DANMARKS NATIONALBANK

ANALYSIS | Monetary and financial trends
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Monetary policy has been tightened further

Contact

Teis Hald Jensen
Communications and Press Officer

tehj@nationalbanken.dk
+45 3363 6066

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The European Central Bank, ECB, has tightened monetary policy further on the back of high underlying inflation. Danmarks Nationalbank has raised monetary policy interest rates in line with the ECB. In Denmark, the pass-through of monetary policy interest rates to market rates has been faster and stronger than in the euro area.

A high underlying price pressure has led to tighter monetary policy

The ECB and the Federal Reserve have implemented further interest rate hikes. They have signalled that monetary policy interest rates will remain at their present levels or higher levels in the near future.

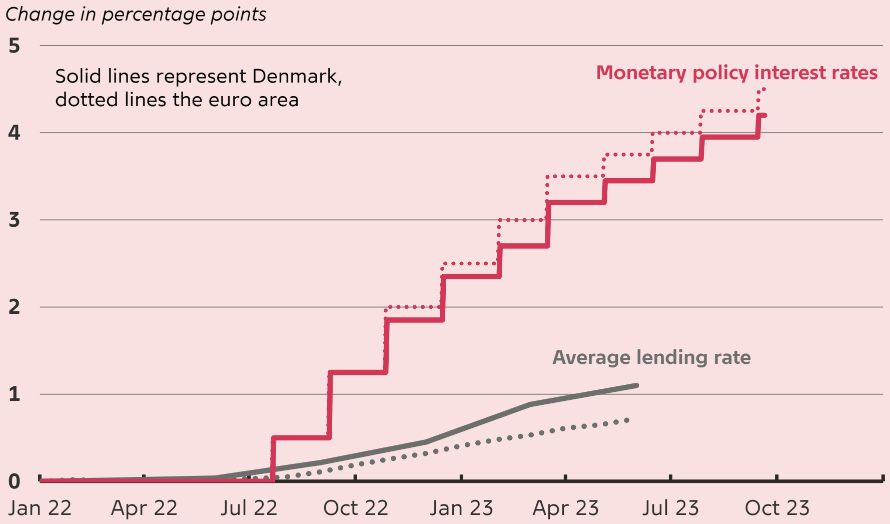
Danmarks Nationalbank has followed the ECB and raised interest rates

The higher interest rates have been transmitted smoothly to the Danish money market. The krone exchange rate vis-à-vis the euro has weakened moderately following the latest widening of the monetary policy interest rate spread.

Strong pass-through to lending rates in Denmark

Lending rates in Denmark continue to rise. The pass-through from higher monetary policy interest rates to rates on new loans has been strong. The market-based mortgage credit system contributes to a rapid pass-through.

Main chart: Monetary policy interest rates and average lending rates



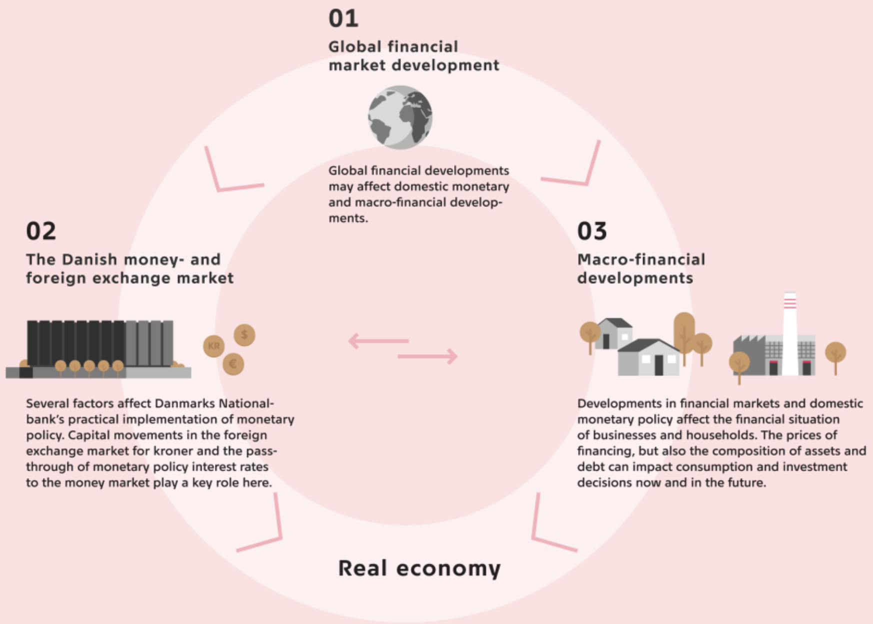
Note: Changes in monetary policy interest rates as well as in average interest rates on outstanding bank and mortgage loans in Denmark and the euro area since the beginning of 2022. The average lending rates for Denmark are adjusted for the effect of buy-backs of fixed-rate mortgage loans as described in the *Macro-financial developments* chapter.

Source: ECB and own data.

Why is this important?

The Danish fixed exchange rate policy means that monetary policy is tailored to ensuring a stable krone exchange rate against the euro. The fixed exchange rate policy means that Danmarks Nationalbank generally follows the interest rate decisions of the ECB. Therefore, the monetary policy of the euro area has a bearing on financial and economic developments in Denmark. So does global financial developments, as Denmark is a small open economy closely integrated into the international financial system. Both are analysed in chapter 1. Global financial developments may also affect the demand for kroner and thus Danmarks Nationalbank's implementation of the fixed exchange rate policy. This is one of the elements touched upon in the second chapter. An important element in the third chapter of the analysis is the assessment of how the fixed exchange rate policy, interacting with global financial developments, affects macro-financial conditions in Denmark. They are important for Danmarks Nationalbank's assessment of the current and expected development in the Danish economy.

The analysis is published twice a year.



Topics

Banking and mortgage lending | Home financing | Central banks

Fixed exchange rate policy | Financial markets | Households and businesses

Monetary and financial trends | Monetary policy | Foreign exchange market

Global financial market developments

- Monetary policy interest rates in the US, the euro area and Denmark have been raised further since March.
- The euro area and US central banks have communicated that monetary policy interest rates will remain at their present levels or higher levels in the near future.
- Bond yields have risen slightly and are close to the highest levels since the financial crisis in 2007-08. The declines associated with the banking sector turmoil in the spring were temporary.

High underlying inflation has led to tightening of monetary policy

Since the most recent Monetary and financial trends in mid-March 2023, one main focus in the financial markets has been the continued tightening of monetary policy to bring down inflation. Inflation has declined over the period, but underlying inflation remains too high and is slowly decreasing.

The banking sector turmoil that dominated markets in March raised doubts among market participants as to whether the European Central Bank, the ECB, and the US central bank, the Federal Reserve, would continue to tighten monetary policy. The banking sector turmoil remained confined to individual institutions, and central banks have continued to tighten monetary policy. This has been achieved by raising monetary policy interest rates and through the ending of asset purchase programmes. Market participants now expect monetary policy interest rates to remain high for longer compared to mid-March.

Bond yields in the euro area and Denmark have risen slightly and are approaching the highest levels since the immediate aftermath of the financial crisis in 2007-08. US bond yields have risen more and are at their highest level since the financial crisis.

Falling inflation and the relatively robust economic development have led to slightly less market volatility and higher risk appetite. Risk premiums have generally decreased across asset classes. This has contributed to a substantial increase in US equity prices, among others.

Inflation in the US and the euro area is falling, but remains too high

Inflation in the euro area and the US has been declining since the second half of 2022, but underlying inflation remains too high. In the euro area, inflation peaked at 10.6 per cent in October 2022, dropping to 5.3 per cent in August 2023. In the US, inflation was 3.3 per cent in July.[1] The most common measure of the underlying price pressure, core inflation, was 5.3 per cent in August in the euro area and 4.2 per cent in July in the US. Core inflation is the rate of inflation less the direct effects of energy and food.

In the current economic situation, the major central banks' main task is to bring down underlying inflation. Underlying inflation suggests where inflation is headed once temporary factors have vanished.[2]

Monetary policy interest rates have been raised further due to continued high inflation

Monetary policy interest rates in the euro area and the US have been raised since the most recent Monetary and financial trends from March 2023. The reason for the higher monetary policy interest rates is the sluggish decline in core inflation and higher-than-expected levels of economic activity. Both the ECB and the Federal Reserve have increased their monetary policy interest rates by 1.50 and 0.75 percentage points, respectively, to 4 per cent and 5.25-5.50 per cent, see chart 1. Moreover, both central banks have continued to reduce their bond holdings, which in isolation leads to higher long-term interest rates.[3] The monetary policy interest rate hikes over the past six months have largely followed market participants' expectations, with expectations going forward being largely unchanged. Danmarks Nationalbank has followed the ECB's

[1] The ECB and the Federal Reserve have explicit inflation targets of 2 per cent over the medium term.
[2] See, for example, speech by ECB Chief Economist Philip Lane, Underlying Inflation, 6 March 2023.
[3] See, for example, Christian Belling Sørensen and Magnus Stenfeldt Madsen, Will the end of the ECB's asset purchase programmes impact the Danish mortgage bond market?, *Danmarks Nationalbank Economic Memo*, No. 6, June 2023.

interest rate hikes since March and raised monetary policy interest rates by 1.5 percentage points to 3.6 per cent, see the *Danish money and foreign exchange market* chapter.

Tighter monetary policy contributes to lower growth and inflation

The tightening of monetary policy increases the financing costs of businesses and households, thereby dampening aggregate demand. Measures of the euro area equilibrium interest rate also indicate that the current level of short-term real interest rates is in itself dampening economic activity in the euro area, see chart 2.[4] The ECB assesses that its monetary policy stance has shifted from being very accommodative to being contractive, resulting in a significant downward impact on growth in 2023 and 2024.[5]

The tighter monetary policy, together with lower energy prices, has contributed to declining inflation in the euro area and the US. Most of the decline in inflation in the euro area is currently driven by lower energy prices. For example, the global energy price index of the International Monetary Fund, IMF, was 50 per cent lower in August 2023 compared to the same month the year before. The ECB estimates that tighter monetary policy is helping to bring down inflation in the euro area. Applying the same assumptions as for the impact on economic growth, their model-based assessment shows that tightening will bring down inflation by around 2 percentage points in 2023 and that the impact will be more pronounced in 2024 and 2025.[6]

Monetary policy will continue to have a dampening effect on the real economy, both because the effects of monetary policy are transmitted gradually and because the current level of interest is assessed to be restrictive for the economy, see Chart 2. This will also be the case if monetary policy interest rates are not raised further. The ECB's Governing Council considers that the policy interest rates have reached levels that, maintained for a sufficiently long duration, will make a substantial contribution to the timely return of inflation to the target. The Governing Council's future decisions will ensure that the policy interest rates will be set at sufficiently restrictive levels for as long as necessary.[7]

Market participants expect imminent peak in interest rates

Financial market participants expect the ECB and the Federal Reserve to be almost done raising monetary policy interest rates, see chart 1.[8] Market participants expect the ECB to start lowering monetary policy interest rates in the second half of 2024. Market participants expect that the Federal Reserve, which started raising interest rates earlier than the ECB, will start lowering interest rates in spring 2024 and that the interest rate cuts will happen gradually and at a slow pace. Market participants currently expect the key interest rate of the Federal Reserve to be around 4.6 per cent by the end of 2024 and that of the ECB to be 3.2 per cent by the end of 2024.

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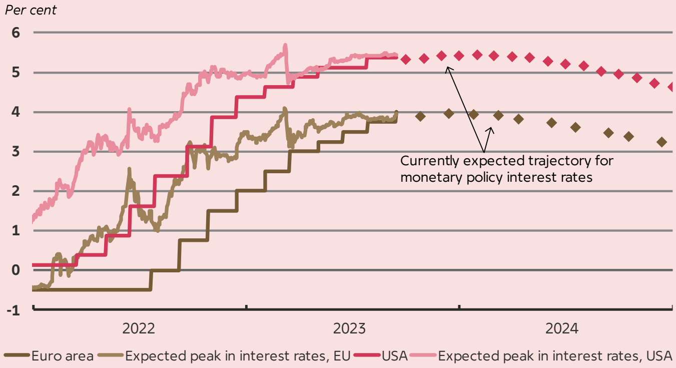
The tightening of monetary policy increases financing costs for businesses and households, thereby dampening aggregate demand.

[4] The equilibrium interest rate is compatible with stable price and wage developments when the actual economic activity is at its structural level. See also speech by ECB Executive Board member Isabel Schnabel, Disinflation and the Phillips curve, 31 August 2023.
[5] See ECB, A model-based assessment of the macroeconomic impact of the ECB's monetary policy tightening since December 2021, *Economic Bulletin*, No. 3 2023. Danmarks Nationalbank assesses that the tighter monetary policy will significantly dampen economic growth in Denmark, see the *Macro-financial developments* chapter.
[6] See ECB, A model-based assessment of the macroeconomic impact of the ECB's monetary policy tightening since December 2021, *Economic Bulletin*, No. 3 2023.
[7] See press release on Monetary policy decisions, 14 September 2023. See also speech by ECB President Christine Lagarde, Policymaking in an age of shifts and breaks, 25 August 2023. The chairman of the Federal Reserve has also said that the Federal Reserve is prepared to raise interest rates further if necessary, and that monetary policy interest rates will remain at restrictive levels until inflation safely moves towards its 2 per cent target. See speech by Federal Reserve Chair Jerome Powell, Inflation: Progress and the Path Ahead, 25 August 2023.
[8] Market-based expectations are derived from the trading prices of financial products, see also note to chart 1.

CHART 1

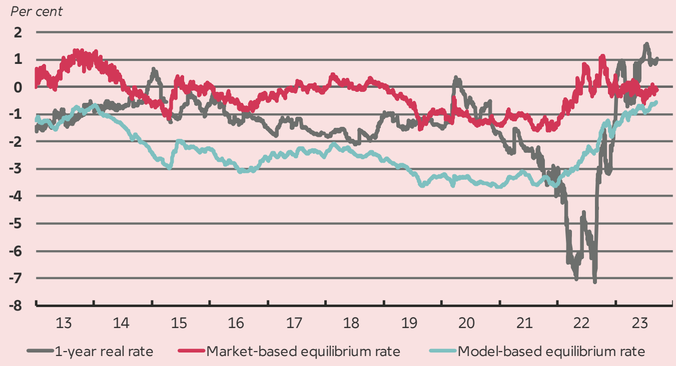
Money market expectations point to imminent peak in interest rates in the US and the euro area



Note: The chart shows the monetary policy interest rates, the expected peak in interest rates and the current expected interest rate trajectory for the euro area and the US, respectively, derived from the trading prices of financial products. For the euro area, the expected peak in interest rates is based on €STR swaps maturing in 1-16 months. In the US, the expected peak in interest rates is based on federal funds futures maturing in 1-24 months. The projected trajectories for monetary policy interest rates are also based on €STR swaps and federal funds futures. The most recent observations are from 15 September 2023.
Source: Refinitiv Eikon and Danmarks Nationalbank.

