loans in 2022 who already had a budget deficit in 2021. The following three bars show the effect of interest rate, wage and consumer price increases, respectively. Realised and expected interest rate and price increases in 2022 and 2023 cause the number to increase. Expected wage increases cause it to fall. The result is the 'Expectation 2023' bar, which is based on unchanged unemployment corresponding to 2021. The last two bars show the further effect of a marked increase in unemployment to the level seen after the financial crisis. See box 1 and Martinello, Meyer and Nissen, Homeowners' budgets and debt servicing capacity projections, *Danmarks Nationalbank Economic Memo*, no. 4, June 2023 (*link*), for further details.
Source: The credit register, Statistics Denmark and own calculations.

falling house prices and unemployment. As long as the homeowners can service their loans, falling house prices alone do not equate to losses in credit institutions. But if the homeowners' financial leeway is under pressure, reducing their debt service capability, falling house prices combined with high loan-to-value ratios can lead to losses in the credit institutions.

Households will experience a significant reduction in their disposable income if they are hit by unemployment. However, even with a very large increase in unemployment, the number of homeowners experiencing a budget deficit will only increase to a limited extent.[21] If unemployment rises to 160,000 persons, equal to the level in the years after the financial crisis, this means that only 6,700 additional homeowners will have a budget deficit, see chart 14.

In comparison, Danmarks Nationalbank's latest projection expects an increase in unemployment to

21 For a description of the method behind the calculations of the unemployed homeowners, see box 4.

88,000 persons in 2023, which supersedes a very low unemployment of 76,000 persons in 2022.[22]

The consequences of high unemployment are significantly limited with less than 40 per cent of the affected households being homeowners with housing loans. In addition, the households are, in many cases, supported by unemployment benefits[23] or a partner's unaffected income.

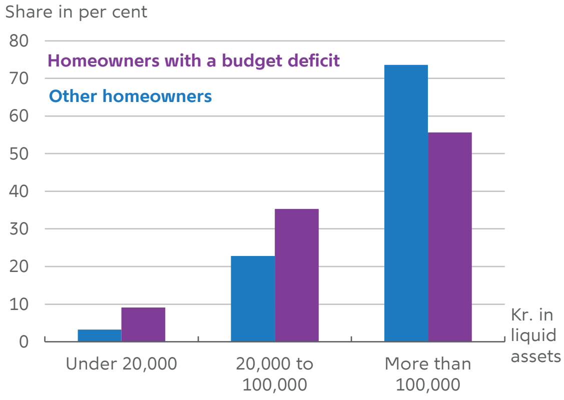
The 6,700 households that nevertheless incur a budget deficit because of unemployment have relatively high indebtedness. On average, this group of homeowners has debt of kr. 1.6 million. In absence of increased unemployment most of these homeowners had greater financial leeway and have thereby been able to take on more debt.

Households can finance increased costs with liquid assets for a period

Most homeowners have enough liquid assets[24] to compensate for a budget deficit for a period. However, the 36,000 homeowners with budget deficits due to consumer price and interest rate increases generally have fewer liquid assets than the homeowners who are not expected to have budget deficits, see chart 15. However, when homeowners use their liquid assets to cover their budget deficit, it drains their resilience. Taking into account how large a budget deficit the household needs to cover, 25 per cent of these homeowners will have exhausted their liquid assets within 12 months.

Some homeowners may have too few liquid assets to cover their costs, or their disposable income may be so low that they default on their debt. To the extent that their housing debt exceeds the value of their property, this may lead to losses being incurred by the credit institutions.

Most households have liquid assets that can be used to offset a budget deficit Chart 15



Note: Homeowners' total liquid assets distributed according to whether the household is expected to have a budget deficit in a situation with rising interest rates and falling real wages.
Source: The credit register, Statistics Denmark and own calculations.

Significant fall in house prices increases number of technically insolvent homeowners

Activity on the housing market slowed down considerably in 2022 concurrent with rising interest rates and high inflation. This led to a significant drop in house prices after their peak in the 1st quarter of 2022. Over the first months of 2023, the price fall has levelled off and the number of transactions have increased since 2nd half of 2022.

In Danmarks Nationalbank's latest projection from March, it is expected that nominal house prices will fall by 13 per cent towards 3rd quarter of 2023 relative to the level in 1st quarter of 2022. This means

22 See Danmarks Nationalbank, Declining but still high inflation, *Danmarks Nationalbank Analysis (Outlook for the Danish economy)*, no. 4, March 2023 (*link*).

23 75 per cent of those selected for unemployment are insured against unemployment, and less than 200 households are affected by unemployment of more than one person.

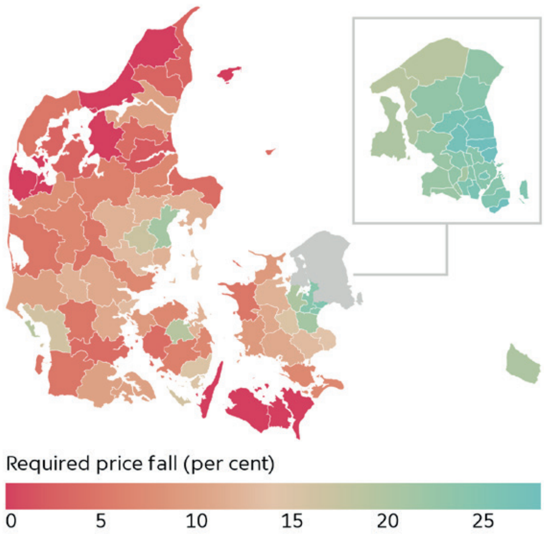
24 Liquid assets are calculated as the homeowners' bank balances, equity and bond holdings as well as investment fund certificates.

The credit institutions have exposed debt of kr. 33 billion Table 1

	Share of house-holds (per cent)	Exposed debt (kr. billion)
LTV 80-100	11.0	18.3
LTV > 100	2.7	15.0
LTV > 80	13.7	33.4

Note: *LTV* indicates the loan-to-value ratio. *Exposed debt* is calculated as the difference between housing debt and the realised sale prices after both the price drop expected by end-2023 and a 20 per cent haircut. This calculation accounts for a lower market value of fixed-rate mortgage debt.
Source: The credit register.

Homeowners in rural municipalities are more vulnerable to price falls Chart 16



Note: The chart shows the house price fall required for at least 3 per cent of homeowners in the municipality to become technically insolvent. The darker the colour, the less resilient households are to house price falls. Technical insolvency is calculated based on the market value of the total housing debt.
Source: The credit register and own calculations.

that house prices are expected to be on a par with prices at around mid-2020.

Homeowners with a budget deficit pose a risk to the institutions due to higher probability of default on their debt.[25] However, this risk can only result in a loss if the collateral behind the loan, i.e. typically the property, in the event of a sale, cannot realise an amount corresponding to the institution's exposure.

The expected fall in house prices means that 30,000 homeowners, corresponding to 2.7 per cent of Danish homeowners, will be technically insolvent by the end of 2023, see table 1.[26] Of this, the credit institutions' total lending to housing purposes exceeding the property values amounts to kr. 6.4 billion.

However, homeowners' property value may be affected both by the expected fall in house prices and by a further haircut in case of a forced sale of the property. Under the assumption of a further 20 per cent haircut in case of a forced sale, the difference between housing debt and the realised sale price of the property sum to a total of kr. 33 billion across the population[27], see table 1. This exposed debt is an indicator of the credit institutions' potential loss, if all technically insolvent and highly mortgaged homeowners were to realise a house price haircut in case of a forced sale. However, not all technically insolvent homeowners or homeowners with high loan-to-value ratios will have a budget deficit large enough to lead to a forced sale of the property. The institutions' credit risk is therefore greatest for homeowners who both have a budget deficit and whose debt exceeds the realised property price in case of a forced sale. The difference between

25 See the Danish Financial Supervisory Authority (2021), the Danish Financial Supervisory Authority and the Consumer Ombudsman's guidelines on creditworthiness assessment (*link*) (*in Danish only*), Asger Lau Andersen and Charlotte Duus, Danish Families in Mortgage Arrears, *Danmarks Nationalbank Monetary Review, 3rd Quarter 2013, Part 2 (link) (in Danish only).*

26 It should be noted that possible regional differences in the price development are not taken into account here.

27 Danmarks Nationalbank, *Finansiel Stabilitet,* 2012 (*link*) shows that the price of most properties sold at auctions in the years after the financial crisis suffered a haircut of at least 20 per cent with respect to the listing price.

housing debt and the expected realised sale price in case of a forced sale totals kr. 1.8 billion overall. This exposure is relatively modest given that the systemic credit institutions' profit before tax was kr. 36.7 billion in 2022. The institutes' ongoing earnings can be used to cover potential losses.

Homeowners in rural municipalities are more vulnerable to falling house prices

There are large geographical differences in how many homeowners become technically insolvent if house prices fall. Homeowners in rural municipalities have less home equity than homeowners in the Greater Copenhagen municipalities, and they are therefore less resilient to house price falls in connection with sales in these areas. The share of technically insolvent homeowners in nine rural municipalities is thus over 3 per cent even before the expected fall in house prices. In comparison, house prices in several Greater Copenhagen municipalities must fall by more than 25 per cent before a corresponding proportion of homeowners become technically insolvent, see chart 16. However, the difference should be viewed in the context that house prices have generally risen more in the Greater Copenhagen municipalities, and there are factors that may pull house prices down more in the area around Copenhagen than in other parts of Denmark.[28]

28 See Danmarks Nationalbank, Declining but still high inflation, *Danmarks Nationalbank Analysis (Outlook for the Danish economy)*, no. 4 March 2023 (*link*).

