

# DANMARKS NATIONALBANK

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MONETARY AND FINANCIAL TRENDS — SEPTEMBER 2019

## Decline in interest rates and refinancing boom

- In September, Danmarks Nationalbank lowered its key monetary policy interest rate, the rate of interest on certificates of deposit, by 10 basis points to -0.75 per cent, following the ECB's reduction of its rate of deposit facility. The krone rate remains stable, being slightly on the weak side of the central rate.
- Overall, financial conditions are accommodative and support the ongoing economic upswing. Interest rates on mortgage and government bond have declined substantially in 2019, triggering a new refinancing boom during which many households have opted for lower-rate home loans. This underpins growth in private consumption.
- Credit growth remains moderate and has slowed slightly in 2019, despite falling interest rates. Household financing costs have fallen since the financial crisis, while firms' financing costs have remained relatively unchanged, reflecting that the cost of equity has not mirrored the decline in interest rates.

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### Monetary policy interest rate reduction

First Danish interest rate change for more than three years.

[Read more](#)



### Falling interest rates

Record low level.

[Read more](#)



### Refinancing boom

Supports increased economic activity

[Read more](#)

## Key trends in the financial markets since March 2019

Over the past six months, several central banks, including the European Central Bank, ECB, have lowered their growth and inflation forecasts. This primarily reflects growing concern over global macroeconomic developments, with uncertainty about the Brexit outcome and the ongoing US-China trade conflict, among other factors.

Both the Federal Reserve, Fed, and the ECB have lowered their monetary policy rates and announced that they are open to the prospect of pursuing a more accommodative monetary policy in future. This has led to a decrease in short-term money market interest rates and substantial declines in the yields of Danish mortgage and government bonds, taking them to record lows.

In September, the ECB lowered the interest rate on the deposit facility by 10 basis points to -0.50 per cent, a record low. The ECB also announced that it would restart its asset purchase programme on 1 November 2019 and introduce a two-tier interest rate system on 30 October. As a result of the ECB's interest rate reduction, Danmarks Nationalbank lowered the rate of interest on certificates of deposit by 10 basis points to -0.75 per cent. The Danish krone is slightly on the weak side of the central rate. Danmarks Nationalbank has not intervened in the foreign exchange market.

### Overview: Financial markets since March 2019



Note: The blue bar indicates the change at the cut-off date of 13 September 2019 relative to the cut-off date for the previous edition, i.e. 15 March 2019. The endpoints of the black lines indicate the largest and smallest changes, respectively, over the period from 15 March 2019.

Source: Thomson Reuters Datastream and Eikon.

## The Danish economy and financial conditions

### Falling interest rates stimulate economic activity

Financial conditions remain accommodative and support the ongoing upswing in the Danish economy. Low interest rates have been the primary driver of accommodative financial conditions and contributed an estimated 0.18 per cent to GDP growth in the 2nd quarter of 2019, cf. Chart 1.

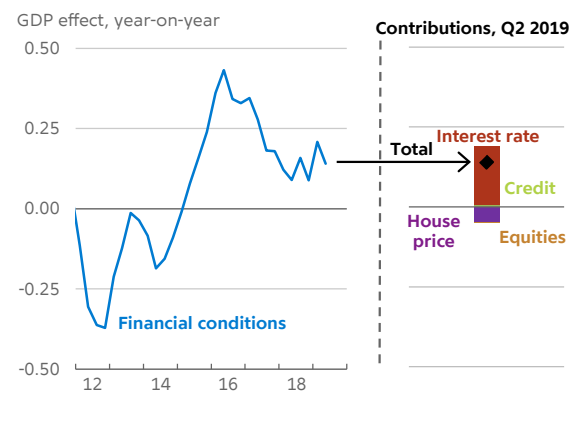
Low interest rates contribute to higher economic activity through several channels. For instance, the drop in interest rates has triggered the largest refinancing boom of fixed-rate mortgage bonds since 2005, cf. the section on *Credit and money*. This helps to support economic growth, as households in connection with refinancing, in average, increase their housing loan and consumption. In Denmark, refinancing and additional borrowing at the same time support growth in private consumption by an estimated 0.9 percentage points in 2019.<sup>1</sup>

Despite historically low interest rates, the interest rate contribution to GDP growth is relatively limited. This reflects that the level of interest rates should be weighed against the natural level of interest rates, measured by *the natural real interest rate*. Danmarks Nationalbank's estimate of the natural real interest rate indicates that the impact on the Danish economy of the level of monetary policy rates is practically neutral. This should be seen in the context of the decline in the natural real interest rate since the 1990s and the subsequent lowering of monetary policy rates. However, due to other factors, such as spillovers from the ECB's asset purchase programme, monetary policy is assessed to provide a moderate stimulus to the Danish economy, cf. the section on *Monetary policy and money markets*.

Equity prices are assessed to have reduced growth slightly in 2019. This should be viewed in light of the

### Falling interest rates have contributed to economic growth

Chart 1



Note: Financial conditions show the total contribution from developments in credit, equity prices, house prices and interest rates to GDP growth. Financial conditions have been calculated by means of a structural VAR model and have thus been purged of cyclical factors, see Jensen and Pedersen, 2019, Macro financial linkages in a SVAR model with application to Denmark, Danmarks Nationalbank, Working Paper, No. 134.

Source: Danmarks Nationalbank, Statistics Denmark and own calculations.

fact that a drop in household wealth resulting from lower equity prices can lead to lower consumption. Lower equity prices may also dampen business investment.<sup>2</sup>

Credit developments in 2019 are estimated to be largely neutral for the Danish economic upswing, while developments in house prices have had a slightly negative impact on GDP growth in 2019, possibly reflecting that house prices have flattened slightly, both for Denmark overall and in Copenhagen.<sup>3</sup>

1 See Henrik Yde Andersen, Stine Ludvig Bech, Ida Rommedahl Julin and Alexander Meldgaard Otte, 2019, Mortgage refinancing supports private consumption, *Danmarks Nationalbank Analysis*, No. 17.