CHART 2

The 1-year real interest rate is now higher than the measure of equilibrium real interest rates in the euro area



Note: The chart shows a 1-year real interest rate calculated as the interest rate on a 1-year European overnight indexed swap less the interest rate on a 1-year European inflation swap. The market-based measure of an equilibrium real interest rate is based on a European five year overnight indexed swap rate starting in five years' time less the interest rate on a European inflation swap with the same maturity. The model-based equilibrium interest rate adjusts the market-based equilibrium interest rate for risk premia (term premium and inflation risk premium) using two dynamic AFNS models, see Jens Christensen, Francis X. Diebold and Glenn D. Rudebusch, The arbitrage-free class of Nelson-Siegel term structure models, *Journal of Econometrics*, 164.1, pp. 4-20, 2011. The most recent observations are from 15 September 2023.
Source: Refinitiv Eikon and Danmarks Nationalbank.

Different measures of inflation expectations point to falling inflation, but at varying rates

The high inflation of recent years have led to higher inflation expectations for the next couple of years, both in the euro area and the US. As monetary policy effects materialise and dampen growth (as mentioned earlier), inflation in the euro area is expected to gradually move closer to the ECB's 2 per cent medium-term target, see chart 3.

Overall, survey-based inflation expectations point to a slow decline in inflation in the euro area and inflation above 2 per cent until the end of 2024. ECB's Survey of Professional Forecasters say that they expect inflation to be around 2 per cent in 2025. Households (the ECB's Consumer Expectations Survey) expect that it will take slightly longer to return to 2 per cent, and that inflation will be slightly above 2 per cent in 2026. Market-based indicators of inflation expectations without adjustment for risk premia suggest that inflation will remain elevated for longer than indicated by the survey-based measures. This is indicated by the prices of inflation fixings and inflation swaps maturing in the next few months and years.

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As monetary policy effects materialise and dampen growth, inflation in the euro area is expected to gradually move closer to the ECB's 2 per cent medium-term target.

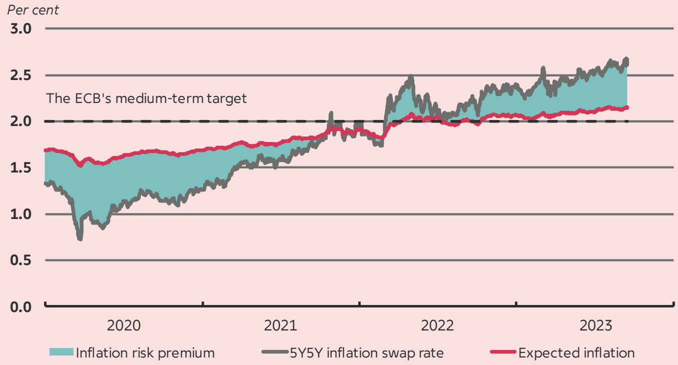
CHART 3

Inflation expectations point to a gradual return to 2 per cent.

Note: The chart shows the inflation rate in the euro area, as measured by the HICP index, together with three different measures of inflation expectations. The most recent observations for the HICP index are from August 2023. 'Consumers' is the median response from the ECB's July 2023 Consumer Expectations Survey. 'Experts' indicate the average response from the ECB's Q3 2023 Survey of Professional Forecasters. 'Financial markets' indicate market prices (not adjusted for risk premia) to hedge inflation risk. From 0-11 months, market participants' expectations are measured by inflation fixings and then by forward-starting inflation swaps. The most recent observations for inflation swaps are from 15 September 2023.
Source: Refinitiv Eikon, Bloomberg and Danmarks Nationalbank.

CHART 4

Medium-term market-based inflation expectations indicate upside inflation risks



Note: The chart shows expected inflation in the euro area, derived from inflation swaps, in five to ten years from now. The difference between the red and grey lines is the inflation risk premium (green area). Decomposed using a dynamic yield curve model. See Jens Christensen, Francis X. Diebold and Glenn D. Rudebusch, The arbitrage-free class of Nelson-Siegel term structure models, *Journal of Econometrics*, 164.1, pp. 4-20, 2011. The most recent observations are from 15 September 2023.
Source: Bloomberg and Danmarks Nationalbank.

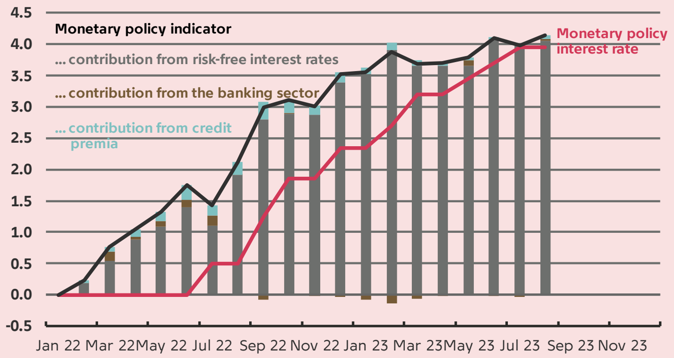
Market-based indicators for even longer horizons also suggest inflation above 2 per cent, but it is important to bear in mind that liquidity and inflation risk premia influence pricing, especially for longer horizons. The price of receiving the average inflation rate over the five year period that begins five years from now, a so-called 5Y5Y inflation swap, has risen to approximately 2.7 per cent a year, see chart 4. This is the highest level since the 2012 sovereign debt crisis. A model-based decomposition indicates that most of the movements are driven precisely by the inflation risk premium. Adjusting the market-based indicator of the inflation risk premium, medium-term inflation expectations are close to, but slightly above the ECB's 2 per cent target. The large fluctuations in recent years, for example in 5Y5Y inflation swaps, likely reflect market participants' perceptions of upside risks associated with future inflation. This should be seen in the context of heightened uncertainty about the economic situation of the euro area and large fluctuations in energy prices.[9]

[9] Other indicators, such as the expected inflation distributions derived from inflation options and the professional forecasters' survey responses, also point to upside inflation risks. See, for example, speech by ECB Executive Board member Isabel Schnabel, Disinflation and the Phillips curve, 31 August 2023.

CHART 5

The banking sector turmoil in March has not had a significant impact on financial conditions in Denmark ...

Percentage points, cumulative change since January 2022

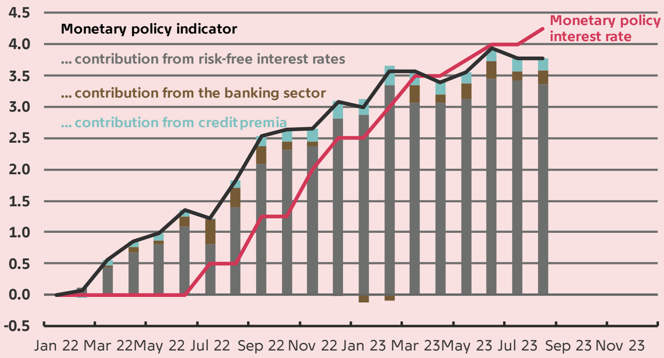


Note: The chart shows the aggregate tightening of the monetary policy indicator in Denmark since January 2022. The ‘contribution from risk-free interest rates’, ‘contribution from the banking sector’ and ‘contribution from credit premia’ columns sum up to the ‘monetary policy indicator’ line. The ‘monetary policy interest rate’ series shows the actual development of the CD rate in Denmark and the euro area. See box 1 for a description of the indicator. The most recent observations are from August 2023.
Source: Refinitiv Eikon, Danmarks Statistik, Eurostat and Danmarks Nationalbank.

CHART 6

... or the euro area

Percentage points, cumulative change since January 2022



Note: The chart shows the aggregate tightening of the monetary policy indicator in the euro area since January 2022. The ‘contribution from risk-free interest rates’, ‘contribution from the banking sector’ and ‘contribution from credit premia’ columns sum up to the ‘monetary policy indicator’ line. The ‘monetary policy interest rate’ series shows the actual development of the CD rate in Denmark and the euro area. See box 1 for a description of the indicator. The most recent observations are from August 2023.
Source: Refinitiv Eikon, Danmarks Statistik, Eurostat and Danmarks Nationalbank.

The banking sector turmoil in the spring has not had a noticeable impact on monetary policy tightening in the euro area and Denmark

The spring was marked by turmoil in the banking sector in the US and Europe, where several US banks found themselves in difficulty, and the Swiss bank Credit Suisse ended up being acquired by the bank UBS.

The banking sector turmoil in the US and Europe led to uncertainty as to whether the situation in the banking sector would contribute to tightening the credit conditions for households and businesses to such an extent as to trigger a risk of an economic recession.[10] As a result, market participants doubted whether central banks would continue to raise monetary policy interest rates, especially in the US, but also in the euro area.[11] The uncertainty surrounding the impact of the banking sector turmoil on monetary policy tightening was reflected in market-based expectations for monetary policy, which declined sharply in the course of March as indicated by the expected peak in interest rates in chart 1. However, the turmoil in the banking sector turned out to be isolated to a few institutions, and thanks to interventions by the US and Swiss authorities it did not spread to other parts of the financial system.[12] Market participants’ expectations for central banks’ interest rate trajectory are now at about the same level as before the banking sector turmoil.

[10] Turmoil in the banking sector may lead banks to tighten their lending willingness and lending conditions to customers, the so-called credit conditions. In a full-blown financial crisis scenario as seen in 2007-08, the tightening could be significant and lead to an economic recession.
[11] See, for example, Danmarks Nationalbank, Interest rate hikes affect the banks and their customers, *Danmarks Nationalbank Analysis (Financial Stability)*, No. 6, June 2023.
[12] For example, the Federal Reserve launched the Bank Term Funding Program in March 2023 to provide emergency liquidity to financial institutions in the US. The emergency funding programme makes short-term loans available against the pledging of government and mortgage bonds etc. as collateral. The programme expires in March 2024.

Some tightening of credit conditions is in itself a natural consequence of tighter monetary policy, which contributes to the impact of monetary policy on the economy. Credit conditions have tightened as central banks have tightened monetary policy as described in the *Macro-financial developments* chapter. The events in the banking sector may have contributed to tight lending conditions in the US, but in the euro area and in Denmark there are no immediate signs that the banking sector turmoil has contributed to tightening beyond what monetary policy dictates. This is supported, among other things, by Danmarks Nationalbank's newly developed monetary policy indicator, which indicates that the banking sector turmoil taken in isolation has not had a significant tightening effect on financial conditions in Denmark and the euro area, see chart 5 and chart 6chart 6. The indicator provides a model-based summary of the development in interest rates and market-based credit spreads, see box 1box 1. The indicator suggests that financial conditions in Denmark and the euro area tightened slightly during the spring and summer. According to the indicator, the tightening of financial conditions has occurred through the risk-free yield curve rather than through higher market-based credit risk premia.[13]

BOX 1

Newly developed indicator summarises financial conditions expressed as a monetary policy interest rate

Since 2012, the European Central Bank, ECB, has adopted several monetary policy tools that affect financing costs differently to normal monetary policy interest rates. Among other things, the ECB has made use of bond purchase programmes and forward guidance. Both tools aim to change the yield curve beyond the very short maturities. In addition, credit easing policies and special lending have aimed at influencing e.g., banks' lending conditions. The different monetary policy tools all affect the financing costs of businesses and households.

The newly developed monetary policy indicator provides a model-based assessment of how different monetary policy tools affect financial conditions expressed as a short-term interest rate equivalent. For this reason, other similar measures are referred to as proxy interest rates.[1] The indicator summarises developments in the monetary policy interest rate, the shape of the risk-free yield curve (government yield curve) as well as credit spreads and the spread to bank lending rates. The indicator is interpreted as a measure of the effective monetary policy stance and can give a quick impression of the overall effective monetary policy stance. The change in the indicator since January 2022 is shown in chart 5 and chart 6.

The indicator is defined as: $r_t = a + b\,F_t + \epsilon_t$, where F_t is the first three principal components from a larger dataset consisting of risk-free interest rates, key indicators for banks, as well as credit spreads and spreads to MFI interest rates. The model is estimated on the period from 2003 to 2012. Until 2012, the ECB mainly used monetary policy interest rates as a monetary policy tool. The parameters of the model are kept constant after 2012, when the use of other tools such as long lending programs, forward guidance and asset purchases took on a significant role. The parameters are used to construct the indicator given the development in the explanatory variables. This produces an indicator that, under certain assumptions, can be interpreted as a proxy for what the monetary policy interest rate should have been in order to achieve the same monetary policy impact actually produced by the use of all monetary policy instruments.

1. A similar indicator was introduced in a US context in Jason Choi, Taeyoung Doh, Andrew Foerster and Zinnia Martinezen, Monetary Policy Stance Is Tighter than Federal Funds Rate, *FRBSF Economic Letter*, 2022, 30, November 2022.

[13] The indicator does not include qualitative factors such as lending surveys. The lending surveys for Denmark and the euro area indicate that banks' credit standards have tightened in the course of 2023 compared to past years.

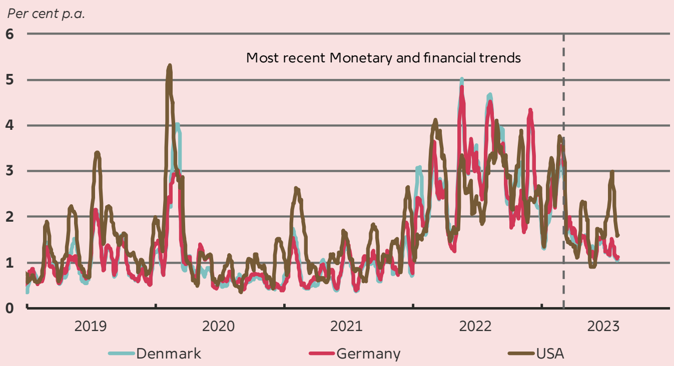
Tight monetary policy is reflected in government yields

The banking sector turmoil led only to a temporary fall in government yields

The early spring was marked by fluctuations in government bond markets as a result of the banking sector turmoil, see chart 7. As mentioned earlier, the banking sector turmoil raised doubts as to whether monetary policy tightening would continue. As a result, short-term and long-term government yields in the US, Germany and Denmark fell throughout March. Interest rates have since risen, and in the euro area and Denmark they are at around the same level as before the banking sector turmoil, see chart 8. In the US, long-term government yields are at a slightly higher level than before the banking sector turmoil.