Key concepts in the analysis

Box 4

The analysis is based on data from the Danish credit register and microdata from Statistics Denmark. More details on data and methods are found in Martinello, Meyer and Nissen, Homeowners' budgets and debt servicing capacity projections, *Danmarks Nationalbank Economic Memo,* no. 4, June 2023.

Calculation of technically insolvent homeowners
Technically insolvent homeowners have been calculated as households for which the market value of their total housing debt exceeds the value of their property. This consequently takes into account a lower market value of fixed-rate mortgage debt. The mortgage bond prices are observed at the end of 2022. The property value is based on the bank and mortgage credit institutions' reports to the credit register as well as projections based on Danmarks Nationalbank's projection for house prices in 2023.

Calculation of increased unemployment
54,000 homeowners among those employed in 2021 are deemed to become unemployed. This number reflects the difference between unemployment during the 2008 financial crisis (160,000) and during 2021 (106,000). However, the rise in unemployment during the 2008 financial crisis started from a lower level (68,000 during the 2nd quarter of 2008). The homeowners' income under unemployment is reduced, accounting for unemployment insurance, and the households' budgets are subsequently recalculated. See Martinello, Meyer and Nissen, Homeowners' budgets and debt servicing capacity projections, *Danmarks Nationalbank Economic Memo,* no. 4, June 2023, for more details.

Calculation of budget
The term *budget deficit* is defined based on the concept of *the economic margin*.[2] The economic margin is defined as the difference between a household's[3] monthly income (disposable income from Statistics Denmark) and monthly minimum expenses.

Minimum monthly expenses are estimated for each household as the sum of:

- Expenses for credits and other debt
- Other fixed costs (childcare, property tax, transport etc.)
- Disposable income for a modest standard of living, as recommended in the Danish Financial Supervisory Authority's and the Consumer Ombudsman's Guidelines for creditworthiness assessment (2021). Reference is made to the applicable amounts at any given time in Danish Executive Order No. 1363 of 19 December 2008 on Debt Restructuring and Danish Executive Order No. 1850 of 7 December 2020 amending Danish Executive Order on Debt Restructuring.

The most complete data on households' income and taxes date from end-2021. The projected budgets for 2023 have been calculated using the following projections:

- Interest rate increases, calculated on the basis of the current forward interest rates (26 April 2023) for end-2023, and data from the credit register (calculated at end-2022), and also comprising households' adjustment of their debt composition (e.g. through refinancing) until 2022.
- Wage increases in 2022 and expected wage increases in Danmarks Nationalbank's projection for 2023 which increase homeowners' disposable income.
- Inflation in 2022 and expected inflation in Danmarks Nationalbank's projection for 2023 which affect homeowners' expected costs through inflation correction of the disposable income for a modest standard of living (total consumer price index) and fixed costs (corresponding subcomponents of the consumer price index).
- Increased unemployment which affects the expected income of homeowners in the event of unemployment. Unemployment has been simulated based on unemployment risk calculated via a machine learning model trained on 2008/2009 data (the financial crisis).

For households with a negative economic margin, it is calculated how many months they can supplement their budget using their liquid assets (calculated end-2021). The value of households' equities and investment fund certificates is adjusted downwards by the average portfolio loss in 2022 in the household sector according to Danmarks Nationalbank's securities statistics (approx. -12 per cent).

1. The stochastic variation between repeated simulations of unemployment is very limited and does not significantly affect the results. See Martinello, Meyer and Nissen, Homeowners' budgets and debt servicing capacity projections, *Danmarks Nationalbank Economic Memo*, no. 4, June 2023 (*link*).
2. See Asger Lau Andersen, Anders Møller Christensen, Charlotte Duus and Ri Kaarup, Danish Families' Financial Robustness, Variable Rates and Deferred Amortisation, *Danmarks Nationalbank, Quarterly Review, 4th Quarter 2012, Part 2 (link)*.
3. Families living at the same address, see Statistics Denmark's definition of E-families (*link*) (*in Danish only*).

Retail and service industries are vulnerable to declining private consumption

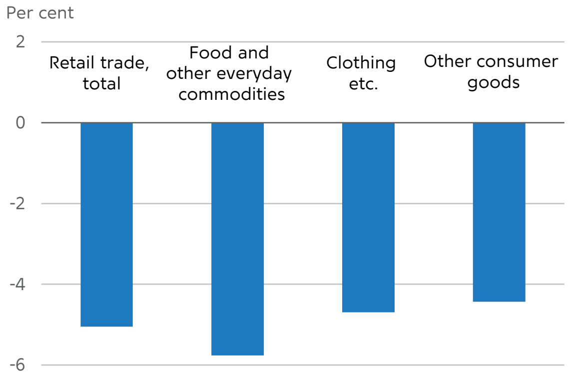
Rising interest rates and consumer prices have eroded consumers' purchasing power, while low consumer confidence continues to dampen growth in private consumption.[29]

Declining consumer demand affects the entire value chain, but it is expected to hit the consumer-facing retail and service industries first. The drop in demand can be seen in the real turnover, which has declined in large parts of the retail and service industries, see chart 17.

Declining demand may put pressure on businesses and make it harder for them to service their debt. This was evident in the period 2019-2022, where the industries that experienced the largest accumulated drop in turnover were also the industries with the largest increases in the share of businesses with non-performing loans (NPLs)[30], see chart 18.

Declining real turnover in the retail industry

Chart 17



Note: Year on year percentage change in the seasonally adjusted quantity index for retail trade in March 2023.
Source: Statistics Denmark.

29 See Danmarks Nationalbank, Declining but still high inflation, *Danmarks Nationalbank Analysis (Outlook for the Danish economy)*, no. 4, March 2023 (*link*).

30 A loan is classified as NPL if the borrower has not paid interest, fees or instalments for more than 90 days, or if it is assessed to be unlikely that the borrower will fully meet the borrower's payment obligations without any collateral being realised.

The amount of non-performing loans in the retail and service industries has not increased substantially yet

During 2022, the share of businesses with NPLs in the retail and service industries has increased slightly, but it remains at a lower level than during the covid-19 pandemic, see chart 19. This indicates that the declining consumer demand is beginning to affect businesses' debt servicing ability. However, the early signs of difficulties in the retail and service industries are primarily driven by relatively small businesses. When businesses are weighted according to their outstanding debt, the development in the share of business with NPLs is flat throughout 2022.

Risk of spillovers to other industries

The retail and service industries account for approximately 6 per cent of the banks' total corporate lending, and the direct risk of loss is therefore relatively limited.

In addition to the direct risk of loss, there are also significant risks that difficulties in the retail and service industries will spread to other industries. Particularly vulnerable are wholesale businesses, which depend on being able to sell their goods to the retail industry, and businesses in the commercial real estate industry, which own the properties from which the retail and service businesses run their business activities.

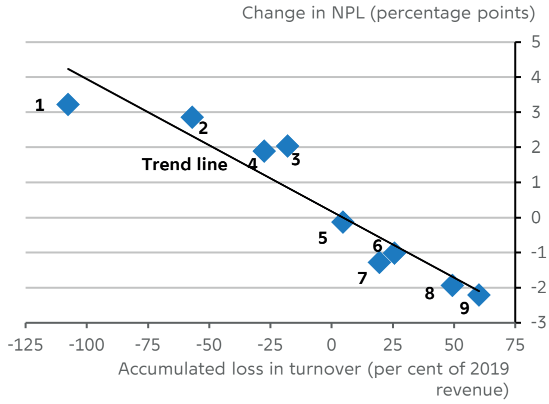
Large decline in private consumption will increase losses from retail and service industries

According to Danmarks Nationalbank's latest projection, consumer demand is expected to increase again in the coming years, so that private consumption will be back at 2021 levels in 2025.[31] Against this background, it is assessed that the risk of losses in the retail and service industries spilling over to other industries is relatively limited.

However, this may change in a risk scenario where private consumption comes under pressure again. This may be the case if the pass-through of the projected interest rate increases is not sufficient to bring inflation under control in the coming years.

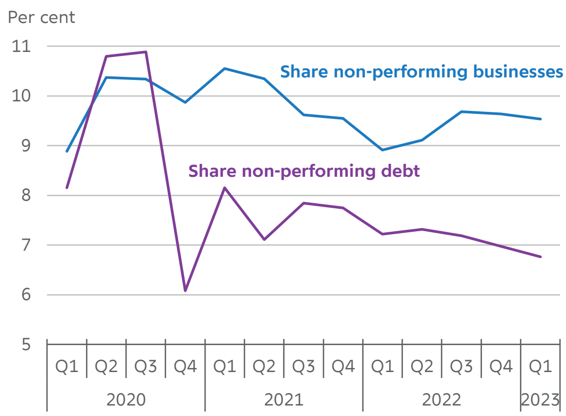
31 See Danmarks Nationalbank, Declining but still high inflation, *Danmarks Nationalbank Analysis (Outlook for the Danish economy)*, no. 4, March 2023 (*link*).

Persistent declines in turnover are associated with more financially challenged businesses Chart 18



Note: Calculated at the industry level for selected consumer-facing retail and service industries.
Horizontal axis: Accumulated losses in real turnover relative to 2019 measured from 2020 through 2022 and scaled with turnover in 2019. Based on total sales from the VAT statistics. Deflated with industry-specific price indices based on the consumer price index.
Vertical axis: Change in the share of businesses with a non-performing loan from 4th quarter 2019 to 4th quarter 2022. Industries are numbered as follows: 1: Travel, hotels etc.; 2: Entertainment; 3: Transport and fuel; 4: Restaurants etc.; 5: Personal services; 6: Non-durable goods; 7: Groceries etc.; 8: Home improvement stores; 9: Durable goods.
Source: Danmarks Nationalbank and Statistics Denmark.