2 See Jonas Ladegaard Hensch and Morten Spange, 2019, Increasing equity prices support investments, *Danmarks Nationalbank Analysis*, No. 8.

3 See Danmarks Nationalbank, 2019, Outlook for the Danish economy, September, *Analysis*, No 20.

**The pass-through from monetary policy depends on the source of financing**

Financial conditions are affected by monetary policy, which is set in accordance with the fixed exchange rate policy against the euro, cf. the illustration in Chart 2. Monetary policy comprises determination of monetary policy rates, inter alia, that determine money market interest rates. Both monetary policy and money market interest rates affect bank rates and mortgage yields, inter alia, which are key to households' and firms' overall financing costs.

Households primarily rely on debt as a source of financing, while firms use both debt and equity financing. The pass-through from monetary policy rates to households' and firms' financing costs can thus differ and depend on the source of financing, cf. Box 1.

**Household financing costs continue to decline**

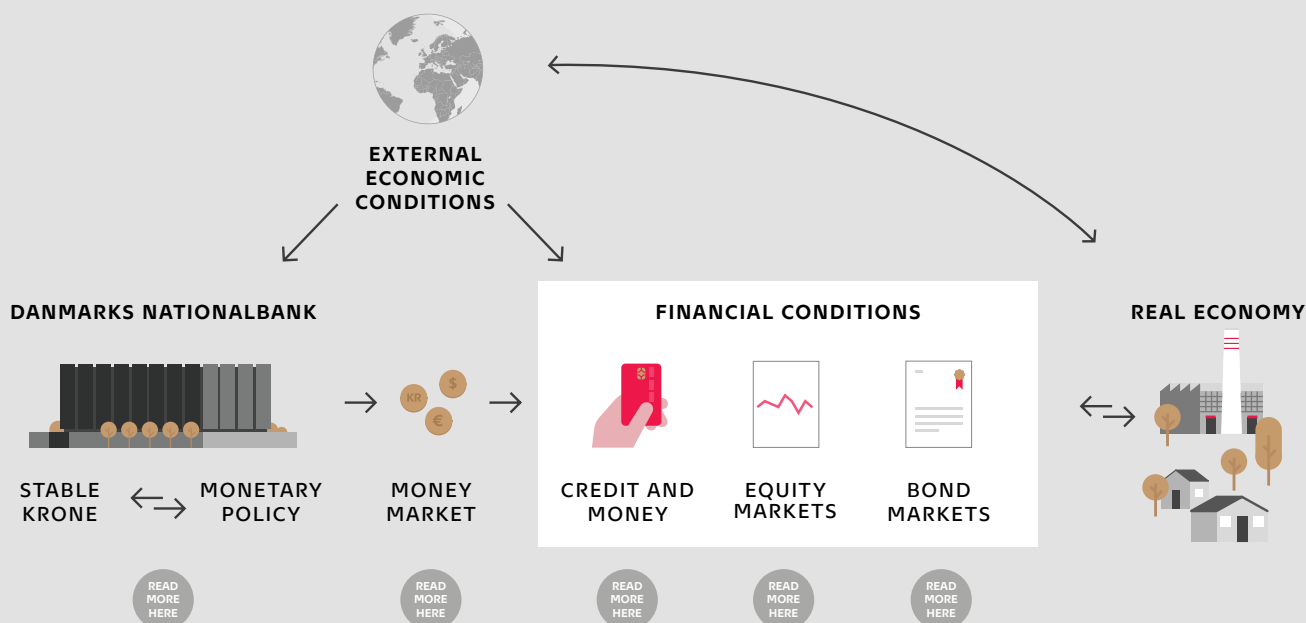
Average household financing costs have shown a slightly declining trend in 2019, cf. Chart 3. This is partly attributable to a changed structure of financing, with households continuing to switch from bank loans to cheaper mortgage loans. The fall in households' financing costs is, however, smaller than in previous years. This is because average mortgage yields have remained largely unchanged as a result of the households' switch to fixed-rate loans, cf. the section on *Credit and money*.

**The full effect of monetary policy has not passed through to firms' financing costs**

Firms' average costs of debt financing have generally mirrored developments in household financing costs, illustrated by the red line, cf. Chart 3. However,

Chart 2

# Financial conditions affect the real economy



## Changes in the composition of liabilities influence the transmission of monetary policy

Box 1

The transmission of monetary policy to the financing conditions of households and non-financial corporations has traditionally taken place through banks and mortgage credit institutions. But especially after the financial crisis in 2007-08, focus has been on transmission of monetary policy through channels other than banks and mortgage credit institutions. Credit risk affects household financing conditions, while the financing conditions of firms are affected also by risk premia on market-based financing (equities and bonds). For instance, fluctuations in credit risk may impact bank lending rates, while the market risk perception can influence the price of equity financing (i.e. financing through equity issuance). Therefore, effects on both price and balance sheet changes must be included to provide the full picture of monetary policy transmission.

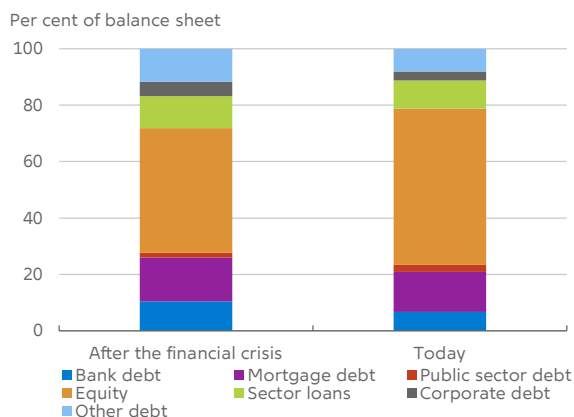
The total cost of external financing can be computed as a weighted average of the cost of the sectors' different sources of financing, based on the share of the individual sources in total external financing.<sup>1</sup> Each financing index is calculated based on a decomposition of the balance sheet into the respective sources of financing. Consequently, the measures include liability composition shifts over time.