CHART 7

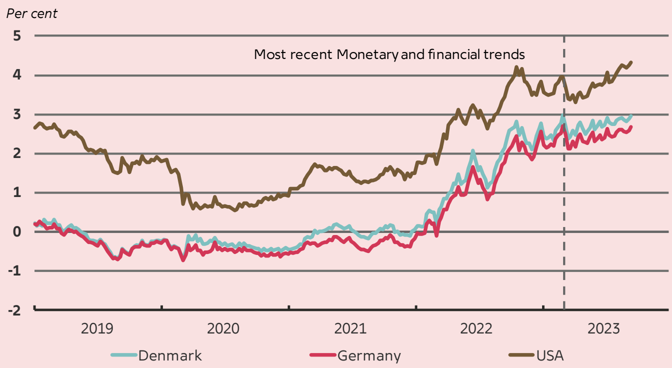
Calm summer after highly volatile spring



Note: The chart shows the realised volatility of 10-year government bonds. Calculated as realised volatility over the past 25 trading days. The most recent observations are from 15 September 2023.
Source: Refinitiv Eikon and Danmarks Nationalbank.

CHART 8

Long-term US government yields have risen since March



Note: Nominal yield on 10-year benchmark government bonds. The most recent observations are from 15 September 2023.
Source: Refinitiv Eikon and Danmarks Nationalbank.

Since mid-March, long-term interest rates in the US, Germany and Denmark have risen less than monetary policy interest rates. This is because long-term interest rates began to rise already in early 2022 on the expectation of monetary policy interest rate hikes. As mentioned earlier, over the past six months, actual monetary policy interest rate hikes have largely followed expectations. Long-term government yields currently reflect the expectation that monetary policy interest rates will remain high for longer than previously expected as indicated in the model-based decomposition in chart 9.[14]

The Danish-German government yield spread remains largely unchanged

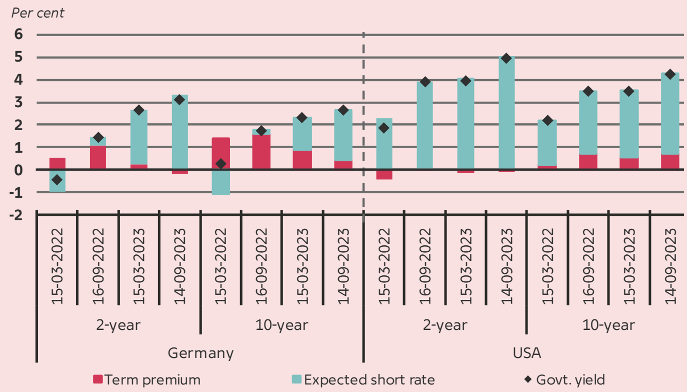
Danish government bond yields have closely mirrored the German bonds, see chart 10. For the longer maturities, such as the 10-year point, the spread is approximately 0.25 percentage points. The spread between Danish and German government bonds should be seen in the light of the market conditions in recent

[14]The model decomposes observed government yields into an interest rate risk premium (the term premium) and the expected average short-term interest rate. The short-term interest rate is interpreted as the monetary policy interest rate. The development in the term premium captures changes in risk premia and reflects the risk compensation demanded by investors for holding a long bond rather than rolling short bonds over the same period.

years, which have led to an increased demand for German government bonds.[15] The 2-year government yield spread has narrowed slightly since the spring, and the 10-year government yield spread remains largely unchanged.

CHART 9

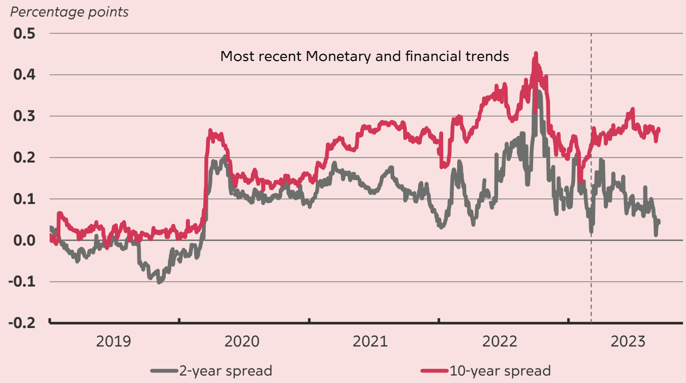
Tight monetary policy reflected in government yields



Note: Zero coupon rates decomposed using an AFNS model. See Jens Christensen, Francis X. Diebold and Glenn D. Rudebusch, The arbitrage-free class of Nelson-Siegel term structure models, *Journal of Econometrics*, 164.1, pp. 4-20, 2011.
Source: Refinitiv Eikon, San Francisco Federal Reserve Bank and Danmarks Nationalbank.

CHART 10

The Danish-German government yield spread remains largely unchanged since March 2023



Note: The chart shows the 2-year and 10-year government yield spreads to German government bonds. Par rates. The most recent observations are from 15 September 2023.
Source: Nordea Analytics and Danmarks Nationalbank.

Mortgage rates at their highest level in a decade

Short-term mortgage rates have risen due to higher monetary policy interest rates

In Denmark, short-term mortgage bond yields have risen since mid-March. For example, the yield on the bonds behind F1 loans has risen by 0.85 percentage points since mid-March 2023 to 3.7 per cent, see chart 11. The increase in short-term mortgage rates followed a considerable fall following the banking sector turmoil in the US and Europe as mentioned earlier.

Yields on callable mortgage bonds are buoyed by increased market fluctuations

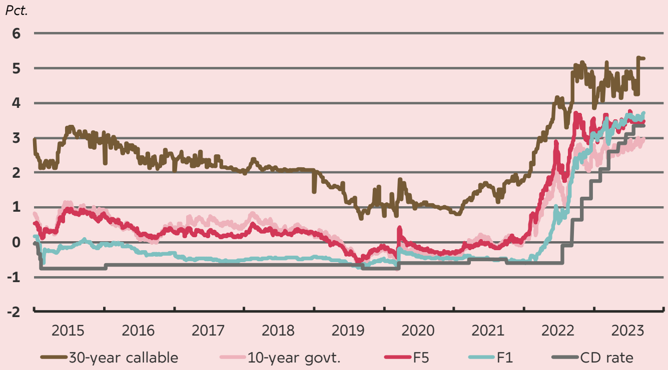
Long-term fixed-rate mortgage rates are at a high level compared to the past decade. This has been the case since mid-2022, when the ECB started raising monetary policy interest rates and announcing further tightening. The yield on long-term callable mortgage bonds has remained largely unchanged since March at around 5 per cent.

[15]The reason for this is that the German government securities market has a special status in times of financial turbulence, as it is considered to be among the most secure and liquid markets, while German bonds are also widely used as collateral for financial contracts. Other factors, such as differences in liquidity and differences in monetary policy interest rates, also affect the spread. See, for example, Asger Munch Grønlund, Jonas Ladegaard Hensch and Simon Thinggaard Hetland, Explaining the Danish-German sovereign yield spread, *Danmarks Nationalbank Economic Memo,* No. 7, June 2022.

The interest rates on the 30-year callable mortgage bonds are higher than on the short-term adjustable-rate loans, such as the F1, F3 and F5 rates. This contrasts with the government yield curve, where, for example, the yield on the 2-year government bond is higher than on the 10-year government bond. The difference between short-term and long-term mortgage bond yields is because the yields on long-term callable mortgage bonds are influenced by factors other than risk-free (government) yields only. Long-term mortgage rates are affected by expectations for future monetary policy, credit and interest rate risk premia and expected market fluctuations.[16] Current long-term mortgage bond yields reflect a relatively high compensation for households' right to redeem the bonds at par. The high compensation for the refinancing right is directly affected by the expected future market movements and has been increased due to large interest rate movements over the past year, see chart 12.[17]

CHART 11

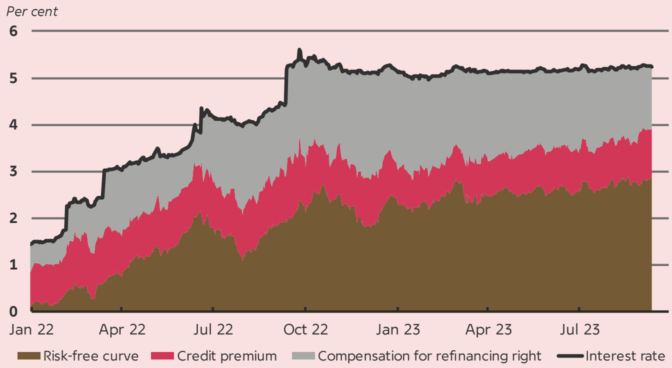
Short-term mortgage rates have risen since the spring, whereas long-term mortgage rates remain virtually unchanged



Note: The 30-year callable yield is the Association of Danish Mortgage Bank's benchmark rate. The series is calculated as the average effective bond yield for new issuances over the past week. The most recent observations are from 15 September 2023.
Source: The Association of Danish Mortgage Banks, Nordea Analytics, Refinitiv Eikon and Danmarks Nationalbank.

CHART 12

High long-term mortgage rates are driven by high compensation for the right to redeem at par



Note: The chart shows the current yield on 30-year callable mortgage bonds, decomposed into a contribution from risk-free interest rates, a credit risk premium and the compensation for the right to redeem at par (refinancing right). The most recent observations are from 14 September 2023.
Source: Bloomberg, Refinitiv Eikon, Scanrate Rio and Danmarks Nationalbank.

Equity price increases despite tighter monetary policy

Equity prices have risen since mid-March

Since mid-March, the Danish OMXC25 index and the euro area Euro Stoxx index have gone up by 1.6 per cent and 5.1 per cent, respectively. The US S&P500 index has risen significantly and is now 14.4 per cent higher than in March, see

[16] Callable mortgage bonds are typically priced on the basis of a 'risk-free' yield curve, such as the government yield curve, to which are added a credit risk premium as well as compensation for the borrower's right to redeem the bond at par. Since the borrower's right to redeem the bond at par is effectively an option, the yield on a callable mortgage bond is affected by market participants' expectations of future market fluctuations (measured by 'implied volatility').
[17] The higher expected market movements should probably be seen in light of the balance sheet reduction initiated by the ECB. See, for example, Christian Belling Sørensen and Magnus Stenfeldt Madsen, Will the end of the ECB's asset purchase programmes impact the Danish mortgage bond market?, *Danmarks Nationalbank Economic Memo*, No. 6, June 2023.

chart 13. The rise in the US stock index is largely driven by a few businesses in the field of information technology.[18]

The banking sector turmoil in the US and Switzerland briefly affected stock indices, leading to higher realised and expected volatility, see chart 14. However, fluctuations in equity prices have eased over the rest of the spring and summer and are currently at a relatively low level.

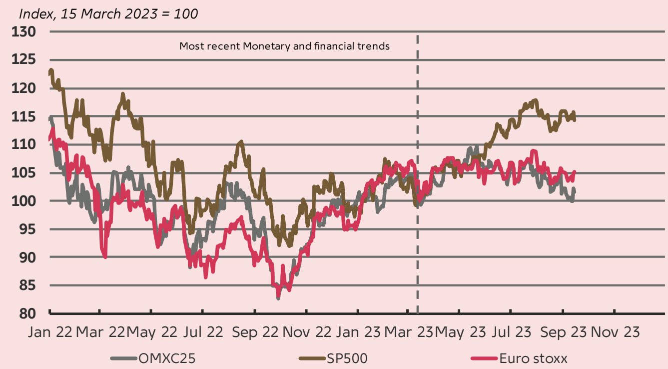
Slightly lower equity risk premium, especially in the US

Since the spring, the tighter monetary policy in the US, the euro area and Denmark has only to a lesser extent led to higher interest rates as mentioned earlier. The effect of interest rates on the pricing of listed companies has therefore been limited since March.[19] Similarly, earnings expectations for the coming years remain largely unchanged since March and continue to point to relatively robust earnings, see chart 15. The rise in the broader US stock index is mainly driven by an increased risk appetite towards tech companies working in artificial intelligence.

Equity risk premia in the euro area, the US and Denmark have declined slightly since the spring, see chart 16. As a result of the relatively small change in the equity risk premium in Denmark, it is assessed that businesses' cost of equity financing has increased less than, for example, the cost of debt financing in the past year, see the *Macro-financial developments* chapter.

CHART 13

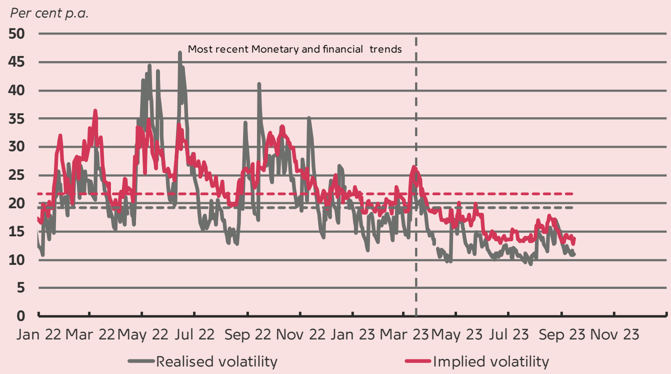
US equities have risen significantly since March



Note: The most recent observations are from 15 September 2023.
Source: Refinitiv Eikon and Danmarks Nationalbank.

CHART 14

Actual and expected volatility is at a low level

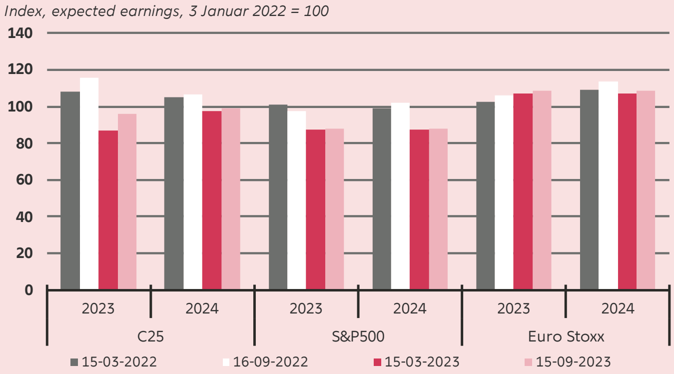


Note: Realised and implicit S&P500. Dotted lines indicate averages from 2019-2023. Realised volatility is estimated using a GJR-GARCH(1.1) model. The most recent observations are from 15 September 2023.
Source: Macrobond and Danmarks Nationalbank.