Stable development in retail and service businesses with non-performing loans in 2022 Chart 19



Note: Share of retail and service businesses with non-performing loans, unweighted and weighted by outstanding debt.
Source: Danmarks Nationalbank.

In this case, it will be necessary to tighten monetary policy more than currently planned, which will dampen activity and increase unemployment more than anticipated in the main scenario in Danmarks Nationalbank's latest projection. If such a scenario materialises, credit institutions could risk significantly higher losses from the retail and service industries and related industries.

Exposures to commercial real estate have previously resulted in large losses

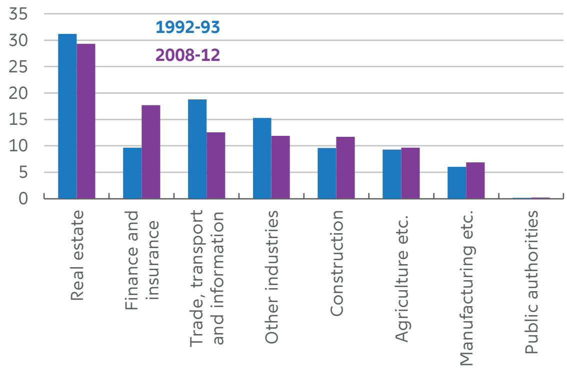
The rising interest rates are currently increasing the return requirement for commercial real estate, and this may lead to sharp price falls. Falling prices may result in the collateral pledged on the loans not being sufficient to cover the full exposure. This may lead to losses in the institutions in the event of default on the loans. Credit institutions have large exposures to the commercial real estate industry. Although the properties are primarily mortgaged through mortgage credit institutions, the risk of credit loss is greatest for the banks, as they usually provide the financing which in the event of default ranks the lowest in respect of the underlying collateral.

Overall, rising interest rates and economic downturn increase the risk that businesses in the real estate industry will not be able to service their debt. Economic downturn affects real estate businesses' earnings through lower rental income and increased vacancy rates and reduces their debt servicing capacity. Rising interest rates also increase costs, thus further squeezing the debt servicing capacity.[32]

Lending to the real estate industry has previously resulted in large impairment charges in banks. During the economic crisis in the 1990s and during the financial crisis, impairment charges on real estate loans accounted for approximately 30 per cent of total impairment charges on corporate loans, see chart 20. Lending to the real estate industry thus constituted the largest shares of the impairment charges during both these crises.

Real estate lending has accounted for the largest share of impairment charges in recent economic crises

Chart 20



Note: *Agriculture etc.* includes agriculture, hunting, forestry and fisheries. *Manufacturing etc.* includes industry, raw material extraction and energy supply. *Financing and insurance* is exclusive of credit institutions. There were data breaches in 2010. Impairment charges, broken down by industry, for the period 1992-2009 have been calculated based on the banks' losses and accumulated impairment charges, see Kim Abildgren and Jannick Damgaard, Models for Banks' Loan Impairment Charges in Stress Tests of the Financial System, *Danmarks Nationalbank, Quarterly Review, 1st Quarter 2012, Part 2 (link)*. With effect from 2010, banks began to report impairment charges by industry to the Danish Financial Supervisory Authority.

Source: Danmarks Nationalbank, the Danish Financial Supervisory Authority and own calculations.

High number of bankruptcies in 2022 should be seen in the context of the expiry of tax and VAT loans

The development in the number of bankruptcies does not indicate that businesses are under pressure, even though the level was high in 2022. The high level in 2022 should be seen as a normalisation rather than a consequence of falling consumer demand and rising costs. The development in bankruptcies should be seen in the context of the tax and VAT loans that were available to businesses in 2020 and 2021 in connection with the covid-19 pandemic. Of the businesses that went bankrupt

32 For an analysis of the debt servicing capacity of letting businesses, see Danmarks Nationalbank, Turbulent times call for a focus on risk management, *Danmarks Nationalbank Analysis (Financial stability)*, no. 14, December 2022 (*link*).

in 2022, 46 per cent had been granted a tax and/or VAT loan. In comparison, only 15 per cent of all active businesses had been granted a tax and/or VAT loan. The repayment of the loans was commenced in April 2022, around the same time that the number of bankruptcies began to increase. The increase in the number of bankruptcies in 2022 was mainly driven by businesses that had been granted a tax and/or VAT loan in 2020-2021, see chart 21.

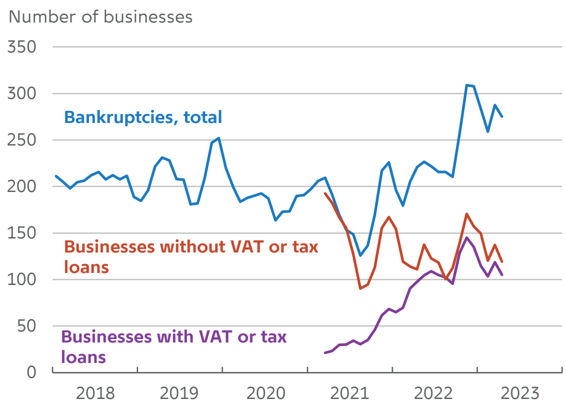
Lending should be based on thorough credit rating
Credit granting should be based on a thorough credit rating to the greatest extent possible. The development in bankruptcies indicates that the central government tax and VAT loans helped support non-viable businesses that would have gone bankrupt earlier if they had not had the opportunity to take out tax and VAT loans.[33] Deferral of the payment deadlines temporarily improves liquidity for the businesses, but will, in some cases, contribute to supporting businesses that are not viable and that should therefore not be offered further credit.

High lending growth in 2022 was to a large extent driven by draws on existing credit facilities
Bank lending to corporate customers increased significantly in 2022, not least in the 2nd half of the year, but has now decreased again. Since August 2022, the lending has decreased by kr. 13 billion, see chart 22, and the year-on-year growth rate has dropped to 5.9 per cent after having peaked at 28 per cent in August 2022. The growth rate in mortgage lending is 3.3 per cent and has been stable in recent years.

A major reason for the high lending growth in 2022 was that businesses increased their draws on existing credit facilities, see chart 23. The median utilisation rate of corporate credit facilities thus increased from 45 per cent in 3rd quarter 2021 to 61 per cent in 3rd quarter 2022 and was 59 per cent in 1st quarter 2023.

The increase in the number of bankruptcies is driven by businesses with VAT and tax loans

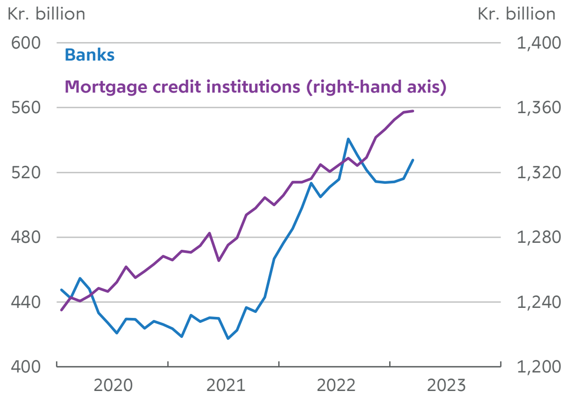
Chart 21



Note: 3-month moving average of the number of bankruptcies of active businesses, broken down by the use of VAT and tax loans. Active businesses are defined as businesses with employees or with revenue above kr. 100,000. This roughly corresponds to Statistics Denmark's definition. The most recent observations are from April 2023.
Source: The Danish Business Authority and own calculations.

Bank loan growth has slowed

Chart 22



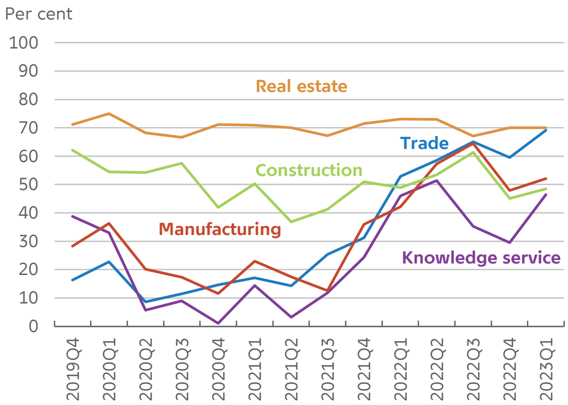
Note: Lending by banks and mortgage credit institutions to Danish non-financial businesses and self-employed persons. The most recent observations are from March 2023.
Source: Danmarks Nationalbank.

33 See Julin, Otte and Kuchler, Firm financing and public support measures during the pandemic, *Danmarks Nationalbank Working Paper*, no. 184, November 2021 (*link*).

The increased draw on credit facilities reflected higher liquidity needs among businesses due to a number of factors, including supply chain challenges and rising energy and commodity prices. For the trade industry, part of the increased draw on credit facilities was also linked to the build-up of stocks due to long delivery times and expectations of continued high revenue.

Corporate customers within trade, industry and knowledge service have increased their draw on credit facilities significantly

Chart 23



Note: Credit facility utilisation rates for non-financial businesses and self-employed persons by industry. Medians weighted by credit facility size.
Source: Danmarks Nationalbank.