Equity accounts for approximately 50 per cent of the total liabilities of non-financial corporations.<sup>2</sup> Debt, comprising mortgage debt, bank debt, sector loans, issuance of corporate bonds and other debt, makes up the remaining share of the balance sheet, cf. Chart A. Like corporate borrowing, equity financing can be considered as an external source of financing. The reason is that equity reflects the owners' capital in the firm. Owners' required return on equity has been largely constant, in the range of 7-9 per cent, cf. the section on *the equity markets*. Non-financial corporations' costs of bond issuance are calculated based on outstanding fixed-rate corporate bonds. Sector-internal loans are assumed to bear interest on the same terms as corporate bonds.

Since 2005, bank and mortgage debt has accounted for about 70-80 per cent of total household balance sheets, cf. Chart B. Other financial accounts, debt to the public sector and consumer loans make up the rest of the balance sheet. Other financial accounts are not included in the financing index, given that it is not possible to identify the debt and its price.

Composition of firms' liabilities

A

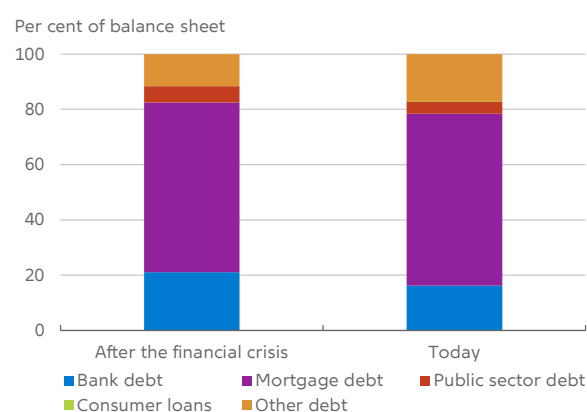


Note: "After the financial crisis" is based on data for 1st quarter of 2012.

Source: Danmarks Nationalbank, Statistics Denmark, Thomson Reuters Eikon and own calculations.

Composition of households' liabilities

B



Note: "Other debt" is other financial accounts. The notation "After the financial crisis" is based on data for 1st of quarter of 2012. Bank debt is bank lending for housing purposes.

Source: Danmarks Nationalbank and own calculations.

1. See also ECB Monthly Bulletin, March/2005 – Box 4 A measure of the real cost of the external financing of euro area non-financial corporation.  
 2. See Danmarks Nationalbank, 2019, Monetary and financial trends, March 2019, Analysis, No 5.

equity financing plays a key role in firms' total financing costs, reflecting that firms have relied on equity as a source of financing to a greater – and increasing – extent since the financial crisis (see Box 1).

The price of equity financing has remained largely unchanged since the financial crisis, cf. the section on *Equity markets*. This has contributed to the limited pass-through of the monetary policy rates to firms' financing costs, illustrated by the difference between the purple and red lines, cf. Chart 3.

## Monetary policy and money markets

### Danmarks Nationalbank has lowered its key monetary policy interest rate

In mid-September, Danmarks Nationalbank lowered the rate of interest on certificates of deposit by 10 basis points to -0.75 per cent, cf. Chart 4. The lending rate, the current-account rate and the discount rate are unchanged. In the current situation where the monetary policy counterparties have a large need to place funds at Danmarks Nationalbank, the monetary deposit rates determine the money market rates and the exchange rate.

Danmarks Nationalbank's interest rate reduction followed in the wake of the Governing Council of the ECB's reduction in the rate on the deposit facility by 10 basis points to -0.50 per cent at its September interest rate meeting. The Governing Council expects the monetary policy interest rates to remain at their present or lower levels until it has seen the inflation outlook converge to a level close to, but below, two per cent.

### The Danish krone has been stable

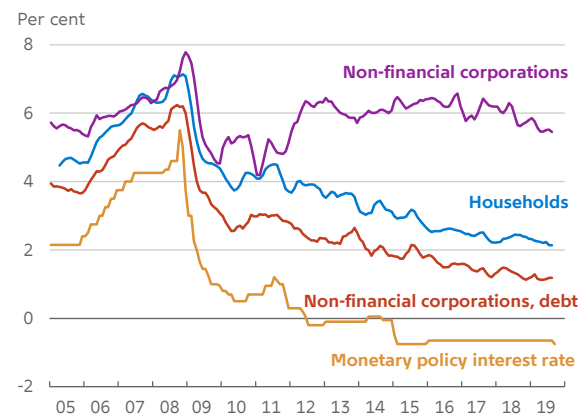
The exchange rate of the krone vis-à-vis the euro has been stable and close to the central rate since the beginning of 2019, cf. Chart 5. At present, the krone rate is slightly on the weak side of the central rate. Danmarks Nationalbank has not intervened in the foreign exchange market in the past six months. At end-August 2019, the foreign exchange reserve amounted to kr. 447 billion.