[18] The information technology sub-index has gone up by 23 per cent since mid-March and currently makes up 27 per cent of the total market capitalisation of the S&P500.
[19] A dividend discount model can be used to decompose the drivers of equity price changes. The model discounts expected future earnings using risk-free government yields and an equity risk premium. The equity risk premium is a measure of the additional return required as compensation for investing in an equity rather than a 'risk-free' asset (government bond). All else being equal, the equity risk premium will fall per construction when equity prices rise.

CHART 15

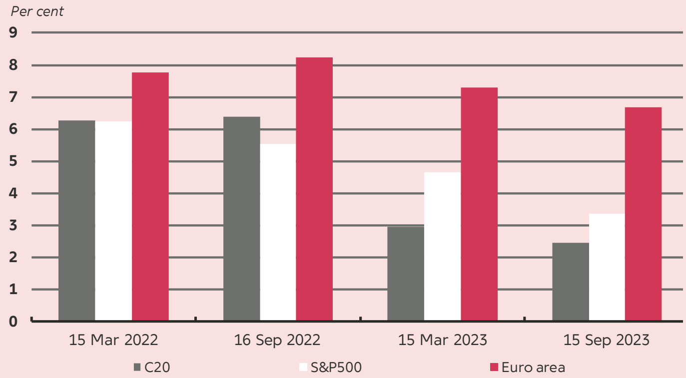
Businesses' expected earnings remain robust



Note: Analysts' expectations of businesses' total earnings. Stated in local currency.
Source: Refinitiv Eikon and Danmarks Nationalbank.

CHART 16

Declining equity risk premia



Note: The euro area is an average of the French CAC40 index, the German DAX index, the Italian FTIT index and the Spanish IBEX35 index. The equity risk premium is a measure of the additional return required as compensation for investing in an equity rather than a 'risk-free' asset (government bond). All else being equal, the equity risk premium will fall per construction when equity prices rise.
Source: Refinitiv Eikon and Danmarks Nationalbank.

The Danish krone has strengthened against a broad range of currencies

Since mid-March, there have been significant fluctuations in parts of the foreign exchange markets, see chart 17. For example, the Chinese yuan has weakened against both the US dollar and the Danish krone. The weakening should be seen in the light of weak economic growth in China and high levels of indebtedness in the Chinese property sector, among other things.[20]

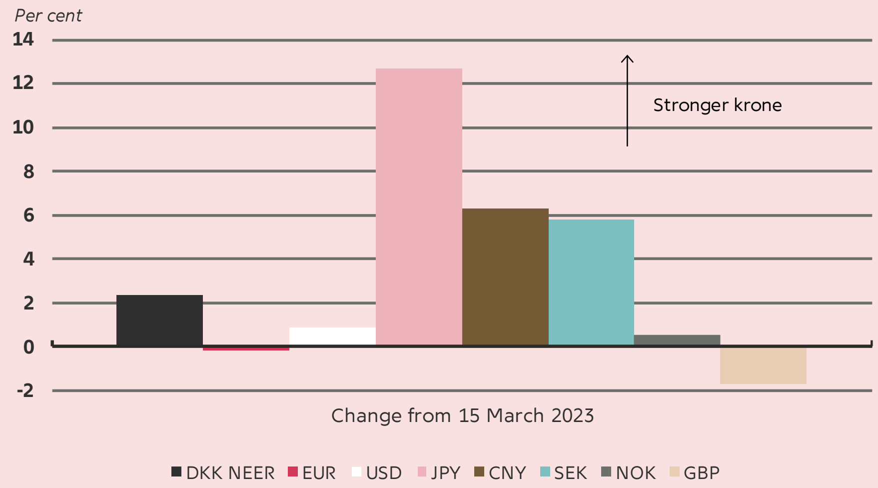
The Japanese yen has also weakened, with the exchange rate being about 12 per cent lower against both the dollar and the krone compared to mid-March. The exchange rate of the Japanese yen against the dollar is roughly at the level at which the Bank of Japan intervened last autumn. The Bank of Japan is not ruling out further intervention.

During the spring and summer, the effective nominal exchange rate of the Danish krone strengthened against a broad range of currencies. The effective nominal exchange rate is a joint weighting of the krone's exchange rate vis-à-vis Denmark's trading partners and is thus relevant for Denmark's foreign trade. The strengthening of the nominal effective exchange rate of the krone should be seen in light of the strengthening of the krone against e.g., the Chinese yuan and Japanese yen. In addition, the Danish krone has strengthened against the Swedish krona since mid-March. This contrasts with the exchange rate of the krone against the euro, which has weakened moderately as described in the *Danish money and foreign exchange market* chapter. The Chinese yuan, the Japanese yen, and the Swedish krona together account for approximately 21 per cent of the weighting in the currency index. The euro, to which the Danish krone is pegged, accounts for just under 43 per cent.

[20] See also the 'Risk outlook is linked to persistently high inflation' section in Danmarks Nationalbank, Persistently high inflationary pressures call for tight economic policy, *Danmarks Nationalbank Analysis (Outlook for the Danish economy)*, No. 13, September 2023.

CHART 17

The Danish krone has strengthened against a broad basket of currencies



Note: DKK NEER is the nominal effective exchange rate of the Danish krone against a broad basket of currencies. EUR is the exchange rate of the krone against the euro, USD is the exchange rate of the krone against the US dollar, JPY is the exchange rate of the krone against the Japanese yen, CNY is the exchange rate of the krone against the Chinese yuan, SEK is the exchange rate of the krone against the Swedish krona, NOK is the exchange rate of the krone against the Norwegian krone and GBP is the exchange rate of the krone against the British pound.

Source: Macrobond, Bank for International Settlements and Danmarks Nationalbank.

Danish money and foreign exchange market

- Danmarks Nationalbank has followed the ECB in raising interest rates five more times since the most recent Monetary and financial trends in March.

- The recent widening of the monetary policy interest rate spread to the ECB has led to a moderate weakening of the krone exchange rate vis-à-vis the euro.

- The negative monetary policy interest rate spread is partly a consequence of the current account surplus and Danish businesses’ demand for kroner.

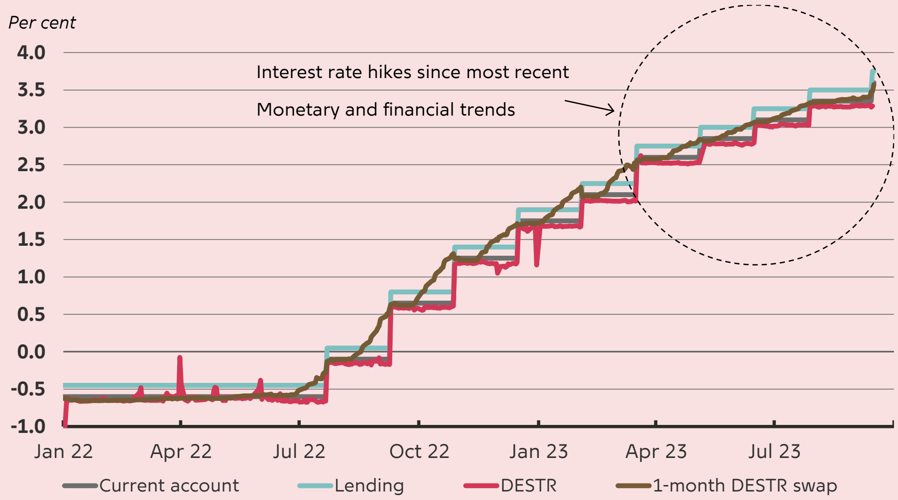
Danmarks Nationalbank has raised interest rates further

The interest rate hikes have been transmitted smoothly to the Danish money market

The ECB has raised its monetary policy interest rates five more times since the most recent Monetary and financial trends in March, and Danmarks Nationalbank has followed the ECB's interest rate hikes one-to-one. As such, Danmarks Nationalbank has raised its monetary policy interest rates by a further 1.5 percentage points, and the higher monetary policy interest rates have been transmitted smoothly to the Danish money market rates, see chart 18. The overnight reference rate, DESTR, follows Danmarks Nationalbank's interest rates closely and is stable slightly below the current account rate.[21] Danmarks Nationalbank has raised interest rates a total of 10 times since summer 2022.

CHART 18

The interest rate hikes have been transmitted smoothly to the Danish money market



Note: The Denmark Short-Term Rate, DESTR, is a short-term transaction-based reference rate for the Danish money market. Before 1 February 2022, the 1-month DESTR swap is calculated as the 1-month CITA swap rate less 19 basis points. The most recent observations are from 15 September 2023.
Source: Danmarks Nationalbank and Refinitiv Eikon.

[21] On 1 April 2022, Danmarks Nationalbank launched the new transaction-based overnight reference rate, the Denmark Short-Term Rate, DESTR, in the Danish money market as a replacement for the existing Tomorrow/Next rate. The introduction of DESTR was prompted by developments in financial markets, where similar transaction-based rates have been launched elsewhere in the world to increase transparency in setting the reference rate, among other things. See Danmarks Nationalbank, Recommendation of DESTR as the preferred risk-free reference rate in Danish kroner, *Danmarks Nationalbank Note*, June 2021.

The monetary policy interest rate spread to the ECB remains unchanged

The difference between Danmarks Nationalbank's current-account rate and the interest rate on the ECB's deposit facility, the monetary policy interest rate spread, remains unchanged since the most recent Monetary and financial trends in March. Danmarks Nationalbank last widened its monetary policy interest rate spread from -25 to -40 basis points on 3 February 2023. The widening of the spread occurred in connection with the ECB's monetary policy rate hike and in the wake of a series of interventions in the foreign exchange market by Danmarks Nationalbank.

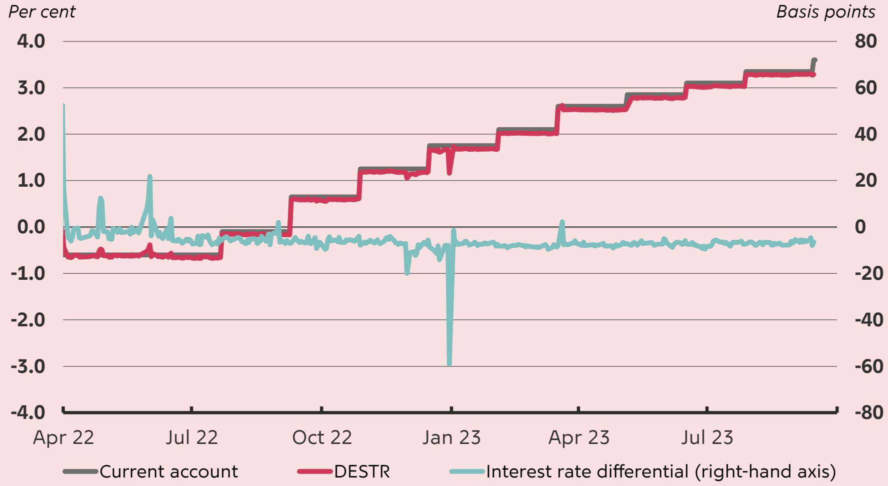
> **Danmarks Nationalbank has raised interest rates a total of 10 times since summer 2022.**

DESTR is stable slightly below Danmarks Nationalbank's current account rate

The spread between DESTR and the current-account rate is negative at about -7 basis points, see chart 19. The interest rate differential is due to high net position, partly as a result of Danmarks Nationalbank's interventions in the foreign exchange market last year. The net position indicates the total net deposits of banks with Danmarks Nationalbank. When the net position is high, banks that are Danmarks Nationalbank's monetary policy counterparties will typically offer to receive money market deposits at an interest rate which is lower than Danmarks Nationalbank's current account rate. Some banks and other financial institutions do not have access to Danmarks Nationalbank's instruments and therefore deposit liquidity with the monetary policy counterparties at the marginally lower rate of return.[22]

CHART 19

DESTR is stable slightly below Danmarks Nationalbank's current account rate



Note: Danmarks Nationalbank's current account rate, the Denmark Short-Term Rate, DESTR, and the difference between the two. The current account rate is the interest rate on the monetary policy counterparties' current account deposits. DESTR is a short-term transaction-based reference rate for the Danish money market. The most recent observations are from 15 September 2023.
Source: Danmarks Nationalbank.

[22]See Danmarks Nationalbank, Tighter monetary policy has made financing more expensive, *Danmarks Nationalbank Analysis (Monetary and financial trends)*, No. 10, September 2022.

Market participants should use DESTR as their primary reference rate

Since its introduction, DESTR has been a robust anchor at the short end of the yield curve and is now used as the reference rate in many types of financial contracts. However, several different reference rates are still used in financial contracts, and Danmarks Nationalbank therefore encourages market participants to use DESTR as their primary reference rate in the future. This will ensure consistent referencing to a single solid anchor in the Danish money market.[23]

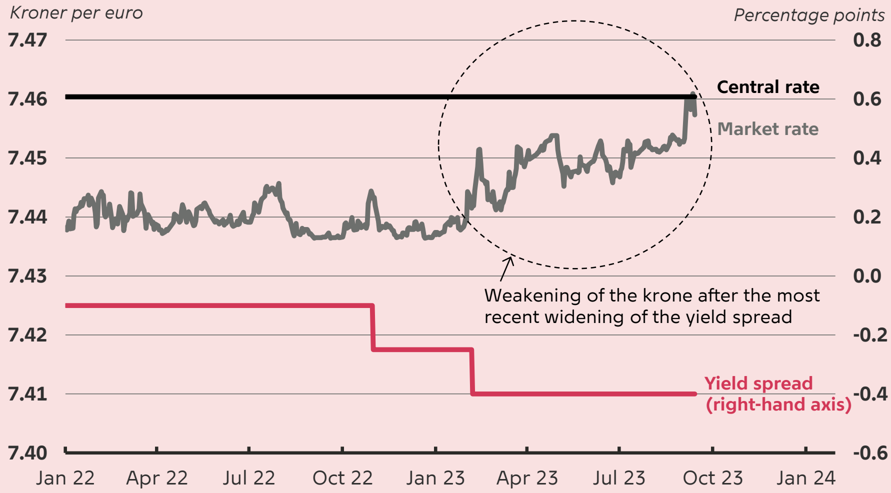
Moderate weakening of the krone vis-à-vis the euro

The negative monetary policy interest rate spread has contributed to the weakening of the krone

Since the most recent Monetary and financial trends in March, Danmarks Nationalbank has neither intervened in the foreign exchange market nor changed the monetary policy interest rate spread to the ECB. The monetary policy interest rate spread was last widened from -25 to -40 basis points on 3 February 2023. Following the most recent widening of the spread, the krone has weakened moderately against the euro, see chart 20. The widening of the spread was implemented after a prolonged period in which the krone was on the strong side of the central rate.