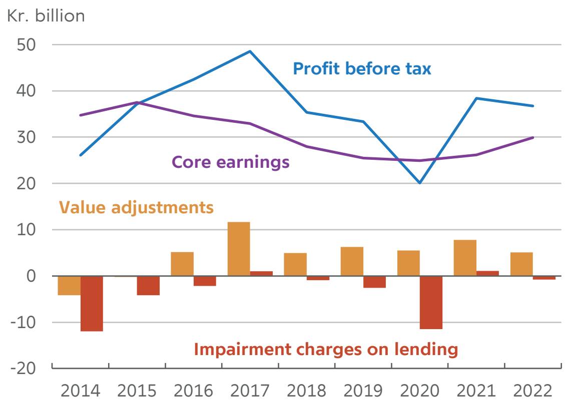
Higher interest rates increase the institutions' core earnings

The systemic credit institutions' profit before tax was kr. 36.7 billion in 2022.[34] This corresponds to an annual return on equity after tax of 7.9 per cent. The result was supported by an increase in the institutions' core earnings and continued low loan impairment charges, see chart 24. The positive result in 2022 was also due to value adjustments on the institutions' holdings, as the development in the financial markets in 4th quarter 2022 offset the large value losses in the 1st half of 2022.[35]

Core earnings are an expression of the institutions' earnings capacity in traditional banking operations.[36] Seen from a risk perspective, higher core earnings contribute to strengthening the institutions' first line of defense against loss.

The increase in core earnings should be seen in the context of higher interest rates in 2022. In the

Growth in core earnings in 2022 Chart 24



Note: Annual data for systemic credit institutions. Profit before tax is adjusted for impairment charges on goodwill and Danske Bank's fine relating to the Estonia case (see note 34).
Source: Danmarks Nationalbank.

34 Profit before tax is adjusted for impairment charges on goodwill and Danske Bank's fine relating to the Estonia case. In 2022, Danske Bank paid a fine totalling kr. 15.3 billion in connection with the money laundering case at its former Estonian branch.

35 See Danmarks Nationalbank, Turbulent times call for a focus on risk management, *Danmarks Nationalbank Analysis (Financial stability),* no. 14, December 2022 (*link*).

36 Core earnings are defined as net interest income, net fee income and income from administration margins less staff costs and administrative expenses as well as other operating expenses.

wake of the higher interest rates, the institutions have increased their interest margin, i.e. the difference between lending rate and deposit rate, which has contributed to an increase in their net interest income, see chart 25.

Improved deposit margin increases earnings

The institutions' total interest margin can be divided into a lending margin and a deposit margin.[37] The lending margin expresses the interest premium that the institutions obtain by lending money rather than placing the money in the money market. Conversely, the deposit margin reflects what institutions can earn by placing their customers' deposits in the money market.

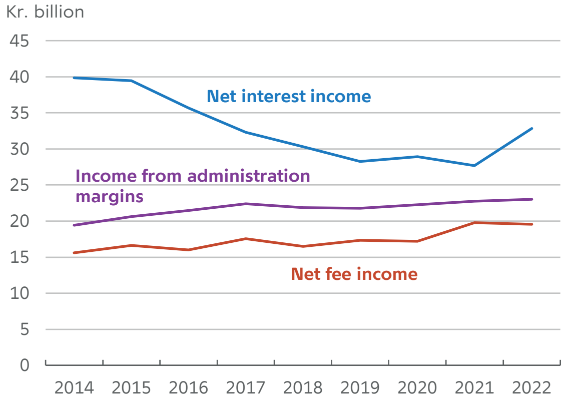
Seen over a number of years up to mid-2022, the institutions' deposit margin was negative. The reason for this was that the institutions did not decrease their deposit rate to the same extent as the decrease in money market interest rates, see chart 26.

In the wake of Danmarks Nationalbank's interest rate hikes in the 2nd half of 2022, the institutions have widened their deposit margin significantly, see chart 26. The widening is largest for households, and the deposit margin in March 2023 was roughly on a par with the period before the financial crisis. Although the institutions offer fixed-term deposits at a higher interest rate, the vast majority of household deposits are still on demand at a significantly lower interest rate, see also the previous section on liquidity and funding.

The institutions' lending margin has been declining over an extended number of years. A number of factors may have contributed to a decrease in the lending margin, including lower loss risk and the competitive situation. In 2022, the lending margin decreased further for households, while it remained unchanged for non-financial businesses, see chart 26.

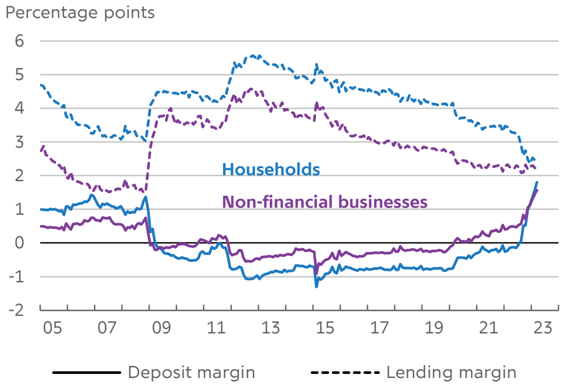
Overall, the increase in the deposit margin more than outweighs the decrease in the lending margin, which

Increase in net interest income in 2022 Chart 25



Note: Annual data for systemic credit institutions.
Source: Danmarks Nationalbank.

The institutions have recovered their deposit margins Chart 26



Note: Monthly margins are defined as the average interest rate in Danish kroner for households and non-financial businesses relative to the T/N money market rate. The most recent observations are from February 2023.
Source: Danmarks Nationalbank and own calculations.

37 The lending margin is the lending rate less the money market interest rate, while the deposit margin is the money market interest rate less the deposit rate.

has increased the institutions' interest margin and thus their net interest income.

In 2023, net interest income is expected to increase more than in 2022 due to a full financial year with a higher level of interest rates. This is reflected in a significant increase in the institutions' net interest income during the 1st quarter of 2023. The increase should be seen in the light of the institutions having increased their interest margin and having more interest-bearing assets than liabilities.[38]

Loan impairment charges are still low

The systemic credit institutions' impairment charge ratio[39] remained low in 2022 and in the 1st quarter of 2023. Relative to 2021, the majority of the institutions have maintained or increased their management estimates due to the macroeconomic uncertainty.[40]

The impairment charge ratio on bank lending has historically been higher than on mortgage lending, see chart 27. Mortgage lending has a lower risk of loss than bank lending, as mortgage loans are to a greater extent secured against a mortgage on the property. This means that the institutions' impairment charges on their mortgage lending are closely linked to the development in house prices.

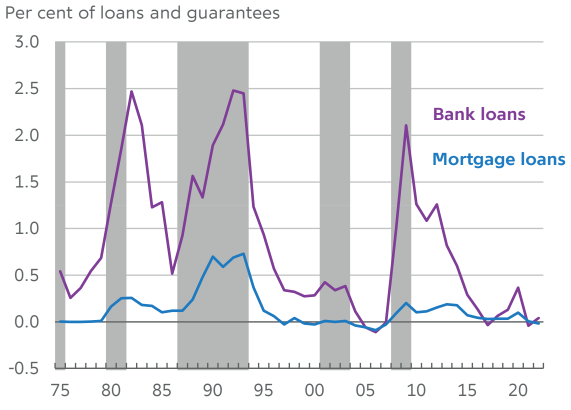
In Danmarks Nationalbank's latest projection from March, nominal prices of single-family houses are estimated to fall by 13 per cent until the 3th quarter of 2023 compared to the level in the 1st quarter of 2022.[41]

House price falls and higher unemployment will increase impairment charges on mortgage lending

Historically, house prices and unemployment have been of great importance to the impairment charge

Impairment charges on bank lending have historically been higher than on mortgage lending

Chart 27



Note: Annual impairment charges taken to the income statement as a percentage of loans and guarantees. The grey areas show periods of economic downturn. Impairment charges on mortgage lending are exclusive of extraordinary impairment charges resulting from the transition to a new set of rules for impairment charges in mortgage credit institutions in 1990.

Source: Danmarks Nationalbank, the Association of Danish Mortgage Banks' report for 1990 and own calculations.

ratio for mortgage lending, see chart 28. Danmarks Nationalbank's latest projection estimates a roughly flat development in the unemployment rate in 2023. However, an increasing unemployment rate combined with declining house prices will increase the institutions' impairment charges and reduce the earnings effect from the increased net interest income.

Declining house prices reduce the value of the institutions' collateral in the property, but this is not a problem seen in isolation unless the home is put up for sale or forced sale, see the previous section on

38 See box 4 in Danmarks Nationalbank, Turbulent times call for a focus on risk management, *Danmarks Nationalbank Analysis (Financial stability)*, no. 14, December 2022 (*link*).

39 The impairment charge ratio represents the institution's impairment charges as a percentage of total loans and guarantees.

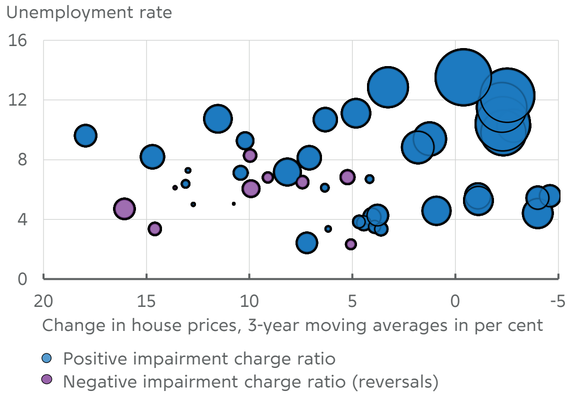
40 The institutions use management estimates when the models for calculating impairment charges do not take future loan losses sufficiently into account.