### The ECB restarts asset purchase programme

In connection with its September interest rate meeting, the Governing Council of the ECB also

**Lower pass-through to firms' financing costs**

Chart 3

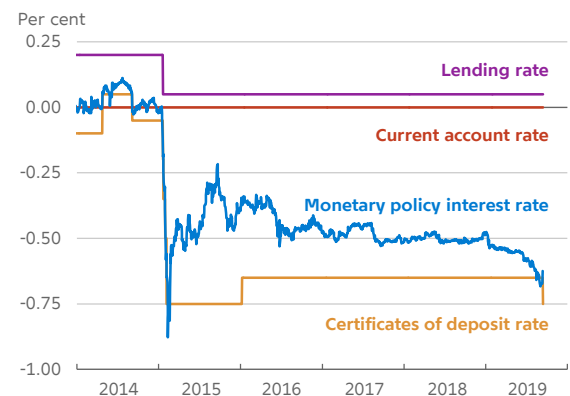


Note: The chart shows the costs of external financing for non-financial corporations and households, respectively. The series non-financial corporations, debt show costs excluding equity financing. The monetary policy interest rate indicates the rate of interest on certificates of deposit.

Source: Danmarks Nationalbank, Statistics Denmark, Thomson Reuters Datastream and own calculations.

**Danmarks Nationalbank has lowered the interest rate on certificates of deposit**

Chart 4



Note: The money market interest rate is the 3-month CITA swap rate.

Source: Thomson Reuters Datastream.

announced that it would restart net purchases under its asset purchase programme (APP) on 1 November. The ECB will purchase assets at a monthly pace of 20 billion euro and reinvestments of principal payments from maturing securities purchased under the APP will continue. The Governing Council expects net purchases to run for as long as necessary to reinforce the accommodative impact of its policy rates, and to end shortly before it starts raising the key ECB interest rates.

**Expectations of monetary policy easing have pushed down money market interest rates**

Market expectations of future short-term money market interest rates have dropped substantially. Forward rates now indicate a decline in money market interest rates of approximately 15 basis points towards the beginning of 2021, cf. Chart 6. Therefore, money market interest rates are likely to remain in negative territory for an even longer period of time. This is in contrast to expectations in June 2018, at which time the ECB announced that its asset purchase programmes would terminate at the end of 2018.

3-month EONIA swap rates have fallen by 10 basis points since mid-June, after having remained unchanged for more than three years, cf. Chart 6. The decline was triggered by Mr Draghi’s speech at the ECB’s annual symposium in Sintra, in which he announced that the ECB opened the door to more accommodative monetary policy in the form of further interest rate reductions and/or new asset purchases.

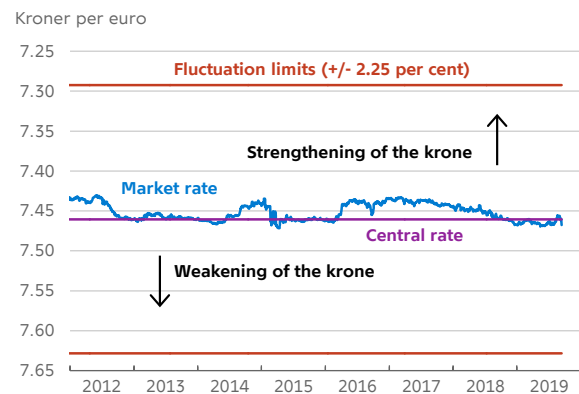
In contrast to EONIA swap rates, CITA swap rates already began to drop slightly in early 2019, cf. Chart 4. This may be attributable to an increase in the net position. As a result, the money market spread between Denmark and the euro area widened a little in early 2019 and has subsequently narrowed slightly in response to the ECB’s announcement of its future monetary policy.

**The ECB introduces a two-tier interest rate system and partly exempts banks from negative interest rates**

In September 2019, the Governing Council of the ECB announced that a two-tier interest rate system would be introduced on 30 October 2019. This means that the monetary policy counterparties of the Eurosystem will be able to place six times their minimum reserve requirements at the MRO rate, which is currently zero. The non-exempt tier will be remunerated at the ECB’s deposit rate.

**The krone has been close to its central rate**

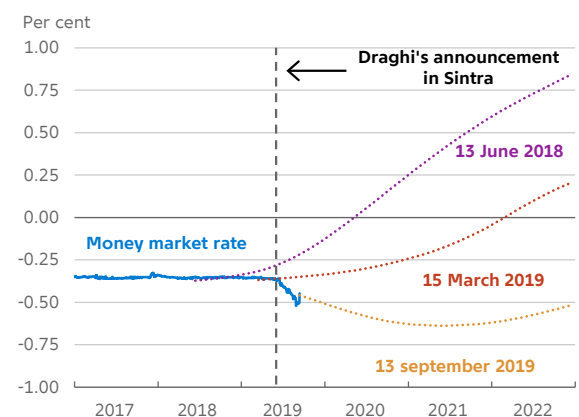
Chart 5



Note: Reverse scale on left-hand axis.  
 Source: Danmarks Nationalbank.

**Expectations of negative interest rates in the euro area for an extended period of time**

Chart 6



Note: 3-month EONIA swap rate. The dotted curves indicate 3-month forward rates on the specified date.  
 Source: Rio Scanrate and Thomson Reuters Datastream.

Danmarks Nationalbank has also a tiering system for deposit rates, allowing banks to place deposits in current accounts and certificates of deposit, respectively, at two different rates of interest. As opposed to the ECB's tiering system, Danmarks Nationalbank's system is designed to keep the krone stable rather than exempting banks from negative interest rates, cf. Box 2.

The Governing Council of the ECB also announced that the key parameters of the new series of targeted longer-term refinancing operations, TLTRO III, would be more accommodative than previously announced. The modifications mean, inter alia, that the ECB will extend the maturity of the loans from 2 to 3 years, and that the rate of interest on the loans could be lower than previously announced.

According to the ECB, the more accommodative TLTRO III terms and the partial exemption of banks from negative interest rates are imposed to support the functioning of monetary policy transmission through the banking sector.