CHART 20

Danmarks Nationalbank's negative yield spread to the ECB has weakened the krone exchange rate



Note: Krone exchange rate against the euro. The official fluctuation bands for the exchange rate are 7.62824 and 7.29252 kroner per euro as per the ERM2 agreement. The most recent observations are from 15 September 2023.
Source: Danmarks Nationalbank.

[23] See Danmarks Nationalbank, DESTR is a robust anchor in the Danish capital market, *Danmarks Nationalbank Analysis*, No. 5, March 2023.

BOX 2

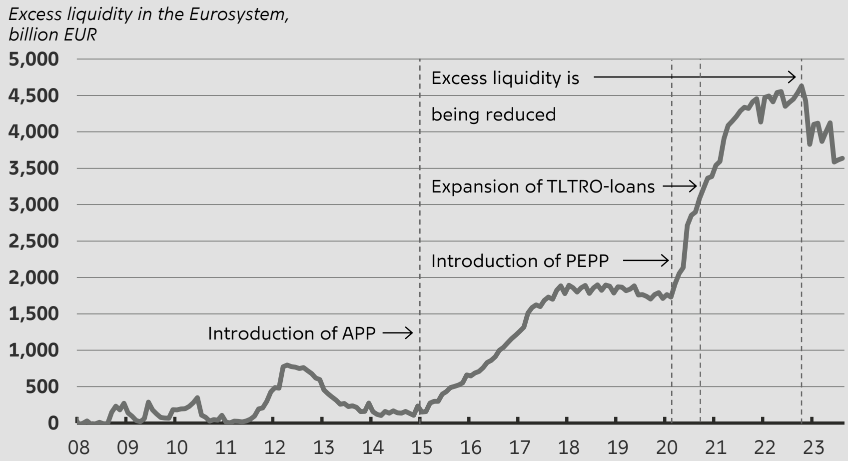
The ECB reduces the amount of excess liquidity in the Eurosystem

Between 2015 and autumn 2022, the ECB's monetary policy led to an increase in excess liquidity in the euro area banking system, first through the introduction of Asset Purchase Programme (APP) as shown in chart A. Following the outbreak of covid-19, excess liquidity was further increased by the launch of the Pandemic Emergency Purchase Programme, PEPP, and by the expansion of Targeted Longer-Term Refinancing Operationsloans, TLTRO, to European financial institutions.

High excess liquidity has led to stronger demand for short-term euro money market products and to interest rates on some safe investments being significantly lower than monetary policy interest rates. This has at times resulted in temporary appreciation pressures on the krone. This was the case, for example, in autumn 2022, when higher deposit rates in kroner than in euro meant that liquidity was allocated to investments in Danish money market products.[1] The ECB's monetary policy currently involves reducing the excess amount of liquidity in the Eurosystem. This reduces the likelihood of a recurrence of conditions in the euro money markets, where some interest rates on safe investments becomes significantly lower than the monetary policy interest rates.

CHART A

The amount of excess liquidity in the Eurosystem is reduced



Note: Excess liquidity in the Eurosystem is defined as the difference between the total liquidity supplied to the banking system and the banks' reserve requirements. The most recent observations are from august 2023.
Source: Bloomberg.

The amount of excess liquidity is reduced through a number of channels. First, the ECB has permitted European banks to repay TLTRO loans early. This, combined with the regular expiry of TLTRO loans, has reduced the amount of excess liquidity since autumn 2022 as shown in chart A. Second, the ECB has also stopped reinvesting maturing bonds purchased under the APP. This increases the amount of safe assets available in the euro money markets, increasing the ability of market participants to accept repo deposits. This may make it less attractive to invest in short-term money market products in, for example, Denmark. Finally, the ECB has increased the interest rate on government deposits held by the Eurosystem, which were subject to an interest rate cap of 0 per cent until September 2022. The aim is to avoid a possible downward impact on money market interest rates if these deposits are moved to market-based alternatives.[2]

[1] See Danmarks Nationalbank, Monetary policy will cool down the economy, *Danmarks Nationalbank Analysis (Monetary and financial trends)*, No. 3, March 2023.
[2] While the ECB has raised its deposit rate, it announced on 27 July 2023 that the interest rate on the minimum reserves which euro area banks are required to hold in their demand accounts with the national central banks will be changed to zero. Among other things, this is done to reduce interest expenses associated with the positive monetary policy interest rates (*link*).

Around earlier turns of the year and in autumn 2022, there were periods of temporary appreciation pressures on the krone exchange rate, partly due to conditions in the euro area money and bond markets.[24] The ECB's monetary policy currently involves reducing the amount of excess liquidity in the Eurosystem, see box 2. This may reduce the likelihood of temporary appreciation pressures on the krone for the reasons that prevailed in the aforementioned periods.

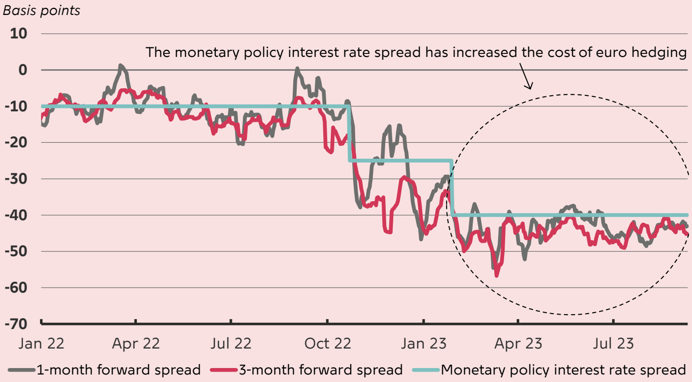
The krone has weakened moderately following the most recent widening of the spread.

The monetary policy interest rate spread affects financial markets and has resulted in krone sales

The negative monetary policy interest rate spread has contributed to the weakening of the krone through a number of channels. On the one hand, this has resulted in lower returns on short-term debt securities in Denmark relative to the euro area. This provides an incentive to borrow kroner and exchange them into euro to invest in short-term money market products in the euro area and to reduce existing euro debt. On the other hand, the interest rate spread increases the cost of hedging foreign currency risks in the forward market because the price primarily reflects the interest rate differential between the currencies being exchanged, see chart 21. The recent widening of the interest rate spread has thus increased the cost of hedging euro exposures, prompting the insurance and pension sector (IP), in particular, to reduce its forward exchange contract holdings.[25]

CHART 21

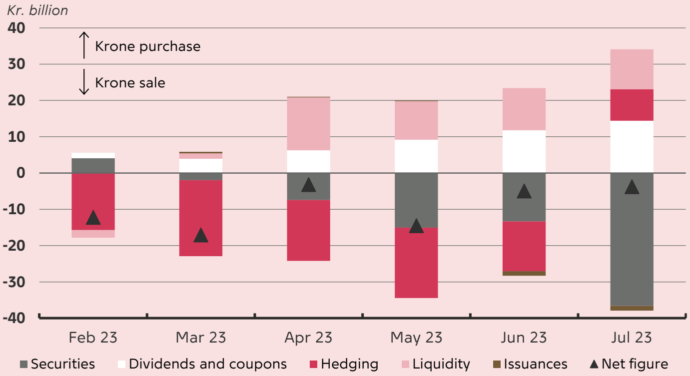
The forward spread closely follows the monetary policy interest rate spread



Note: The forward spread between kroner and euro in the forward exchange market and the monetary policy interest rate spread. A negative forward spread implies a higher price for future exchange of euros into kroner. The most recent observations are from 15 September 2023.
Source: Danmarks Nationalbank.

CHART 22

Reduced currency hedging lead to net krone sales by the insurance and pension sector



Note: Accumulated net krone purchases and net krone sales stated according to the direct reason for the transaction. The figures have been adjusted for major internal redistributions of assets between the insurance and pension sector and investment funds. 'Hedging' includes net krone trade in connection with the hedging of exposures in all foreign currencies. The most recent observations are from July 2023
Source: Danmarks Nationalbank.

[24] See Danmarks Nationalbank, Monetary policy will cool down the economy, *Danmarks Nationalbank Analysis (Monetary and financial trends)*, No. 3, March 2023.
[25] Euro hedging by the insurance and pension sector, in particular, is sensitive to price developments in the forward market, while dollar assets are hedged to a greater extent and more constantly over time. The difference between the hedging of exposures in the two currencies is due, among other things, to capital requirements and the credibility of the fixed exchange rate policy. See Martin Dencker Raffnsøe, Jakob Roager Jensen and Anders Larsen, The pension sector as a foreign exchange market participant, *Danmarks Nationalbank Monetary Review*, Q4 2016.

IP has reduced its holdings of forward exchange contracts in step with the expiry of existing contracts. Upon expiry, the IP has delivered euros and received kroner at the exchange rate agreed when the contracts were initiated. These euros have to a large extent been obtained by selling kroner in the spot market, which has contributed to the weakening of the krone exchange rate.[26] Following the recent widening of the monetary policy interest rate spread, IP has reduced the sector's overall euro exposure hedge ratio by around 2.0 percentage points. The reduced hedging has contributed around kr. 18.5 billion worth of krone sales to the sector's total currency trading.

In recent months, the sector's net krone sales have been offset by krone purchases in connection with the hedging of dollars, among other things, see chart 22. This has happened as IP has both increased the hedge ratio and reshuffled parts of their currency hedging. Some dollar exposures have gone from previously being hedged to euro to now also being hedged via the euro to Danish kroner. The counterparties to the new forward contracts for the future exchange of euros into kroner typically buy kroner in the spot market when the contracts are concluded. This is done in order to not take on the risk of exchange rate changes up until the delivery of the kroner takes place, resulting in the purchase of kroner in the foreign exchange market.

Businesses' strong earnings abroad continue to result in a current account surplus and demand for kroner.

Earnings abroad resulted in krone purchases by Danish businesses

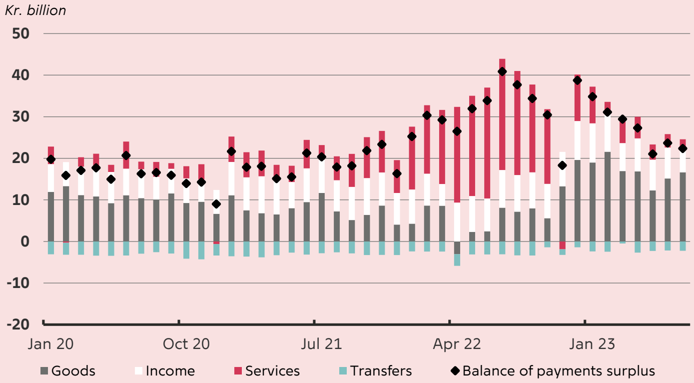
The most recent widening of the monetary policy interest rate spread was implemented after a prolonged period in which the krone was on the strong side of the central rate. The strong krone exchange rate was, among other things, a consequence of Danish businesses' demand for kroner. The businesses' demand for kroner is particularly due to their strong earnings abroad, which are partly exchanged into kroner.[27]

Danish businesses continue to record strong earnings abroad, resulting in a current account surplus and demand for kroner.[28] In 2023, exports of goods from businesses in the pharmaceutical industry, in particular, have contributed to the account surplus, see chart 23.[29] At the same time, there has been a continued demand for kroner among Danish non-financial businesses. This is supported by a summary of the total net trade in the Danish krone market, based on Danmarks Nationalbank's new money and foreign exchange market statistics, see chart 24. For more information on the new statistics, see box 3.

[26] If, on the other hand, the insurance and pension sector maintains a constant hedging level, the krone exchange rate is not affected. When new forward contracts are initiated as a replacement for expiring contracts, the counterparty will typically buy the kroner in the spot market immediately. The counterparty's krone purchase thus offsets the krone sales by the insurance and pension sector that take place to obtain currency for expired forward contracts. See, for example, Danmarks Nationalbank, The krone under pressure in January-February 2015, *Danmarks Nationalbank Quarterly Review*, Q1 2015.
[27] See Danmarks Nationalbank, Monetary policy will cool down the economy, *Danmarks Nationalbank Analysis (Monetary and financial trends)*, No. 3, March 2023.
[28] See Danmarks Nationalbank, Persistently high inflationary pressures call for tight economic policy, *Danmarks Nationalbank Analysis (Outlook for the Danish economy)*, No. 13, September 2023.
[29] In 2022, the surplus was primarily driven by services exports by shipping companies, see Danmarks Nationalbank, Monetary policy will cool down the economy, *Danmarks Nationalbank Analysis (Monetary and financial trends)*, No. 3, March 2023.

CHART 23

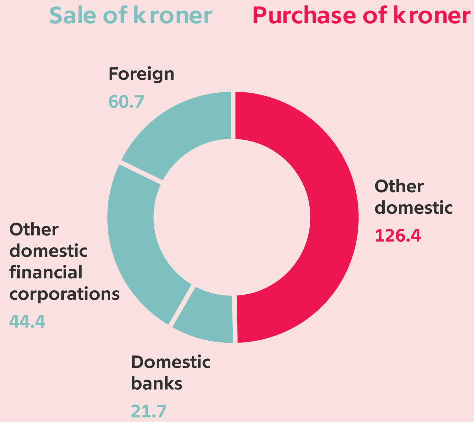
The current account surplus remains high



Note: Monthly account surplus by item, seasonally adjusted. The most recent observations are from July 2023.
Source: Statistics Denmark.

CHART 24

Total net trading in the Danish krone market in 2023



Note: Total net krone trade from January up to and including August 2023 in billion kroner. Net krone purchases are based on spot and forward trades made through banks that report to the money and foreign exchange market statistics. The 'Other domestic' category includes, among other, Danish non-financial businesses, 'Other domestic financial businesses' includes Danish insurance and pension companies, 'Foreign' includes all foreign market participants, which are primarily foreign banks and businesses, while "Domestic banks" includes Danish financial institutions and Danmarks Nationalbank
Source: Danmarks Nationalbank.