41 See Danmarks Nationalbank, Declining but still high inflation, *Danmarks Nationalbank Analysis (Outlook for the Danish economy)*, no. 4, March 2023 *(link)*.

credit to households. In periods with declining house prices, it is therefore crucial for the institutions' losses that borrowers are able to meet their current payment obligations. A large part of the institutes' mortgage lending is to households. Their ability to service debt is closely linked to unemployment.

During the financial crisis, the impairment charge ratio on mortgage lending was significantly lower than in the 1990s, see chart 27. This should be seen in the context of the unemployment rate being significantly lower during the financial crisis than in the 1990s. Since the high impairment charge ratios of the 1990s and the financial crisis, a number of factors have increased the resilience of the institutions. These includes a tightening of the institutions' credit granting through, among other regulations, the Danish Executive Order on good practice for mortgage lending and the Danish Financial Supervisory Authority's growth area guidelines.

Historically, unemployment and house prices have had a significant impact on impairment charges Chart 28



Note: The size of the bubble indicates the size of the annual impairment charge ratio for mortgage lending for the period 1975-2022.
Source: Danmarks Nationalbank and own calculations.

Institutions must ensure excess eligible liabilities relative to MREL requirement

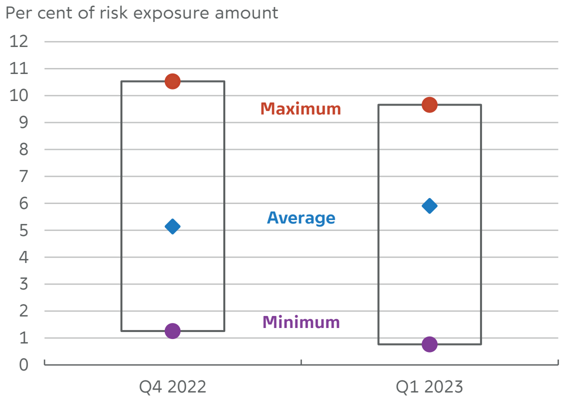
The institutions must meet an aggregate minimum requirement for their eligible liabilities, the risk-based MREL requirement.[42] All the systemic institutions had excess eligible liabilities relative to their MREL requirement at the end of 1st quarter 2023, see chart 29.[43] The purpose of the MREL requirement is that the institutions can be restructured or wound up without the use of government funds, and without any substantial negative impact on financial stability, see box 5 on crisis management of banks and MREL.

Some institutions should increase their excess eligible liabilities relative to MREL requirement

During periods with stress in the financial markets where the refinancing of expired issuances may be difficult, the institutions must still be able to meet their MREL requirement.

Low excess eligible liabilities relative to MREL requirement for some institutions

Chart 29



Note: The chart shows excess eligible liabilities relative to the MREL requirement. The excess eligible liabilities has been calculated as the difference between the institutions' total MREL eligible instruments and their total risk-based MREL.

Source: Danmarks Nationalbank and own calculations.

42 The risk-based MREL requirement covers the bank's MREL requirement calculated on the basis of its solvency requirements and capital buffer requirements plus the mortgage credit institution's total capital requirements and debt buffer requirements.

43 If an institution fails to meet the MREL requirement, the Danish Financial Supervisory Authority will, as a general rule, require the institution to implement measures to ensure that the institution can again meet the MREL requirement, for example through the injection of new capital or selling off assets. In the worst-case scenario, control may be transferred to the resolution authority Financial Stability for restructuring or winding-up.

Crisis management of banks and MREL requirement

Box 5

In continuation of the experiences from the financial crisis, we now have rules for crisis management in Denmark and the rest of the EU.[1] The rules are to ensure that failing credit institutions can be handled without significant negative impact on financial stability and the real economy and without use of government funds. One of the most important tools that the authorities have acquired is the so-called bail-in tool. The bail-in tool allows the resolution authorities to write down and convert an institution's capital and debt in a crisis. Firstly, this ensures that the institution's investors and creditors – and not the taxpayers – foot the bill for crisis management of the institution. Secondly, the institution's critical functions can be continued so that the individual citizens can still conduct their banking business.

Crisis management

For all Danish systemic banks, the crisis management strategy is that the whole group must be recapitalised and continued, so that the critical functions can be maintained. This is done using the bail-in tool. The general strategy for small and medium-sized institutions in Denmark is that the resolution authority Financial Stability conducts a so-called controlled winding-down. This means that as much of the activities as possible will be sold, while the remainder of the institution will be continued temporarily under the auspices of the resolution authority Financial Stability.[2]

Minimum requirement for own funds and eligible liabilities (MREL)

As part of the crisis management regime, banks must meet a minimum requirement for eligible liabilities (MREL).[3] The object of the MREL requirement is to ensure that the institutions do not compose their liabilities in such a way that the crisis management tools, including bail-in, cannot be used or become less effective. The purpose of the MREL requirement is thus to ensure that the institutions have sufficient capital instruments and liabilities that are eligible for being written down and converted in a crisis to cover the institution's losses and restore its capital. Investors in eligible debt or capital in a credit institution must therefore be prepared to incur losses if the institution becomes distressed and subject to crisis management. The institution's other creditors also risk incurring losses during crisis management. EU legislation lays down that depositors are to have additional protection. Therefore, deposits of up to 100,000 euro are covered by the deposit guarantee scheme and are thus not at risk of losses in a crisis. In addition, uncovered deposits are ranked in the lower part of the order of losses in a failing bank.

Source: Danmarks Nationalbank.

1. See Danmarks Nationalbank, Crisis management of credit institutions – what is new?, *Danmarks Nationalbank Analysis*, no. 4, March 2021 (*link*).
2. Controlled winding-up is implemented using the business sales tool and the bridge institution tool, see Danmarks Nationalbank, Crisis management of credit institutions – what is new?, *Danmarks Nationalbank Analysis*, no. 4, March 2021 (*link*).
3. The MREL requirement can be met with, for example, capital instruments, non-preferred senior debt and ordinary senior debt. For a liability to be used to meet the MREL requirement, it must, among other requirements, have a remaining maturity of minimum one year. Danish mortgage credit institutions are exempt from the MREL requirement. Instead, they must meet a debt buffer requirement. The debt buffer requirement has the same purpose as the MREL requirement.

Danmarks Nationalbank's stress test shows that some systemic credit institutions will not be able to continue to meet their total MREL requirement (incl. the combined buffer requirement) during a one-year period with limited possibility of issuing new debt instruments.[44] Overall, the systemic institutions need an additional kr. 8 billion in 2nd quarter 2024.[45]

By being dependent on market access within a short period of time, the institutions run a refinancing risk. The institutions are responsible for ensuring a sound financing structure. It is therefore important that the institutions both build up sufficient excess eligible liabilities relative to the MREL requirement and have a sufficiently long and diversified maturity on their

44 In the severe recession scenario, where the countercyclical capital buffer is assumed to be released.

45 The institutions are not assumed to be able to issue new debt instruments in the period from the 2nd half of 2023 up to and including the 1st half of 2024.

senior issuances to enable them to cope with a period with no or limited market access without breaching the requirement.[46]

Credit institutions' excess capital has developed steadily in the past year

The systemic credit institutions' excess capital is at approximately the same levels as a year ago. However, the level of excess capital varies across institutions, see chart 30.

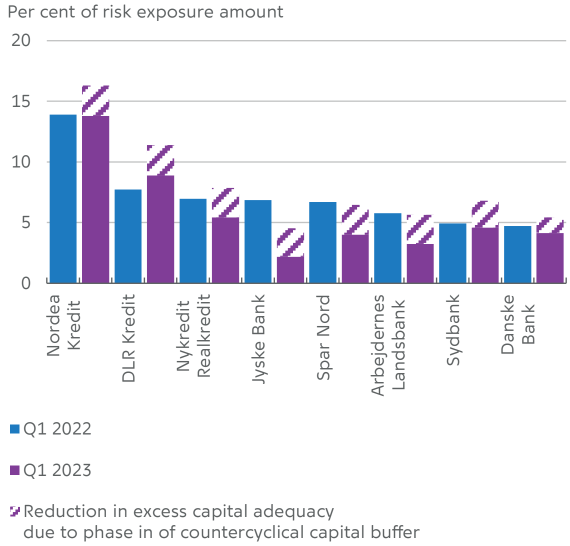
For several institutions, increased earnings have contributed positively to their capitalisation. However, several other factors have pulled down the excess capital: From the end of March 2023, all institutions have had to meet a requirement for a countercyclical capital buffer of 2.5 per cent of their Danish exposures. This has contributed to lower excess capital. Some institutions have also had a decrease in their excess capital due to institution-specific circumstances. The decrease in Nykredit's excess capital is especially due to a marked increase in risk-weighted exposures as a result of increased lending, implementation of new regulatory requirements for internal models and increased uncertainty in the financial markets in autumn 2022. The decrease in Jyske Bank's excess capital should be seen in the context of the acquisition of Handelsbanken's Danish activities. The acquisition has led to a significant increase in risk-weighted exposures as a result of higher lending and has also meant a significant decrease in Jyske Bank's capital base, as the bank financed part of the acquisition via its equity. Conversely, DLR Kredit's increase is due to a combination of the full profit for the year being allocated to reserves and a decrease in risk-weighted exposures due to an adjustment of the internal models.