### Monetary policy stimulates the Danish economy despite a low natural rate of interest

The natural real interest rate<sup>4</sup> in Denmark has declined substantially since the 1990s, cf. Chart 7. This indicates that a given level of monetary policy rates will provide less stimulus to the Danish economy than it did in the 1990s. The fall in the natural real interest rate reflects structural factors, in particular the aging population both in Denmark and abroad, that have contributed to an increase in private savings.<sup>5</sup> The exact level of the natural real interest rate is subject to great uncertainty.

Currently, the level of the natural real interest rate indicates that monetary policy rates do not provide a clear stimulus to the Danish economy. Spillovers

### Danmarks Nationalbank's current-account limits

Box 2

The current system of the banks' facilities with Danmarks Nationalbank dates back to 1999, at which time the present current accounts were introduced. Current accounts enable Danmarks Nationalbank's counterparties to place highly liquid deposits at Danmarks Nationalbank. In contrast to deposits placed in certificates of deposit, current-account deposits can be transferred directly to the current accounts of other counterparties. A ceiling (limit) was set for banks' and mortgage credit institutions' total current-account deposits. Current-account limits were introduced to keep the krone stable, especially in situations of downward pressure on the krone. The purpose was to limit the short-term liquidity available in the krone market, which could be used to speculate against the krone.

Current accounts and current-account limits were introduced long before the possibility of negative monetary policy rates in Denmark was considered, and for a different purpose.

Until negative interest rates were first introduced in 2012, the rate of interest on certificates of deposits was higher than the current-account rate. From 1999 until 2012, the average difference was just under 25 basis points. With the introduction of negative interest rates in 2012, the interest rate on certificates of deposits turned negative, while the current-account rate remained zero. The interest rate reduction took place in an environment of upward pressure on the krone, caused by the sovereign debt crisis in the euro area. In this situation, it was necessary to make it less attractive for investors to hold assets in Danish kroner.

A lowering of the interest rate on certificates of deposits was most expedient, as the rate determined money market interest rates and thus the financial system in a broader sense. Current-account rates remained zero, because the real purpose of current-account deposits is to settle payments, and in a fixed exchange rate policy perspective it was not necessary to apply negative rates to these deposits to ensure the desired effect on the money market.

During some periods, current-account limits were raised. But the limits were reduced again and are currently in line with the real purpose of the current account system: the need for liquidity to settle payments.

4 The natural real interest rate is the real interest rate level that brings actual economic activity in line with potential economic activity. Potential activity means economic activity that is compatible with stable price and wage growth. Monetary policy will neither stimulate nor dampen economic activity if the actual real interest rate equals the natural real interest rate. When the real interest rate is lower than the natural real interest rate, growth in activity is stimulated by monetary policy interest rates, and when the real interest rate is higher than the natural real interest rate, growth is dampened.

5 See Jakob Feveile Adolfsen and Jesper Pedersen, 2019, The natural real interest rate in Denmark has declined, *Danmarks Nationalbank Analysis*, No. 13.



from the ECB’s unconventional monetary policy have, however, provided a stimulus to the Danish economy through other channels. For example, the ECB’s 2015 asset purchase programme contributed to the flattening of the Danish yield curve, given that Danish assets are close substitutes to those in the euro area.<sup>6</sup> Indications of further easing by the ECB during the summer also led to a fall in interest rates in the long-term segment, both in the euro area and in Denmark. So, overall, monetary policy is assessed to provide a moderate stimulus to Danish economic growth.

## Bond markets

### Mortgage and government bond yields are at record lows

Danish mortgage yields have declined substantially, both in the short and long-term maturity segments, since the turn of the year and are now at all-time lows, cf. Chart 8. During the same period, Danish government bond yields have also dropped sharply. As a result, yields on all Danish government bonds have been negative since early July.

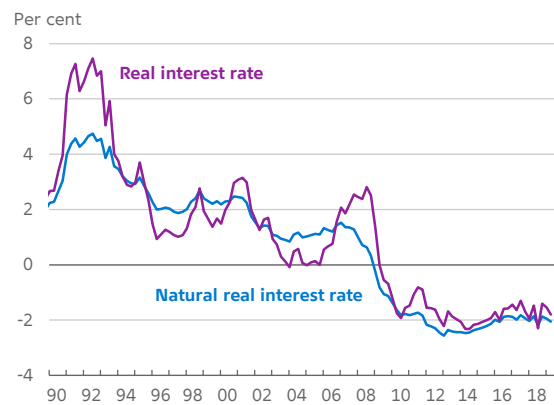
In the long-term maturity segment, the decline in government bond yields has exceeded that of mortgage yields. This should be seen in the context that the refinancing boom in connection with the termination deadline for the upcoming October pay date increased the supply of long-term mortgage bonds, putting a damper on prices.

### Decline in interest rates has triggered a new refinancing boom

The drop in mortgage yields has been sufficient for mortgage credit institutions to open new 30-year bond series with coupons of 1.5 per cent in connection with the July pay date, 1 per cent for the October pay date and 0.5 per cent for the January pay date. This has led many households to refinance to lower-coupon rates, triggering the largest refinancing boom since 2005, see the section on *Credit and money*.

### The natural real interest rate has declined

Chart 7

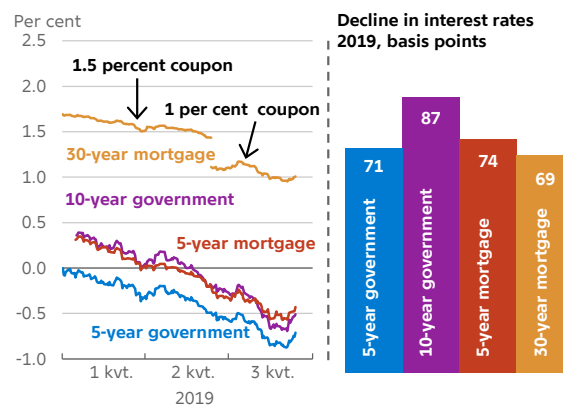


Note: The chart shows estimates of the natural real interest rate and the actual real interest rate, defined here as the short-term money market interest rate adjusted for expected inflation. Inflation expectations have been calculated as a projection from a simple time series model. For further details, see Pedersen (2015).