BOX 3

New money and foreign exchange market statistics from Danmarks Nationalbank

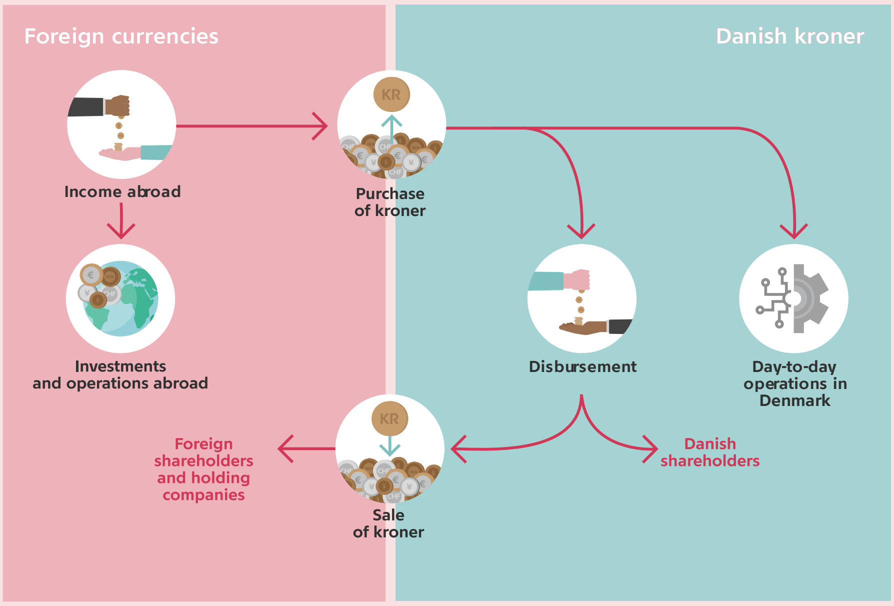
Danmarks Nationalbank has started collecting money and foreign exchange market data at the transaction level. The data consist of high-frequency reports by the nine most active banks in the Danish money and foreign exchange market and include spot trades, forward contracts and swap agreements. Similar statistics are already collected by the ECB, Norges Bank, Riksbanken and the Bank of England, among others, to gain a deeper understanding of local money and foreign exchange markets.

In the Danish money and foreign exchange market statistics, the 'Other domestic' category consists of trades by non-financial businesses, public institutions, foundations and non-profit organisations, among others. 'Other domestic financial businesses' consists of trades by pension companies, insurance companies, investment funds, mortgage credit institutions and others. 'Foreign' includes trades from all foreign market participants and consists primarily of foreign banks and businesses. "Domestic banks" includes Danish financial institutions and Danmarks Nationalbank. Data will be published on a monthly basis on Danmarks Nationalbank's website from November 2023.

The demand for kroner comes from a broad range of Danish businesses, with the kroner being used for a number of different purposes. Among other things, the businesses have used kroner in their day-to-day operations in Denmark, for example to pay tax, pay salaries, pay their suppliers and to make investments in facilities and equipment. Some of the kroner have also been paid to the shareholders of the businesses in the form of dividend payments and as share repurchases, see chart 25.[30] After disbursement, some of the kroner have been exchanged back into other currencies primarily via foreign banks. This is because Danish businesses have many foreign shareholders, and because some of the dividend has been paid to holding companies that have exchanged it into currencies for the purpose of investing in foreign securities.

CHART 25

Exchanged kroner are used in the day-to-day operations or paid to shareholders



Note: Simplified overview of currency flows from Danish businesses' earnings abroad. Danish businesses have either used their foreign earnings for investments and operations abroad or have exchanged them into kroner. The exchanged kroner have been used in the day-to-day operations in Denmark or to pay dividends and carry out share repurchases. After payment, foreign shareholders and businesses' holding companies have exchanged some of the kroner back into other currencies.
Source: Danmarks Nationalbank.

[30] Danish businesses, dividend payments and share buy-backs have been increasing in recent years, partly as a result of the businesses' strong earnings abroad. Up to and including July 2023, Danish businesses have paid kr. 174 billion to shareholders in the form of dividends and share buy-backs. In 2022, 2021 and 2020, kr. 134, 76 and 53 billion, respectively, were paid out in the corresponding period.

Macro-financial developments

- Tighter credit standards and weaker loan demand from both households and businesses have resulted in a slowdown in lending growth.
- Lending rates have risen faster and more steeply in Denmark compared to the euro area. In the same period, the income of Danish households has been increasing, which is expected to counter the rising impact of interest rates on private consumption.
- The businesses’ capital costs have increased significantly less than interest rates, dampening the downward impact of rising interest rates on investments.

Tighter monetary policy is slowing economic growth

The transmission of monetary policy is largely progressing as expected

Monetary policy has tightened significantly since 2022, and Danmarks Nationalbank has raised its monetary policy interest rates five times by a total of 1.5 percentage points since the most recent Monetary and financial trends in March 2023. The transmission, i.e. the pass-through, of monetary policy interest rates to bond yields and bank lending rates in Denmark has been smooth and efficient. A stylised illustration of monetary policy transmission can be seen in chart 26. However, bank deposit rates have risen somewhat less and more slowly than lending rates. Credit standards for banks and mortgage credit institutions have generally tightened further in 2023, for example through higher disposable income requirements, and lending growth, which has slowed sharply since the end of 2022, has continued to decline through 2023. This has happened as a natural part of the transmission of monetary policy to the real economy, and there is no evidence in Denmark of an extraordinary contribution from stress in the financial system as described in the *Global financial market developments* chapter.

Compared to the euro area, the financial transmission to deposit and lending rates has been faster in Denmark. Moreover, Danish households' interest rate exposure is higher than in the euro area. There are tentative indications that the direct transmission from rising interest payments to consumption may therefore be slightly stronger in Denmark than in the euro area.[31]

CHART 26

The transmission of monetary policy through the economy

Monetary policy is slowing economic growth

Taken in isolation, the monetary policy tightening since 2022 is estimated to dampen GDP growth significantly in 2023. This assessment is supported by estimates from Danmarks Nationalbank's macroeconometric models. A range of models is used, and the average indicates that GDP growth will be reduced by 1.5 percentage points in 2023 and by 1.0 percentage point in 2024 as a result of the monetary policy tightening implemented.[32] The average covers a span of

[31] See, for example, the ECB: The role of housing wealth in the transmission of monetary policy, *ECB Economic Bulletin*, Issue 5/2023.
[32] For a more in-depth review of the methodology and suite-of-model approach, see Danmarks Nationalbank, Monetary policy will cool down the economy, *Danmarks Nationalbank Analysis (Monetary and financial trends)*, March 2023.

0.75-2.75 percentage points for the effect in 2023, and the timings of the effects also vary between models. The effects on GDP growth are estimated to be significant in both 2023 and 2024. The estimates of the effect of monetary policy on GDP growth are in line with Danmarks Nationalbank's assessment from March 2023.[33] It is expected that monetary policy will continue to dampen activity in the Danish economy and that the impact is significant at the moment. However, other factors are pulling in the opposite direction, and there is no prospect of the Danish economy going through a recession, see Outlook for the Danish economy.

Tighter credit conditions as a natural part of monetary policy tightening

Tighter credit standards in Denmark, but signs that the trend is easing off for households

Danmarks Nationalbank's lending survey indicates that credit standards for both households and businesses have tightened in 2023. Credit standards for households tightened significantly in Q1, with more than 40 per cent of the banks surveyed reporting tightening, see chart 27. In Q2, however, credit standards remained unchanged for Danish households, while they continue to tighten for business customers. Especially in the real estate sector, banks expect credit standards to be tightened further in Q3, while standards for households are expected to remain unchanged. Banks also report that tighter credit conditions are driven mainly by higher disposable income requirements for customers, primarily due to the situation of higher interest rates and inflation. Against this background, the tightening of credit standards is seen to be driven by macroeconomic conditions and therefore to be a natural consequence of the tightening of monetary policy. As a result, there is no direct evidence of an extraordinary contribution to banks' credit policy from stress in the financial system. This is further supported by the *Global financial market developments* chapter.

Further tightening of credit standards in the euro area and the US

Lending surveys from both the euro area and the US are reporting a further tightening of credit standards for both households and businesses in Q2, although the pace of tightening has slowed in the euro area. However, the slowdown in the euro area should be seen in light of the most comprehensive quarterly tightening of credit standards since 2009 in the previous quarters. Unlike Denmark and the euro area, reports are of further tightening of standards in the US. The main reasons for the tightening in both the euro area and the US are reported to be reduced risk appetite, growing uncertainty about the economy, declining liquidity and rising financing costs.

Weaker demand for loans in Denmark and the euro area

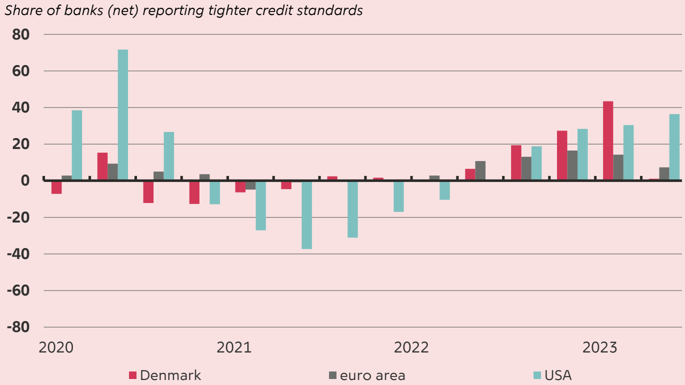
Danmarks Nationalbank's lending survey indicates a considerable decline in Danish household loan demand in H1 2023, see chart 28. However, the decline in Q2 2022 was less pronounced than in previous quarters. At the same time, banks report that the weaker loan demand from household customers is driven mainly by higher interest rates. The euro area is reporting a continued decline in loan demand from both households and businesses, driven by higher interest rates, a weakened housing market, lower consumer confidence and investment. Reductions in corporate loan demand are not reflected in the survey of Danish

[33] Danmarks Nationalbank, Monetary policy will cool down the economy, *Danmarks Nationalbank Analysis (Monetary and financial trends)*, March 2023.

banks, which also report slightly increasing demand from business customers in 2023. In the US, unlike Denmark and the euro area, loan demand from households remained stable in Q2. The stabilisation of demand may indicate that tightening has peaked in the US loan market as the four previous quarters were characterised by large declines in household demand.

CHART 27

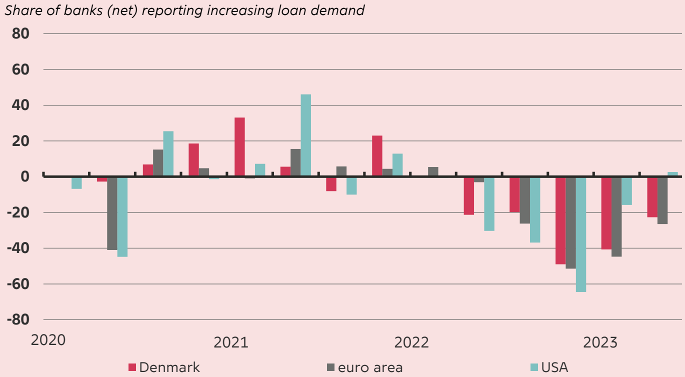
Tighter credit standards in Denmark, the euro area and the US



Note: Net share of banks reporting tighter credit standards. The lending survey is not 100 per cent comparable to the corresponding surveys in the US and the euro area. As a result, the most consistent categories are compared: For Denmark, the development in aggregate credit standards is shown.
Source: Danmarks Nationalbank's lending survey, Bank Lending Survey and Senior Loan Officer Survey.

CHART 28

Weaker loan demand in Denmark and the euro area



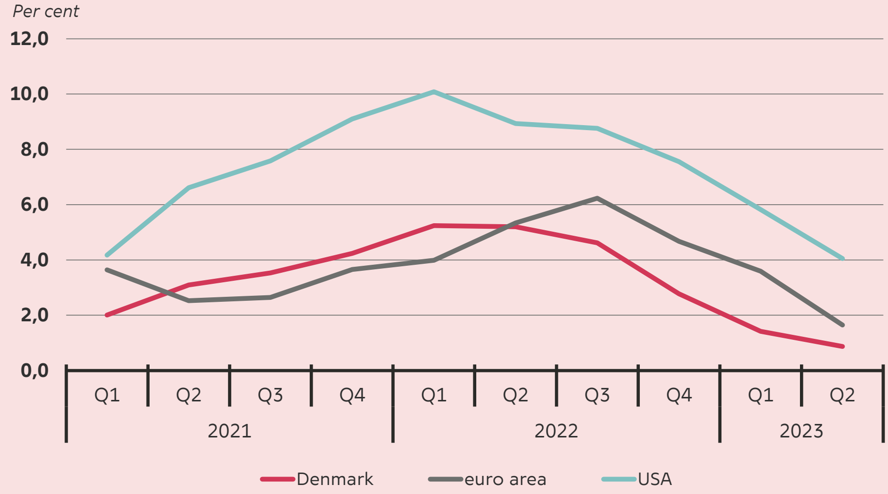
Note: Net share of banks reporting weaker loan demand. The lending survey is not 100 per cent comparable to the corresponding surveys in the US and the euro area. As a result, the most consistent categories are compared: For Denmark, the development in loan demand from households is shown.
Source: Danmarks Nationalbank's lending survey, Bank Lending Survey and Senior Loan Officer Survey.

Credit growth in Denmark, the euro area and the US is waning

In Denmark, total lending growth has been waning since the end of 2022, see chart 29. Since Q2 2022, the annual lending growth rate has declined from around 5.2 per cent to 0.4 per cent in July 2023. Developments in Denmark and the euro area show a similar trend, although the slowdown in Denmark started a little earlier. Lending growth in the US is also slowing, albeit from a slightly higher starting point. The lower lending growth comes on the back of relatively large increases in lending, especially in 2021 and 2022 in both Denmark, the euro area and the US.

CHART 29

Decline in credit growth in Denmark, the euro area and the US – albeit from high levels



Anm.: Year-on-year growth in lending to households, non-profit institutions targeted at households and non-financial businesses. Lending is stated at nominal value.
Kilde: Danmarks Nationalbank, Federal Reserve Bank of St. Louis and the ECB.