Annual profits provide leeway for capital build-up after dividend payments

After some years with limited dividend distributions due to the coronavirus pandemic, more than half the systemic credit institutions have adopted significant distributions based on their financial statements for 2022. For the institutions that have published a dividend policy, the dividend is at the upper end of their dividend policy rate, see chart 31.

Stable development in excess capital for systemic groups

Chart 30



Note: The excess capital is calculated as the difference between Common Equity Tier 1 capital and Common Equity Tier 1 capital need. The countercyclical capital buffer is 2.5 per cent from the end of 1st quarter 2023. The Common Equity Tier 1 capital need is the Common Equity Tier 1 capital requirement plus the Additional Tier 1 capital and Tier 2 capital requirements which are met by Common Equity Tier 1 capital. The shaded area shows how much of the excess capital is used to meet the requirement for a 2.5 per cent countercyclical capital buffer.

Source: Danmarks Nationalbank and own calculations.

Three of the systemic credit institutions have chosen not to pay any dividend based on their financial statements for 2022. These are Danske Bank, Jyske Bank and DLR Kredit. Danske Bank's decision should be seen in the context of its losses in 2022.[47] Jyske Bank's decision should be seen in the context of the bank's capital situation, which is affected by the

46 On 2 May 2023, the Danish Financial Supervisory Authority submitted draft guidelines for a sound financing structure in relation to the MREL and debt buffer requirements (*Vejledning om forsvarlig finansieringsstruktur i forhold til NEP- og gældsbufferkravet*) (*link*) (*in Danish only*) for consultation. In 2021, the Danish Financial Supervisory Authority submitted a similar draft for the guidelines for consultation, on which Danmarks Nationalbank submitted a consultation opinion (*link*) (*in Danish only*).

47 In 2022, Danske Bank paid a total fine of kr. 15.3 billion in connection with the money laundering case at its former Estonian branch.

acquisition of Handelsbanken's Danish activities. Jyske Bank has therefore chosen not to pay any dividend and to postpone any share buybacks until the 2nd half of 2023.

Systemic credit institutions do not have large unrealised market value losses that can erode their capital

In early March 2023, stress arose in the financial markets following problems in specific banks in the United States and Europe, see also the previous section on financial markets. This led to increased focus on accounting disclosure of, for example, bonds, see box 6. In the US bank Silicon Valley Bank, the bonds turned out to pose a risk that was not sufficiently reflected in either the bank's liquidity management or its capital management. Silicon Valley Bank was taken over by the authorities on 10 March. The rapid decline of Silicon Valley Bank underlines the need for strong liquidity and capital management.

In Silicon Valley Bank, the holding of bonds that were not regularly value-adjusted accounted for 43 per cent of the bank's assets, and the unrealised market value losses was equal to approximately 94 per cent of the capital base.

Danish banks also hold bonds that are not value-adjusted on an ongoing basis. Unlike Silicon Valley Bank, these holdings in Danish banks represent a relatively limited exposure, which is not in itself assessed to pose a challenge to the banks. In the systemic credit institution which has the largest exposure relative to its capital base, the holdings represent only 4 per cent of the assets and the unrealised market value loss constitutes 6 per cent of the capital base.

Furthermore, holdings are regulated differently in Denmark and the EU than in the United States. According to the regulation, banks in the EU and Denmark must include bonds when determining how sensitive the bank's balance sheet is to interest rate changes,[48] and the banks must reserve capital for

48 The European rules on this are known as Interest rate risk in the banking book (IRRBB). These rules aim precisely to catch whether the bank has large unrealised losses on its balance sheet when interest rates change. The IRRBB comprises bonds, deposits and loans. A potential unrealised loss on a bond portfolio can thus be balanced by a corresponding unrealised gain on issued bonds or long-term fixed-rate deposits.

Bonds booked at amortised cost Box 6

Overall, there are two ways in which the value of bonds can be recognised in banks' financial statements:

One way is that bonds are recognised at market value and are value-adjusted on an ongoing basis via profit and loss or through other comprehensive income. This affects the bank's earnings and thus its capitalisation on an ongoing basis. This provides transparency, but also risks reflecting a market risk that the bank does not necessarily intend to realise.

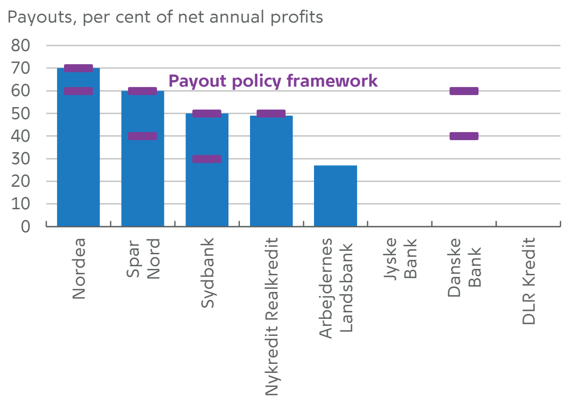
The second way is to recognise the bonds at amortised cost if the bank intends to hold the bonds to maturity. In this case, the bonds are not value-adjusted on an ongoing basis, as it is assumed that the bank will not sell them.[1] Market value fluctuations will therefore not immediately result in changes in the bank's earnings.

Over time, a discrepancy may arise between the book value and the market value. In an environment with sharply rising interest rates, the market value of bonds will fall. If, despite the intention to the contrary, the bank is forced to sell the bonds, for example due to lack of liquidity, the capital loss is realised and negatively impacts the bank's capitalisation.

Source: Danmarks Nationalbank and the Danish Financial Supervisory Authority.

1. If the bank makes ongoing market value adjustments, price fluctuations will appear as a cost or income that the bank will not end up realising if the bonds are held to maturity.

Dividends are at the upper end of the dividend policy range Chart 31



Note: The chart shows the groups' announced dividends and share buy-backs, based on the profit for the year, as well as published distribution policies.
Arbejdernes Landsbank, Jyske Bank and DLR Kredit have not published dividend policies.
Source: The institutions' annual reports and own calculations.

this risk. In Denmark, the Danish Financial Supervisory Authority has pointed out that, in addition, the banks must reserve capital when they observe a significant unrealised market value loss on their bonds that are not valued on an ongoing basis.[49] It is up to the banks themselves to set this level.

A few systemic credit institutions are close to breaching buffer requirements under stress

To assess the robustness of the financial sector's resilience, Danmarks Nationalbank conducts a stress test of the systemic credit institutions and non-systemic banks every six months, see appendix 1.

In this stress test, Danmarks Nationalbank examines whether the institutions maintain a sufficient distance to the capital requirements in three scenarios, see box 7 and appendix 2.

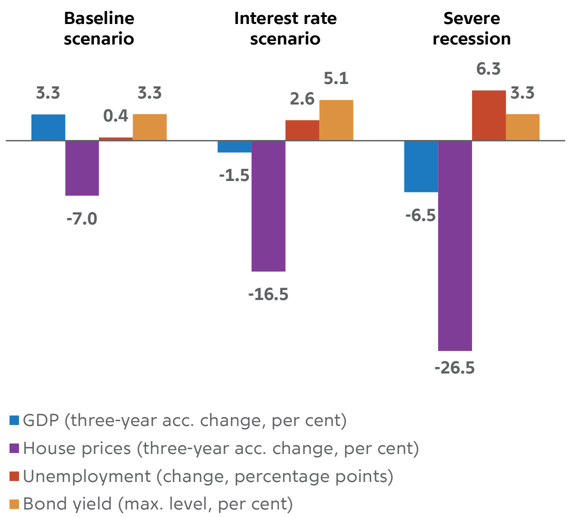
The stress test shows that all institutions' capital ratios comfortably exceed capital requirements relative to the risk-based capital buffer requirements in the interest rate scenario. In this scenario, negative economic growth results in a greater loss for the institutions than in the baseline scenario. Conversely, the additional interest rate increases contribute to the institutions' earnings through increasing net interest income, see section on earnings.

Overall, a severe recession leaves comfortable excess capital for the non-systemic banks on the assumption that the countercyclical capital buffer is released. The systemic institutions also maintain overall excess capital relative to the risk-based capital buffer requirements. However, there is a wide dispersion in the distribution across the institutions, and some of the systemic institutions come close to their capital buffer requirements. Without release of the countercyclical capital buffer (CCyB), a few institutions would breach their capital buffer requirements during a severe recession, see chart 32.[50]

Macroeconomic scenarios in stress test over the period 2023-2025 Box 7

This stress test contains three scenarios consisting of:
1. a baseline scenario that follows Danmarks Nationalbank's latest projection[1];
2. an interest rate scenario characterised by a sharp rise in interest rates and additional reduction in house prices combined with a persistent economic downturn;
3. a severe recession scenario in which the Danish economy is hit by a severe economic downturn.

In both the interest rate scenario and the severe recession scenario, the macroeconomic downturn will hit in the 2nd half of 2023.



Note: The figures have been calculated based on annual averages. Bond yields indicate average bond yield (per cent p.a.). See also appendix 2 for a detailed description of the stress test scenarios.
Source: MONA and own calculations.

1. See Danmarks Nationalbank, Declining but still high inflation, *Danmarks Nationalbank Analysis (Outlook for the Danish economy)*, no. 15, March 2023 (*link*).

49 See the Danish Financial Supervisory Authority, *Guidelines on adequate base capital and individual solvency needs for credit institutions* (*link*) (*in Danish only*).