Source: Adolfsen and Pedersen (2019)

### Yields on Danish bonds are at record lows

Chart 8



Note: Yields to maturity. Government bond yields are based on Danish government bonds maturing in 2025 and 2029. The 5-year mortgage bond is a Nykredit bond with a 1 per cent coupon maturing on 1 July 2024. The 30-year mortgage bond is a Nykredit bond with a 1 and 1.5 per cent coupon, respectively, maturing in 2050.

Source: Thomson Reuters Datastream.

<sup>6</sup> See Jensen et al., 2017, The ECB’s unconventional monetary policy and the role of exchange rate regimes in cross-country spillover, *Danmarks Nationalbank Working Paper*, No. 119.

### Monetary policy transmission through one of the world's largest mortgage markets

Box 3

Due to the size and structure of the Danish mortgage market, transmission of monetary policy to household budgets in Denmark is different from that of otherwise comparable countries. The debt-to-GDP ratio of Danish households is one of the highest in the world, and mortgage debt accounts for most of the debt, cf. Box 1. The special characteristics of the Danish mortgage system are a large number of long-term, fixed-rate loans and the use of the balance principle and match-funding. This means that a loan is matched by the issuance of a bond and that households can prepay the loan by rebuying the bond. Overall, there are three loan types: variable-rate loans, adjustable-rate loans and loans with a fixed rate throughout the loan term.

Monetary policy transmission to households can be divided into two stages (see the illustration in Chart A). First, monetary policy affects market rates in the mortgage market. Then, mortgage yields affect household budgets.

Mortgage yields reflect expected future short-term interest rates plus market risk premia (such as credit risk, liquidity risk and maturity risk) and payment for bond options (especially the borrower's right to redeem at par). Monetary policy has limited influence on risk premia and option prices.

The longer the fixed-interest period of the bond, the greater the impact of market expectations of future monetary policy on the current mortgage yield. Therefore, the pass-through from the current monetary policy interest rate tends to be greater for bonds with a short fixed-interest period than for, say, 30-year fixed-rate bonds. Moreover, short-term bonds will be less exposed to market risk and risk premia fluctuations. As a result, the transmission of monetary policy interest rates to bond yields is lower for long-term callable bonds.

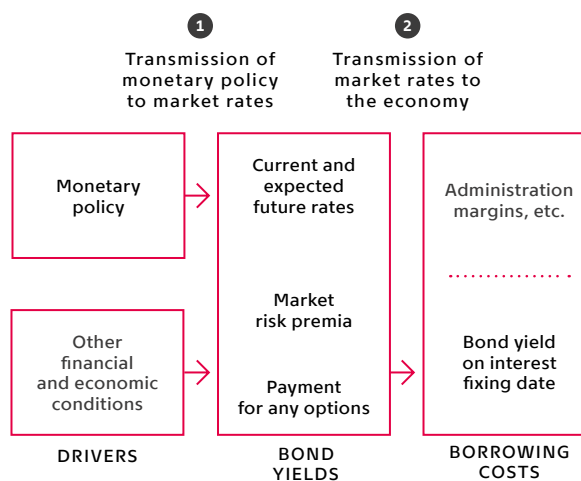
In stage two, market rates are transmitted to household budgets. The transmission of market rates through variable-rate loans occurs at high frequency (corresponding to the fixed-interest period). For adjustable-rate loans, the frequency is lower, but transmission will (as a minimum) occur as the underlying loans are refinanced over, for example, five years for an F5 loan.

For long-term fixed-rate mortgages, interest rates are changed only if the old loan is terminated and a new loan is raised. This involves costs, and is therefore a relatively rare occurrence. But after a sufficient decline in interest rates, many borrowers will refinance at the current market rate. Consequently, there is non-linearity in the transmission of market rates to average interest rates on fixed-rate mortgage loans. Overall, this means that average household interest rates, i.e. weighted variable-rate and fixed-rate loans, show a relatively flat trend in periods of low refinancing activity and decrease/increase in periods of refinancing booms, cf. Chart B. The great majority of issuances of new mortgage loans in 2019 are fixed-rate loans. Refinancing

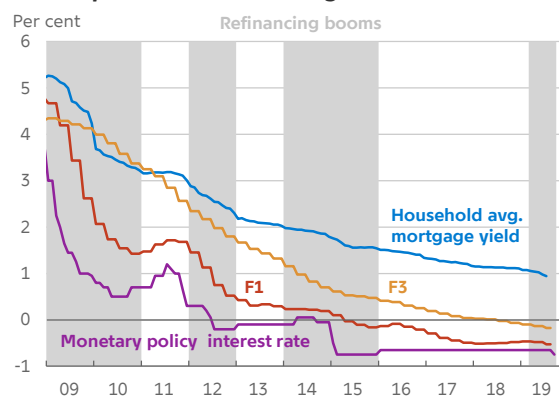
from variable-rate loans to fixed-rate loans has contributed to reducing the fall in average interest rates.

The option of prepaying loans before maturity means that the average life of a fixed-rate loan is substantially lower than the agreed term of the loan. Therefore, the transmission of market rates to household budgets is faster than if the loans were to be held to maturity, but the transmission is also more unpredictable, given that household decisions to refinance have an impact.