Tighter financial conditions and refinancing of fixed-rate mortgage loans have contributed to declining credit growth

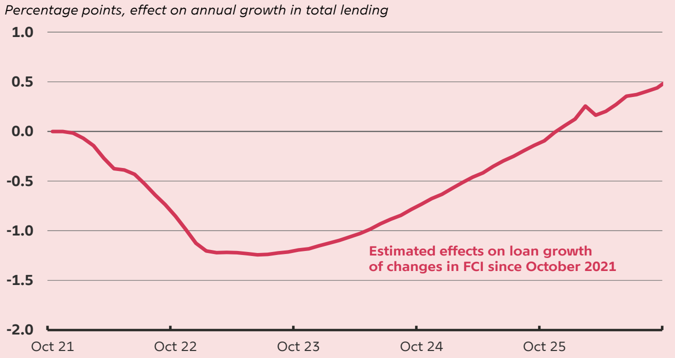
Since October 2021 and the first tightening of Danish financial conditions, total lending growth in Denmark has declined. A model calculation shows that the negative contribution from tighter financial conditions will peak in mid-2023 and is expected to decline towards the end of 2025, see chart 30.[34].

Since February 2022, lending growth for households has declined from 3.0 per cent to -1.9 per cent, see chart 31. This is the first time since 2014 that lending growth for households has been negative. This is partly driven by a substantial decline in mortgage lending. The marked decline in growth since the start of 2022 is partly due to lower loan demand and partly to lower prices and less activity in the housing market. However, the decline should also be seen in light of refinancing of fixed-rate mortgage loans, with loans being bought back at a rate below par and in many cases replaced by a new and smaller mortgage loan. Taken in isolation, the refinancing has reduced lending by 1.1 percentage point since the start of 2022, see chart 31.

[34] For a further discussion, see the *Global financial market developments* chapter on a newly developed monetary policy indicator, which summarises financial conditions.

CHART 30

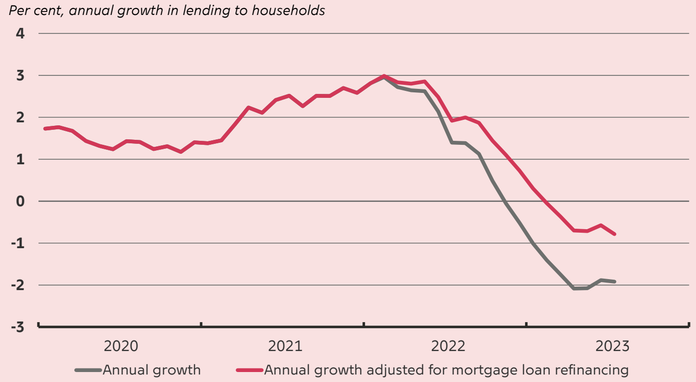
Tighter financial conditions contribute to the decline in credit growth in Denmark



Note: The effects were calculated using a structural VAR model in the period 2005-2021. The model includes annual growth in total lending and a *financial conditions index*, FCI. The FCI index is exclusively price-based and does not include, for example, qualitative factors such as the lending survey. The so-called structural shocks of the model are identified through short-term identification (also called Cholesky identification). For more details, see box 4 in Danmarks Nationalbank, Monetary policy will cool down the economy, *Danmarks Nationalbank Analysis (Monetary and financial trends)*, March 2023.
Source: Own calculations based on Statistics Denmark and Danmarks Nationalbank.

CHART 31

Homeowners' buy-backs of fixed-rate mortgage loans have also contributed to the waning credit growth



Note: Lending is stated at nominal value. Adjustment for loan refinancing includes the debt reduction directly attributable to households that have bought back an existing fixed-rate mortgage loan and taken out a new mortgage loan secured on the same property. The method follows Danmarks Nationalbank, Refinancing behaviour by homeowners in Denmark when mortgage rates rise, *Danmarks Nationalbank Economic Memo*, No. 2, *2023.*
Source: Danmarks Nationalbank and own calculations.

Households' interest costs are rising, but incomes even more so

Strong pass-through of higher monetary policy interest rates to new bank and mortgage loans

Since the beginning of 2023 and up to and including July, the average interest rate on new bank and mortgage loans to Danish households has increased by 1.1 percentage points and stood at 5.4 percent at the end of July 2023, see chart 32. Overall, the pass-through from higher monetary policy interest rates to current loan conditions has been rapid.

Yields on long-term mortgage bonds started rising already in late 2021 in anticipation of future monetary policy interest rate increases. This quickly led to rising interest rates on mortgage loans with longer fixed-interest periods. The early increase in retail lending rates can therefore be attributed to the Danish market-based mortgage credit system, in particular, where mortgages are granted on the basis of bond issuances on market terms.[35] The mortgage credit system in Denmark has also meant that the interest rates on mortgage loans with a long fixed-interest period, such as 30-year loans, are higher than the interest rates on loans with short fixed-interest period, even though the opposite is true in, for example, the government bond market. This is because the borrower pays a premium in the form of a higher interest rate for the right to

[35] see Danmarks Nationalbank, Monetary policy will cool down the economy, *Danmarks Nationalbank Analysis (Monetary and Financial Trends)*, March 2023

refinance fixed-rate loans as described in the *Global financial market developments* chapter.

Since the beginning of 2022, lending rates for households have risen both faster and more steeply in Denmark compared to the euro area. Denmark is comparable to the euro area countries where interest rates on new loans have risen the most. In the euro area, the home financing market is based on bank loans, and interest rates on new loans are largely set at the banks' discretion. Therefore, unlike in Denmark, there is not necessarily an immediate impact from changing bond yields to interest rates on new loans. Unlike Denmark, interest rates on long-term housing loans in the euro area are currently lower than interest rates on short-term housing loans. The interest rate differential between Denmark and the euro area for loans with a long fixed-interest period has increased significantly since 2021. This is due, among other things, to the market-based mortgage credit system in Denmark as well as an increase in the premium that Danish borrowers pay for the refinancing right as described in the *Global financial market developments* chapter.

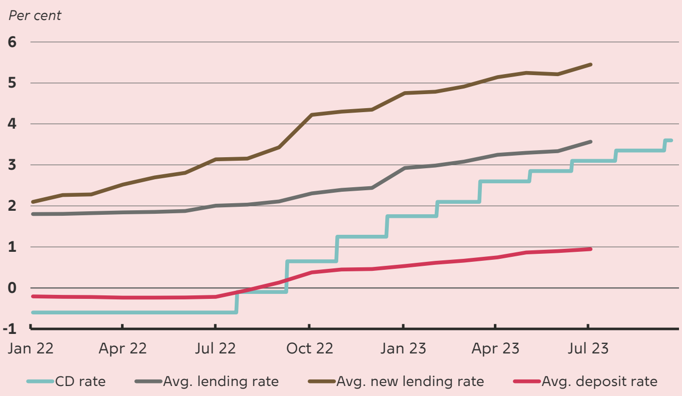
Interest rates on total loans have risen faster and more steeply in Denmark compared to the euro area

Up to and including July 2023, the average interest rate on total loans to Danish households have since the start of the year increased by 1.1 percentage points to approximately 3.6 per cent, see chart 32. Higher interest rates on new bank and mortgage loans are only gradually passed through to the average interest rate on *total* loans, as new loans are issued and interest rates on existing variable rate loans are adjusted on an ongoing basis. A significant part of the increase in average interest rates can be attributed to refinancing of fixed-rate mortgage loans, see chart 33. However, the part of the interest rate increase that can be attributed to refinancing may not necessarily have a similar dampening effect on economic activity. This is because, in most cases, higher interest rates due to refinancing result in a limited increase in the monthly payment after tax. This is due, among other things, to the annuity principle, which means that instalment amounts are reduced when the interest rate is increased. In addition, in many cases, the outstanding debt is reduced by using the capital gain on the bond, as described in the previous section, and the interest deduction partially absorbs the higher interest expenses.

The average interest rate on total loans to households has also increased significantly more in Denmark compared to the euro area as a whole, also when adjusting for the impact of the Danish wave of refinancings, see chart 33. This should be seen in light of the steeper increase in interest rates on new loans and the fact that the share of loans due for interest rate adjustment within the next 12 months is higher in Denmark compared to the euro area, see chart 34. During the past two years, unlike in the euro area, there has been a trend towards shorter fixed-interest periods in Denmark.

CHART 32

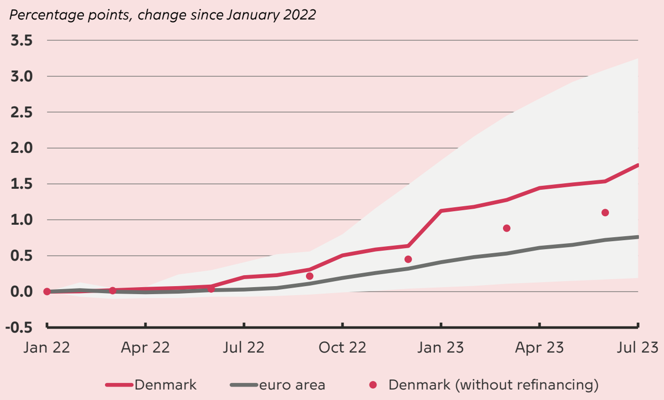
The increase in interest rates on new loans is gradually passed through to the average interest rate on total loans



Note: Average effective lending rates including contributions for households and non-profit institutions targeted at households. The rates cover total lending and new business for banks and mortgage credit institutions, respectively. The average deposit rate relates to total deposits.
Source: Danmarks Nationalbank.

CHART 33

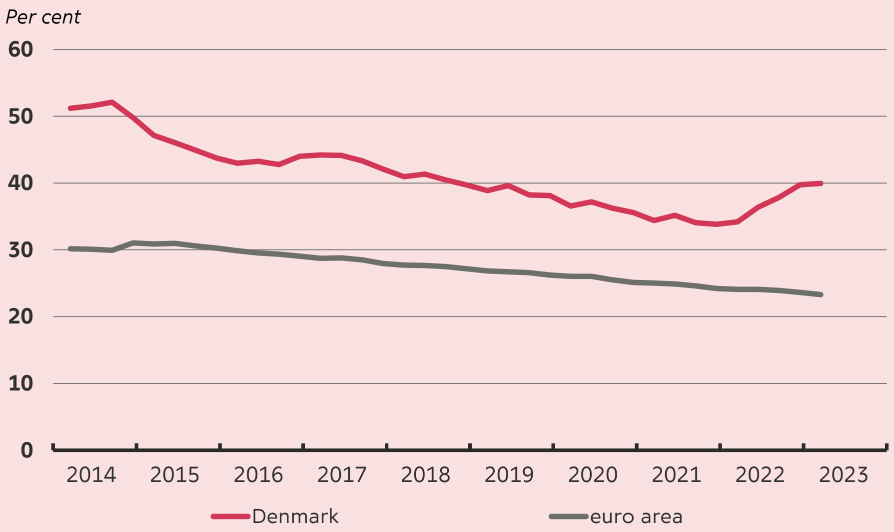
The average interest rate have risen more in Denmark compared to the euro area.



Note: Effective lending rate including contributions for total MFI debt (to banks and mortgage credit institutions) of households and non-profit institutions targeted at households. The shaded area indicates the spread within euro area countries, excluding Greece, Croatia, Luxembourg and Malta.
Source: Danmarks Nationalbank and the ECB.

CHART 34

The share of total debt in Denmark due for interest rate adjustment within the next 12 months is higher than in the euro area



Note: The share of total debt with maturity beyond one year with next interest rate adjustment within the next 12 months. Bank debt, where the interest rate is set at the bank's discretion, is included in the share of loans due for interest rate adjustment within the next 12 months.
Source: Danmarks Nationalbank and the ECB.

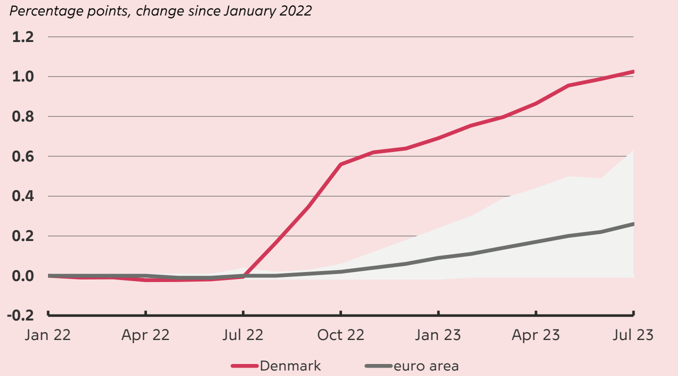
Deposit rates have increased later and less than interest rates on bank loans

Interest rates on bank deposits have not been increased to the same extent as interest rates on bank loans. Deposit rates started to slowly increase from mid-2022 following the monetary policy rate hikes. The trend of rising deposit rates has continued in 2023, and the average interest rate on total deposits rose to 0.9 per cent in July 2023.[36] Since the start of 2022, deposit rates in Denmark have risen more than in the euro area, see chart 35. However, this should be seen in light of the fact that deposit rates were initially lower in Denmark than in the euro area.

Although the transmission to deposit rates has been faster and stronger in Denmark than in the euro area, deposit rates have risen more slowly than has been the case over the past almost 20 years. Estimates from an econometric model indicate that deposit rates in Denmark have risen less than expected based on historical correlations between deposit rates and monetary policy interest rates over that period, see chart 36.

CHART 35

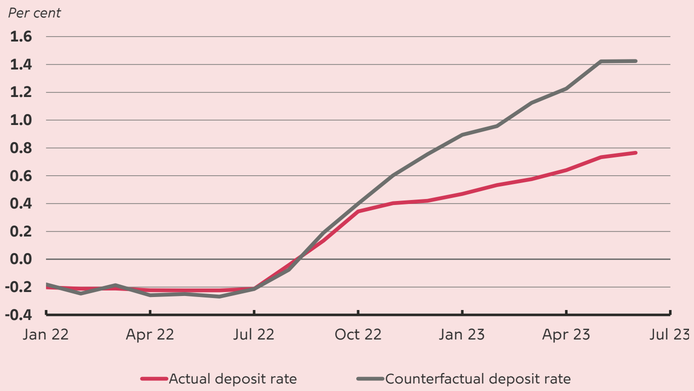
Deposit rates for households have risen faster than in the euro area



Note: Change in overnight deposit rates. The shaded area indicates the spread within euro area countries, excluding Greece, Croatia, Luxembourg and Malta.
Source: Danmarks Nationalbank and the ECB.

CHART 36

Deposit rates in Denmark have risen less than in previous periods of monetary policy interest rate hikes



Note: The counterfactual interest rate pass-through is based on an econometric model for the change in the overnight deposit rate, which is modelled as a function of changes in Danmarks Nationalbank's CD rate. In addition, the model controls for the annual rate of increase in industrial production and core inflation. The model contains 12 lags for each of the three explanatory factors. The model estimates are based on monthly data from January 2003 to June 2012, when Danmarks Nationalbank lowered the CD rate to a negative level. The model is inspired by Todd Messner and Friederike Niepmann, *What determines the passthrough of policy rates in the euro area*, *FEDS notes*, 28 July 2023.
Source: Danmarks Nationalbank.