50 Failure to meet capital buffer requirements is not in itself critical to the institution's survival going forward. However, several restrictions will be imposed, e.g., in relation to dividend payments and coupon interest rate payments on hybrid capital instruments. For further information on the consequences of a breach of capital requirements, see the memo from the Danish Financial Supervisory Authority: *The Danish Supervisory Financial Authority's expectations for capital plans and capital adequacy targets*, 7 November 2018 (*link*) (*in Danish only*).

Some institutions should increase their capital towards the phasing-in of the banking package

In addition to the capital effect of a severe recession scenario, individual institutions must also hold sufficient capital to meet future capital requirements. The European Commission's banking package is expected to enter into force on 1 January 2025. The banking package proposes a revision of the European Capital Requirements Regulation (CRR) and the Capital Requirements Directive (CRD).[51] The total increase in the capital requirement in 2025 for Danish systemic institutions is estimated at just under kr. 6 billion.[52] A few systemic institutions do not have adequate capital relative to meeting a more stringent requirement in a severe recession scenario without breaching their capital buffer requirements. Though the final effects of the capital requirements package are unknown, the credit institutions should generally exercise prudence in their capital planning, and some institutions should increase their capital.

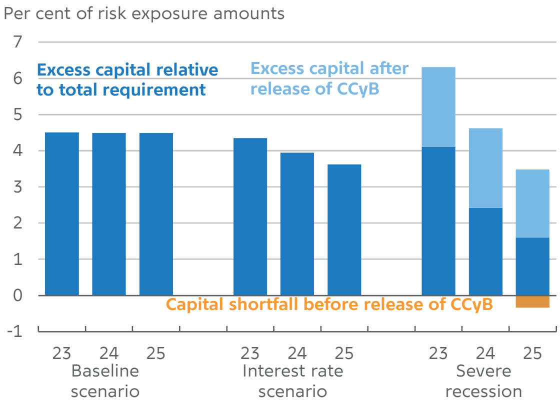
The capital targets of several systemic institutions are too low to cope with a severe recession

In addition to the regulatory requirements, the credit institutions determine their capital targets following a dialogue with the Danish Financial Supervisory Authority, see box 8. At the end of 2022, the capital ratio of all systemic credit institutions except Jyske Bank was above their capital target. Jyske Bank's capital ratio was within the range of its capital target.

The object of the credit institutions' capital targets is to ensure that the credit institution is sufficiently capitalised and that all capital requirements are met – even in a situation in which the credit institution is exposed to severe macroeconomic stress.[53]

A few systemic institutions will breach capital buffer requirements if the countercyclical capital buffer is not released

Chart 32



Note: The chart shows the excess capital or capital shortfall of the systemic credit institutions that either have excess capital or a capital shortfall as a percentage of their total risk exposure amounts. The stress test assumes the release of the countercyclical capital buffer (CCyB) in a severe recession. The additional excess capital and shortfall is illustrated in a severe recession scenario.

Source: Danmarks Nationalbank and own calculations.

Danmarks Nationalbank's stress test of the institutions' capital targets shows that several systemic credit institutions would not be sufficiently capitalised to withstand a severe recession if their initial capital ratio was on a par with their capital target, see chart 33.[54] Overall, they would have a capital shortfall relative to the capital buffer requirements of kr. 5 billion in 2025. This indicates that several institutions should consider increasing their capital target.

51 See European Commission, *Banking package* (*link*).

52 Assuming that the countercyclical capital buffer rate is 0 per cent.

53 For an exhaustive discussion of capital adequacy targets, see memo from the Danish Financial Supervisory Authority: *The Danish Financial Supervisory Authority's expectations for capital plans and capital adequacy targets*, 7 November 2018 (*link*) (*in Danish only*).

54 The stress test is conducted under the worst-case scenario, where the only change we make is to the credit institutions' excess capital on commencement of the stress test. If, for example, a credit institution has published a capital adequacy target of 16 per cent, the credit institution's capital ratio will be 16 per cent on commencement of the stress test. For systemic institutions that state a range for their capital adequacy target, the midpoint of the range is used, while, for institutions that set a minimum, this minimum is used. For Nordea Kredit, we assume that its capital adequacy target is equal to its observed capital ratio at the end of the 4th quarter of 2022. All other input are the same as in the regular stress test. This means that it is implicitly assumed that the size of the balance sheet total remains unchanged, but that the composition of the liabilities has changed. To isolate the effect of changed capital ratios, it is assumed that the reduced equity is matched by a corresponding increase in another liability.

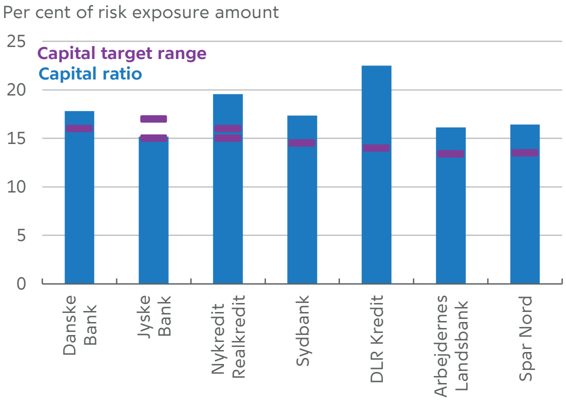
Capital adequacy targets must ensure adequate capitalisation

Box 8

The object of the capital target is to ensure that the credit institution is adequately capitalised at any given time. Generally, the institutions must have a capital target that is sufficiently high to enable them to cope with both institution-specific and macroeconomic stress without breaching the combined buffer requirement.[1] In addition, the capital target should take into account known future changes in the requirements.

The institutions' determination of their capital target is done in a dialogue with the Danish Financial Supervisory Authority, which, based on European rules, has laid down guidelines[2] for how the capital adequacy target is to be set.

Systemic credit institutions' capital adequacy targets

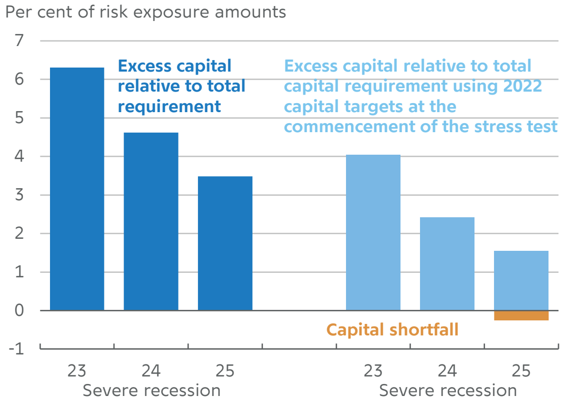


Note: The chart shows the groups' Common Equity Tier 1 capital ratios and capital targets at the end of 2022.
Source: The institutions' annual reports for 2022, Danmarks Nationalbank and own calculations.

1. The credit institutions cannot assume that the countercyclical capital buffer will be released in an institution-specific stress situation. The institutions can expect the countercyclical capital buffer to be released in a scenario of hard general stress, see the Danish Financial Supervisory Authority: *The Danish Financial Supervisory Authority's expectations for capital plans and targets (link)* (*in Danish only*).
2. See Finanstilsynet, *Vejledning om tilstrækkelig basiskapital og solvensbehov for kreditinstitutter'* (The Danish Financial Supervisory Authority's Guidelines on adequate capital base and solvency need for credit institutions) *(link)* (*in Danish only*) and *Forventninger til kapitalplaner og kapitalmålsætninger* (The Danish Financial Supervisory Authority's expectations for capital plans and capital adequacy targets), 2018 *(link)* (*in Danish only*).

The capital targets of several systemic institutions are too low to cope with a severe recession

Chart 33



Note: The chart shows the excess capital or capital deficiency of systemic banks with either excess capital adequacy or a capital need as percentages of their total risk-weighted exposure amount.
Source: Danmarks Nationalbank.

Advanced cyberattacks may threaten financial stability

Cyberattacks may threaten financial stability in Denmark in several ways. For example, a cyberattack may limit societally critical functions, impact confidence in the financial sector or cause financial losses to such an extent that the financial system is unable to absorb them.

Cyber threat is evolving and changing nature
The threat from cyber espionage and cybercrime is still assessed as very high by the Centre for Cyber Security (CFCS)[55]. On the other hand, CFCS assesses that the threat from destructive cyberattacks[56] against Danish targets is low. However, CFCS assesses it as likely that state-sponsored hacker groups are developing the capability to launch destructive cyberattacks against critical infrastructure in Denmark. In this context, it is assessed by CFCS as likely that cyber espionage is used in preparation for destructive cyberattacks. It is also possible that Danish organisations that have activities in Ukraine or deliver products or services related to the war in Ukraine may be exposed to a higher risk of being hit by attacks directed against Ukraine or of becoming collateral victims of such attacks.

As a result of the war in Ukraine, CFCS assesses that the threat from cyber activism has increased to high. The nature of the cyber threat can also quickly change if the political situation were to escalate.[57]

Continued work to limit the impact of cyberattacks
For a number of years, the Danish financial sector has targeted work at improving operational resilience with particular focus on strengthening cyber resilience. The financial institutions are themselves responsible for ensuring stable operations and operational resilience.

Work is being done to achieve this both individually and jointly, including through Danmarks Nationalbank's and the financial sector's initiatives in Financial Sector forum for Operational Resilience (FSOR) and the TIBER-DK programme, see box 9.

55 The Centre for Cyber Security (CFCS) was established in 2012 as part of the Danish Defence Intelligence Service. CFCS's mission is to support a high level of information security in infrastructure that is vital to society (*link*).