### Illustration of the transmission of monetary policy rates to household borrowing costs



### The transmission to long-term yields is sticky and depends on refinancing booms



Note: The monetary policy interest rate indicates the rate of interest on certificates of deposit. Interest rates for F1 and F3 have been calculated under the assumption that a fixed share of outstanding loans are refinanced on each pay date. Mortgage yields are exclusive of administration margins.

Source: Danmarks Nationalbank, Nordea Analytics and own calculations.

Decisions to refinance home loans with fixed-rate mortgage loans are typically not affected by small declines in interest rates. Conversely, the possibility of interest cost-saving may be considered if the drop in interest rates is sufficient to prompt the introduction of new bond series with lower coupons. As a result, the transmission of monetary policy rates to household budgets may be sticky and come in surges during refinancing booms, cf. Box 3.

### Decline in interest rates has reduced the interest rate risk of long-term mortgage bonds

In Denmark, drops in interest rates cause dynamics in the financial system that is different from those seen in other countries. This is due to the very large pension sector and the widespread use of callable mortgage bonds in the Danish bond market. The characteristic of a callable bond is that the underlying mortgage loan can be prepaid at par by the borrower. The borrower's right to prepay the mortgage loan has implications for the interest rate risk (duration) of the underlying bond. Consequently, developments in households' refinancing volumes and the duration of mortgage bonds cohere cf. Box 4.

Buyers of Danish mortgage bonds include Danish pension companies which, as opposed to many other investors, have high duration requirements for their portfolios, reflecting that their liabilities primarily consist of long-duration provisions. Therefore, changes in the duration of mortgage bonds have implications for the Danish bond market as a whole, including the interest rate spread to the euro area and thus the exchange rate of the krone vis-à-vis the euro.

Changes in the overall duration of outstanding mortgage bonds are determined by a *price effect*, associated with the duration of the individual bond series, and a *quantity effect*, associated with the size of the individual bond series.

The overall duration of callable bonds dropped sharply in the 1st half of 2019, in response to a major reduction of duration in bond series with coupons of 2 per cent or more cf. Chart 9. This was mainly because the prices of these bond series were pushed substantially above par following the sharp declines in interest rates, i.e. a *price effect*. Conversely, a *quantity effect*, through ongoing issuances of 1 and 1.5 per cent coupons, contributed to exerting upward pressure on duration. The reason being that new bond issuances with lower coupons have higher duration as they are issued below par.

### Refinancing boom and duration of mortgage bonds

Box 4

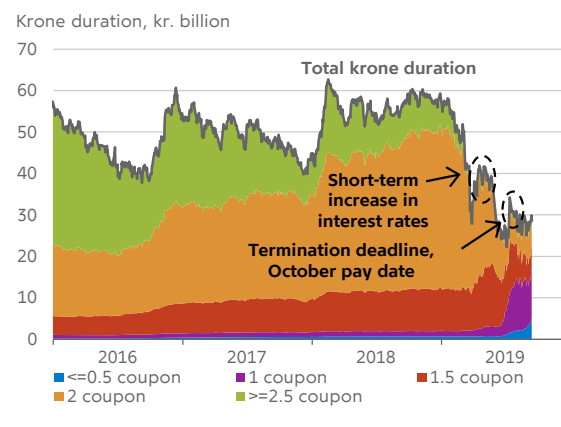
As described in Box 3, mortgage bonds are linked to an underlying housing loan, where the borrower is able to prepay the loan by rebuying the bond at par.

When interest rates decline, it becomes more attractive for borrowers to refinance their mortgage loans. This increases the probability that the underlying bonds will be refinanced, meaning that investors are repaid earlier than expected. This is reflected in a decrease in the average expected remaining maturities of the bonds, which reduces the interest rate risk of the bonds. Therefore, lower mortgage bond durations will be seen ahead of refinancing boom, when households want to refinance their housing loans to lower coupons.

New issuances of mortgage bonds with lower coupons have larger duration due to the fact that the bonds are issued below par. This entails a lower probability that the underlying mortgage loans are refinanced. So, at the end of a refinancing boom or in its wake, the duration typically begins to increase again. As a result, the duration of mortgage bonds often follows a u-shaped curve in connection with refinancing booms: in the period leading up to the termination deadlines, the duration declines, as the prices of the existing mortgage loans are pushed above par. After the termination deadlines, the duration typically begins to increase, given that low duration bonds have been terminated and new higher duration bonds are issued.

### Large declines in interest rates led to duration shortage

Chart 9



Note: Krone duration of all outstanding callable fixed-rate mortgage bonds. Krone duration expresses the overall duration multiplied by the market value. The krone duration indicates the change in the market value measured in kroner in the event of a one percentage point increase in interest rates.

Source: Danmarks Nationalbank and own calculations.

In connection with the surge in refinancing activity at the October pay date, issuance activity for new bond series with 1 and 1.5 per cent coupons increased further. As a result, the overall duration has increased since it bottomed out in late June. New low-coupon bonds now account for 80 per cent of the remaining duration in the callable segment.

### Duration shortage affected the spread between Danish and German government bonds

The sharp decline in duration in the 1st half of 2019 led to demand for duration from a number of investors wishing to maintain a specific level of duration. The low supply of duration pushed down the OAS spread between mortgage bonds and swap rates<sup>7</sup> to a low level, cf. Chart 10. Therefore, callable bonds were highly priced when the duration supply was at its lowest.

Disposal of duration in the 1st half of 2019 was substantial, corresponding to approximately kr. 350 billion in 10-year government bonds. This underpinned demand for long-term Danish government bonds, causing the spread between Danish and German 10-year government bonds to narrow substantially in June and turn negative for the first time since the krone pressure in 2015, cf. Chart 10.