Marked increase in disposable incomes and savings

Although households have to pay more interest on their debt, their financial situation over the past six months has been favourable overall. This has allowed households to increase their consumption and savings at the same time. In H1 2023, private consumption amounted to kr. 631 billion. This is an increase of kr.

[36] The deposit rate on demand deposits has risen to 0.8 per cent. When adjusted for lending-related deposits, the deposit rate stood at 0.49 per cent in May 2023. With this adjustment, deposit rates have still risen more in Denmark than the euro area average.

33 billion compared to H1 2022, corresponding to a nominal increase of 5.5 per cent. Household transactions in H1 2023 are summarised in chart 37.

The favourable situation is due, in particular, to an increase in the nominal disposable incomes of households. During Q1 2023, they grew by kr. 38 billion compared to the previous quarter to a level of kr. 373 billion.[37] The increase in Q1 2023 is largely due to share dividends, see later, but overall disposable incomes have grown substantially over the past two years. The *annual* nominal disposable incomes have increased by 10 per cent from Q1 2022 to Q1 2023.[38] Disposable incomes are projected to increase moderately through the remainder of 2023 compared to 2022, see Outlook for the Danish economy.

Households' financial assets comprising deposits, equities, bonds and investment fund certificates increased by a total of kr. 60 billion in the first two quarters of 2023. Of this, the increase in household deposits amounts to kr. 31 billion, up 2.6 per cent. In the same period, households transferred kr. 28 billion to investments in equities, bonds and investment fund certificates. Of this, kr. 24 billion was invested in bonds, which is an increase of approximately 50 per cent in households' direct bond ownership. In the same period, households have reduced their debt to banks and mortgage credit institutions by kr. 12 billion, corresponding to a reduction of 0.5 per cent in their total debt to banks and mortgage credit institutions.[39]

Increased savings are an expected effect of tighter monetary policy

The higher savings are partly due to rising incomes and partly to the higher interest rate level having provided increased incentives to postpone consumption and pay off debt. The higher savings are an expected effect of the tightening of monetary policy as savings become more attractive when interest rates rise, all else being equal. Similarly, savings in the euro area tended to increase slightly in Q1 2023. The extent to which higher savings lead to lower consumption depends on the types of income groups that increase savings. This is because the marginal propensities to consume vary across the income distribution.[40]

Extraordinarily large dividend payments to Danish households

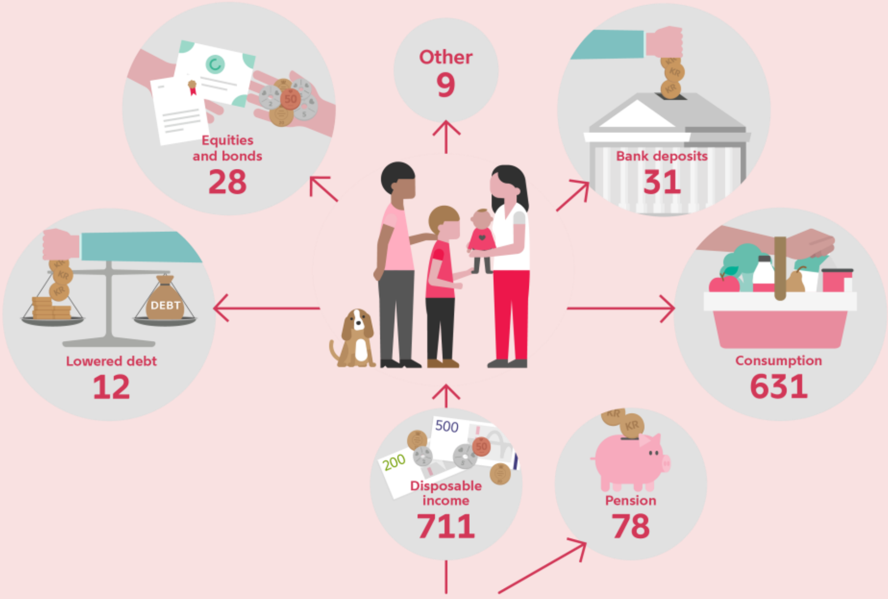
The value of households' listed equities and investment certificates increased by approximately kr. 55 billion in 2023. A significant part of this amount, approximately kr. 28 billion, is due to the increase in Novo Nordisk's equity price. In addition, large dividends have been paid to Danish households as described in the *Danish money and foreign exchange market* chapter. Overall, dividends of kr. 61 billion have been paid to Danish households in 2022-2023.[41] Annual dividends in 2022 and 2023 are roughly double those seen in the period 2018-2021. How much dividends affect consumption depends, among other things, on which income groups receive the dividends. This is because the marginal propensity to consume is not the same for all population groups, for example over the income distribution.[42] Approximately 64 per cent of households' non-pension-related equity holdings are owned by the top quintile in the income distribution, while approximately 35 per cent are owned by the middle three quintiles in the income distribution.

[37] For households and non-profit institutions targeted at households, such as the Red Cross.
[38] Annual nominal disposable incomes for the period Q2 2022-Q1 2023 compared to the period Q2 2021-Q1 2022. By comparison, real annual disposable incomes saw a more modest 2.5 per cent increase in 2022 compared to 2021.
[39] Mortgage debt is stated at nominal value.
[40] See Andreas Kuchler and Edmund Crawley, Consumption heterogeneity: Micro drivers and macro implications, 2023, *American Economic Journal*.
[41] For households and non-profit institutions targeted at households. Dividends related to private equity holdings, including voluntary private pension holdings, but excluding occupational pension schemes.
[42] See Andersen, Johannesen and Sheridan, Dynamic spending response to wealth shocks: evidence from quasi-lotteries on the stock market, *Working Paper*, 2021.

CHART 37

Danish households' financial transactions during H1 2023

Kr. billion



Note: Financial transactions of households and non-profit institutions targeted at households. Disposable incomes for Q2 2023 are estimated based on a forecast, see Outlook for the Danish economy. 'Other' includes changes in cash holdings, real investments, individual pension deposits and other unpaid balances from the national accounts.
Source: Danmarks Nationalbank, Statistics Denmark and own calculations.

Limited impact on businesses' total capital costs so far

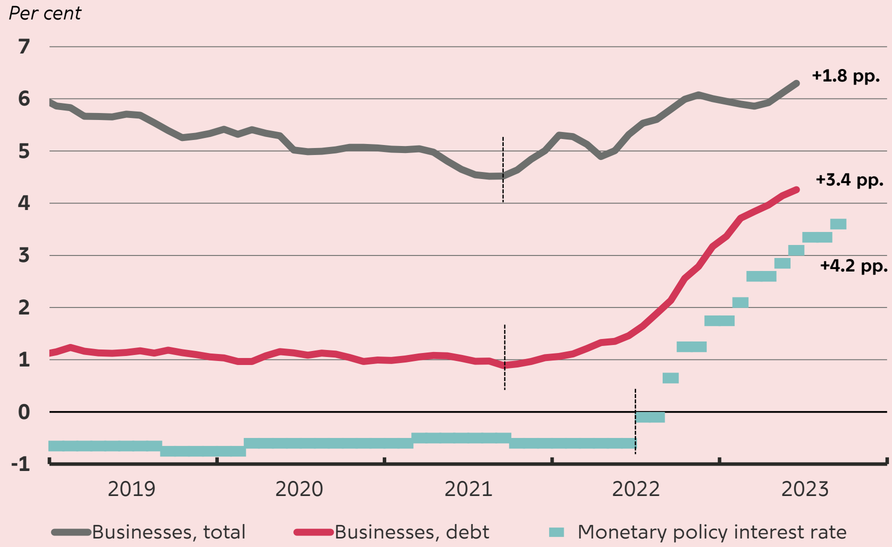
The price of equity has not risen as much as interest rates

The rising interest rates are not fully reflected in the cost of all sources of corporate financing. The price of equity financing, for example, has increased only slightly since 2021. The price is derived from equity prices, among other things, and they have risen in line with the businesses' higher earnings expectations.

Therefore, the average cost of financing, which in addition to the price of equity also includes the price of debt financing, has so far only increased to a relatively limited extent, see chart 38. As a result, the average cost of financing in Q2 2023 was at about the same level as it was at the start of 2019, despite the marked increase in monetary policy interest rates. The average cost of financing is an important factor in businesses' investment decisions.

CHART 38

The average cost of financing for businesses has increased, but is almost the same as it was at the start of 2019



Anm.: The figure shows the estimated average cost of external financing for businesses. The estimate weighs interest rates and expected returns on equities using weights from the composition of the businesses' balance sheets. The monetary policy interest rate is the interest rate on certificates of deposit. The measures of external financing are based on the methodology in box 1 in Danmarks Nationalbank, Decline in interest rates and refinancing boom, *Danmarks Nationalbank Analysis (Monetary and financial trends)*, No. 19, September 2019.
Kilde: Danmarks Nationalbank, Statistics Denmark, Refinitiv Datastream and own calculations.

Higher interest rates are not fully reflected in businesses' required return on investment

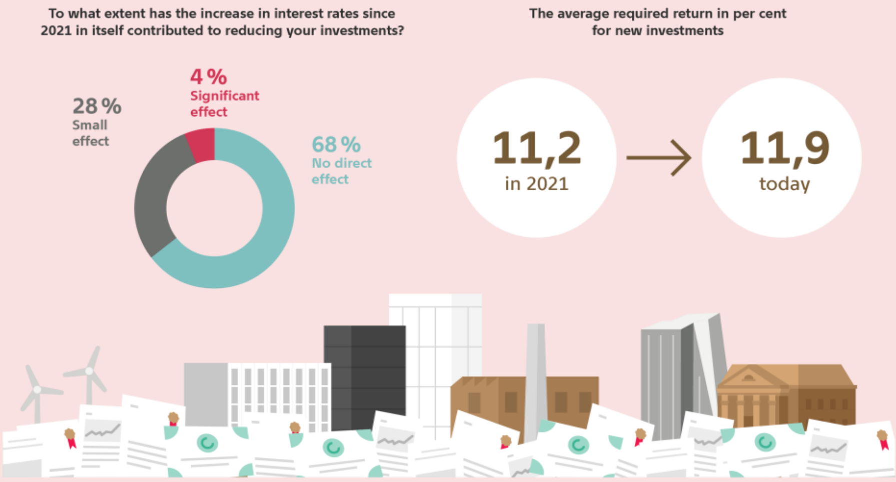
On average, businesses' required return on new investment increased slightly from 11.2 per cent in 2021 to 11.9 per cent in summer 2023. This is shown by a survey of large Danish businesses conducted during summer 2023.[43] All else being equal, a higher required return will lead to fewer new investments. The increase is significantly smaller than the increase in interest rates over that period.[44] The fact that the increase is small should probably be seen in light of the fact that the required return did not decrease during the years of falling and low interest rates up until 2020. The survey shows, for example, that the required return for the majority of the surveyed Danish businesses remained unchanged or even increased in the period 2009-2019.[45]

Two-thirds of the survey respondents say that rising interest rates have not had a clear effect on their business's new investments since 2021, see chart 39. The majority of the remaining respondents find that the downward effect of interest rates on the volume of investments has been limited. Similarly, more than half estimate that there will be no clear additional effect if interest rates rise to and remain around 5 per cent.

[43] In summer 2023, Danmarks Nationalbank conducted an ad hoc survey of Danish businesses' capital costs and investment decisions. The questionnaire was sent to major Danish businesses with the help of Danske Bank. The survey was conducted in July and August 2023. 27 businesses responded.
[44] New research based on a number of countries in the period 2000-2021, including Denmark, shows alow pass-through of interest rates to required returns on new investment. See Niels Joachim Gormsen and Kilian Huber, Corporate Discount Rates, *NBER Working Paper*, June 2023.
[45] Norges Bank sees the same development in Norway, see Norges Bank, What factors influence firms' investment decisions?, Regional network, special topic 2017.

CHART 39

Survey of businesses shows that a small proportion react to rising interest rates



Note: Based on the businesses' responses to Danmarks Nationalbank's survey of Danish businesses' capital costs and investment decisions. The survey was conducted in July and August 2023. 27 businesses responded. Not all businesses reported required returns.
Source: Danmarks Nationalbank.

Corporate cash flows are strong – despite interest rate hikes

Overall, Danish businesses have achieved strong financial results, both in 2021, 2022 and so far in 2023. The large and rising profits have contributed to the strengthening of corporate cash flows. Against this background, businesses have paid higher dividends, and there has been an increase in own share buy-backs, see the *Global financial market developments* chapter and *The Danish money and foreign exchange market* chapter. In 2022, businesses bought back own shares worth kr. 79 billion, an increase of 25 per cent compared to 2021.[46] In H1 2023, corporate buy-backs were at the same high level as in 2022. Growth in corporate borrowing with Danish banks and mortgage credit institutions slowed in H1 2023 and is relatively low compared to the same period the year before.[47]

Businesses' interest expenses have risen as a result of the higher interest rate level. In H1 2023, businesses paid kr. 9.2 billion in interest and administration margins.[48] By comparison, kr. 3.5 billion was paid in H1 2022. However, the increase in interest expenses is limited compared to the businesses' total profit before tax, which amounted to kr. 655 billion in 2021.[49]

Overall, it is assessed that, due to significant liquid assets and continued positive cash flows from operating activities, businesses are able to maintain their desired investment levels. However, some industries may feel more pressured by rising interest rates.[50]

[46] Total including financial businesses. Kr. 76 billion without financial businesses.
[47] For non-financial businesses without real property, property trading and letting. Consequently, businesses' total debt to Danish banks and mortgage credit institutions only increased by approximately 1.6 per cent in H1 2023. By comparison, debt increased by 9,8 per cent in H1 2022.
[48] For non-financial businesses without real property, property trading and letting to Danish MFIs.
[49] For non-agricultural private sector.
[50] These include the commercial property sector, see Danmarks Nationalbank, Interest rate hikes affect the banks and their customers, Danmarks Nationalbank Analysis (*Financial Stability*), No. 6, 2023.

In H1 2023, corporate investments increased by 2 per cent compared to H1 2022. The higher financing costs and signs of a slightly higher required return on investment are expected to dampen corporate investments in 2023 and 2024. For 2023, an overall decline in corporate investment is expected, see Outlook for the Danish economy, September 2023.

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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.

Danmarks Nationalbank
Langelinie Allé 47
2100 Copenhagen Ø
+45 3363 6363

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DANMARKS NATIONALBANK