56 Descriptions of threats and types of attacks can be found in CFCS' threat assessment (*link*).

57 See Centre for Cyber Security, *The Cyber Threat Against Denmark*, threat assessment from 8 May 2023 (*link*).

The cyber threat cannot be eliminated, and there is still a need to increase cyber resilience. The reason for this is that the best hackers are continuously becoming more specialised and sophisticated in their methods. At the same time, the war in Ukraine is changing the threat landscape. Several states have the capabilities needed to carry out advanced cyber-attacks, but currently limited intentions of launching such attacks against Denmark. The threat could change with little or no warning.[58] It is therefore important that the financial sector continues to target work at increasing cyber resilience and limiting the impacts of cyberattacks.

Examples of operational measures: FSOR and TIBER-DK

Box 9

FSOR

In 2016, Danmarks Nationalbank and the financial sector established a voluntary, but binding, private/public collaboration forum: Financial Sector forum for Operational Resilience (FSOR). The purpose is to increase operational resilience across the financial sector, including resilience to cyberattacks.[1] FSOR's work is based on a risk analysis that identifies the greatest risks to the sector. It lays down a direction for the work with joint mitigating measures. These measures include a crisis management team that ensures coordinated action across the sector in the event of a systemic crisis. The participants in FSOR are the most central financial institutions, Nordic Financial CERT[2], interest group organisations and authorities, including CFCS. Danmarks Nationalbank chairs FSOR and provides secretariat services. Read more about FSOR on nationalbanken.dk (*link*).

TIBER-DK

Since the beginning of 2019, Danmarks Nationalbank has coordinated testing of cyber resilience in the financial sector under the TIBER-DK programme. A TIBER test simulates advanced attacks from state-sponsored or organised criminal groups in real production environments. Based on intelligence information about current threats, the tests use real tactics, techniques and procedures. The goal is to identify strengths and challenges in the cyber defence. Addressing the challenges increases cyber resilience. Danmarks Nationalbank was one of the first central banks to implement the programme, which today exists in another 11 European countries and in the European Central Bank (ECB). Read more about TIBER-DK on nationalbanken.dk (*link*).

1. Danmarks Nationalbank examines the cyber resilience of key actors in the Danish financial sector through questionnaire surveys that make use of self-assessment – see Danmarks Nationalbank, *Cyber resilience in the financial sector* (*link*).
2. Nordic Financial CERT is a member-driven non-profit organisation, and its objective is to strengthen the Nordic financial industry's resilience to cyberattacks and enable Nordic financial institutions to respond quickly and effectively to cybersecurity threats and online crime. Nordic Financial CERT collects and shares information about cyber threats and cyberattacks.

58 See Centre for Cyber Security, *The Cyber Threat Against Denmark*, threat assessment from 8 May 2023 (*link*).

Appendix 1:
Analysis data basis

The analysis applies the term 'credit institutions' when referring to the activities of both banks and mortgage credit institutions. The term 'bank' refers specifically to entities carrying out banking activities. These institutions are listed in table A1.

The analysis of Danish credit institutions' earnings, liquidity and own funds as well as the stress test comprise eight systemic credit institutions designated by the Danish Financial Supervisory Authority in 2022. The analysis and stress test also include the non-systemic banks. This group consists of the institutions in group 2 defined by the Danish Financial Supervisory Authority for 2022, with the exception of Saxo Bank and Danish Ship Finance, which have both been omitted due to their business models. The grouping applies retrospectively.

In the analysis and assessment of lending activity, focus is on the grouping of large and medium-sized banks in Danmarks Nationalbank's lending survey. Large banks are the Danish Financial Supervisory Authority's group 1 plus Nordea Danmark, while medium-sized banks are the Danish Financial Supervisory Authority's group 2 plus Santander Consumer Bank.

Institutions in the analysis by total assets as at 31 December 2022, kr. million Table A1

Systemic credit institutions	Amount
Danske Bank	3,763,999
Nykredit Realkredit	1,600,129
Jyske Bank	749,997
Nordea Kredit	425,506
DLR Kredit	180,244
Sydbank	179,318
Spar Nord	123,936
Arbejdernes Landsbank	107,987
Total systemic credit institutions	7,130,115

Systemic banks	
Danske Bank	2,398,317
Jyske Bank	421,675
Nykredit Bank	234,608
Sydbank	181,309
Spar Nord	124,040
Arbejdernes Landsbank	107,987
Total systemic banks	3,467,935

Non-systemic banks	
Ringkjøbing Landbobank	68,980
Sparekassen Danmark	58,396
Sparekassen Kronjylland	39,315
Lån & Spar Bank	30,022
Sparekassen Sjælland-Fyn A/S	29,658
Middelfart Sparekasse	18,358
Total non-systemic banks	244,729

Mortgage credit institutions	
Nykredit Realkredit	1,492,504
Realkredit Danmark	782,084
Nordea Kredit	425,506
Jyske Realkredit	359,621
DLR Kredit	180,244
Total mortgage credit institutions	3,239,960

Note: The balance sheet total for the systemic credit institutions is stated at group level. The credit institutions have thus been stated inclusive of assets in their subsidiaries in the form of, for example, mortgage credit institutions. The balance sheet total for systemic banks, non-systemic banks and mortgage credit institutions is stated at institution level. Exceptionally, Arbejdernes Landsbank has been included at group level to reflect the consolidation with Vestjysk Bank. The assets in the financial statements of the mortgage credit institution Nykredit Realkredit also reflect the Nykredit Group's funding of the subsidiary Totalkredit.
Source: Danmarks Nationalbank.

Appendix 2: Stress test scenarios

The stress test is based on three scenarios for the macroeconomic development in Denmark spanning the three-year period from 2023 to 2025. The three scenarios consist of a baseline scenario that follows Danmarks Nationalbank's latest projection[59], an interest rate scenario and a severe recession scenario.[60]

The interest rate scenario reflects a situation in which it will require further interest rate increases from central banks to bring inflation under control. Interest rates in Denmark and abroad continue to rise, and will, from 2024, be 2 percentage points higher over the entire yield curve compared to the baseline scenario. The dampening effect of the interest rate increase on growth in the Danish economy is reinforced by interest rate increases abroad reducing Danish export market growth. At the same time, from 3rd quarter 2023, the Danish and international economy will be hit by declining consumer and business confidence, resulting in negative shocks to private consumption, private investments and the housing market. Both result in a reduction in house prices of 16.5 per cent over the period 2023-2025, an increase in the rate of unemployment of 2.6 percentage points and a fall in GDP of 1.5 per cent.

In the severe recession scenario, the world economy is hit by a global crisis in the 2nd half of 2023, and the Danish economy experiences a severe economic downturn. The Danish export market growth is reduced significantly, resulting in sharp falls in GDP and house prices as well as increased unemployment. At the same time, the economy is hit by declining consumer and business confidence, in line with the interest rate scenario. Overall, GDP will decline by 6.5 per cent over a three-year period and will thus be 9.5 per cent lower than in the baseline scenario in 2025. The rate of unemployment will increase by 6.3 percentage points from 2023 to 2025 and house prices will fall sharply by 26.5 per cent and be on a par with house prices in 2015 at the end of the recession.

See table A2 for selected key chartes for the scenarios.

59 See Danmarks Nationalbank, Declining but still high inflation, *Danmarks Nationalbank Analysis (Outlook for the Danish economy)*, no. 4, March 2023 (*link*).

60 The interest rate increase scenario and the severe recession scenario have been prepared in collaboration with the Danish Financial Supervisory Authority. The approach used to generate the scenarios is described in detail in Danmarks Nationalbank, The largest banks satisfy capital requirements in stress test, *Danmarks Nationalbank Analysis (Stress test)*, no. 21, November 2018 (*link*).

Selected key figures in Danmarks Nationalbank's stress test scenarios

Table A2

	Baseline scenario	Interest rate increase	Severe recession
2023			
GDP, per cent year-on-year	0.9	0.3	-0.7
Private consumption, per cent year-on-year	0.2	0.0	-1.6
Export market growth, per cent year-on-year	2.6	2.1	-1.4
House prices, per cent year-on-year	-9.4	-10.1	-13.3
Gross unemployment, per cent of labour force	2.7	2.8	3.1
Average bond yield, per cent p.a.	3.3	3.9	3.3
2024			
GDP, per cent year-on-year	1.2	-2.2	-6.1
Private consumption, per cent year-on-year	1.8	-1.0	-5.4
Export market growth, per cent year-on-year	2.8	0.4	-11.8
House prices, per cent year-on-year	-0.3	-5.2	-15.0
Gross unemployment, per cent of labour force	3.0	4.3	6.7
Average bond yield, per cent p.a.	3.1	5.1	3.1
2025			
GDP, per cent year-on-year	1.2	0.4	0.3
Private consumption, per cent year-on-year	1.2	-0.7	-0.4
Export market growth, per cent year-on-year	2.9	1.0	-0.9
House prices, per cent year-on-year	2.9	-2.0	-0.3
Gross unemployment, per cent of labour force	3.1	5.4	9.4
Average bond yield, per cent p.a.	3.0	5.0	3.0
Cumulative change			
GDP, three-year cumulative change per cent	3.3	-1.5	-6.5
House prices, three-year cumulative change per cent	-7.0	-16.5	-26.5

Note: Annual averages. House prices are cash prices of single-family houses. It should be noted that rounding may mean that the stated accumulated growth does not necessarily correspond to the cumulative growth that can be calculated based on the figures in the table.

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The analysis consists of a Danish and an English version. In case of doubt regarding the correctness of the translation the Danish version is considered to be binding.

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