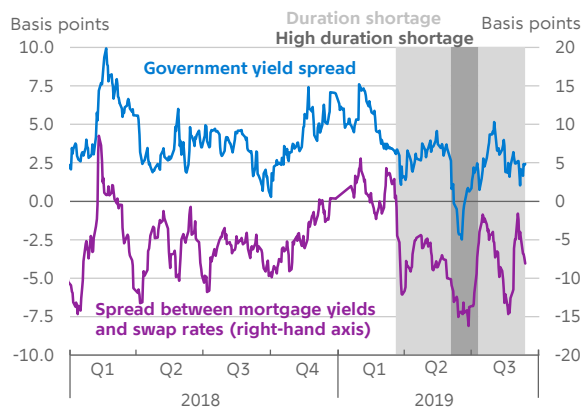
The large activity of new issuances of low-coupon bonds in connection with the October pay date contributed to repricing of the callable segment. As a result, both the OAS spread and the government yield spread have widened by 8 and 5 basis points, respectively, since they bottom in early June.

### Duration decline led to increased demand for long-term Danish interest rate swaps

Investors can achieve duration through other products than bonds, such as interest rate swaps, in which a fixed rate is received and shorter rates are paid. In the 2nd quarter of 2019, search for duration also boosted demand for long-term Danish swap rates. This caused the spread between Danish and euro-based swap rates with long-term interest rate fixing, illustrated by the 10-year swap spread, to be squeezed to its lowest level for almost five years, cf. Chart 11. During the same period, the money market

**Duration shortage resulted in higher prices of products with high interest rate risk**

Chart 10



Note: Option-adjusted (OAS) mortgage bond spreads. Data based on Nykredit's mortgage bonds. The yield spread between Danish and German government bonds is based on 9-year par yields. Duration shortage is defined by a krone duration below approximately 40, and high duration shortage is below approximately 30.

Source: Nykredit and Nordea Analytics.

**Low duration supply has boosted demand for long-term interest rate swaps**

Chart 11



Note: The money market spread is the spread between 6-month EURIBOR and CIBOR rates. The swap spread is based on the spread between Danish swap rates and euro-based swap rates for 2- and 10-year maturities. Danish swap rates are against a 6-month CIBOR, while euro-based swap rates are against a 6-month EURIBOR. Duration shortage is defined by a krone duration below approximately 40, and high duration shortage is below approximately 30.

Source: Thomson Reuters Eikon.

<sup>7</sup> OAS is the option-adjusted spread. It is frequently used for callable bonds to adjust the value of the "call option" that exists due to the borrower's right to redeem the loan at par constitutes.

spread showed a more stable trend and conversely increased during the substantial duration shortage in June 2019.

## Equity markets

### High equity returns in 2019

Danish equities (OMXC25 CAP) have increased by 17.8 per cent in 2019, cf. Chart 12. Danish equity returns have largely mirrored developments in European (Euro Stoxx) and US equities (S&P 500), which have gained 20.0 per cent and 21.8 per cent, respectively. The high equity returns in 2019 reflect a sharp increase in early 2019. Subsequently, equities have been characterised by fluctuations, and returns have been slightly positive.

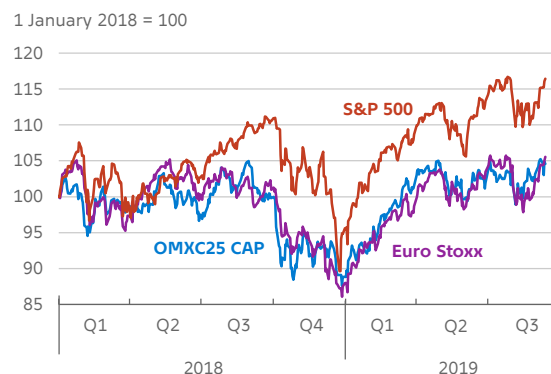
### Equity prices are no longer supported by increasing earnings, but conversely by monetary policy easing

A decomposition of equity return developments shows that the gains in Danish equities in 2019 have not been driven by firms' underlying and expected earnings, cf. Chart 13.<sup>8</sup> The same has been the case for US and European equities. The development is in contrast to the situation in previous years with positive equity returns, where the increases, to a great extent, were driven by expectations of higher earnings growth. Lower expected earnings could reflect larger concern that the global economy is headed for recession. The risk that the US and the euro area will go into recession within the next two years is estimated to be around 60 and 65 per cent, respectively.<sup>9</sup>

Instead, the positive equity returns in 2019 have been driven by substantial declines in interest rates, reflecting, inter alia, that the ECB and the Fed have opened the door to monetary policy easing, cf. the section on *Monetary policy and money markets*. Consequently, expectations of monetary policy easing have helped to support equity markets in 2019.

High equity returns during 2019

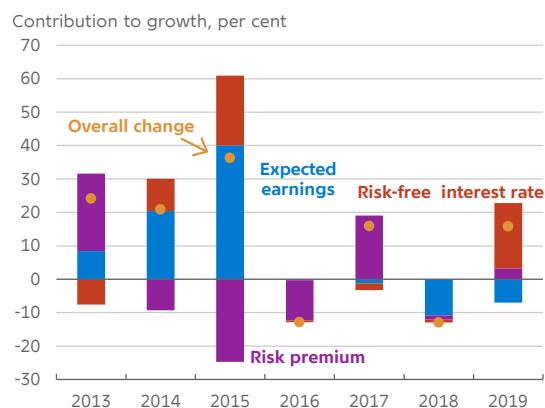
Chart 12



Note: Total returns i.e. including dividends distributed.  
 Source: Thomson Reuters Datastream and own calculations.

Equity prices are no longer supported by growing earnings

Chart 13



Note: Developments from 1 January 2013 to 1 September 2019. Based on OMXC20, Euro Stoxx and S&P 500. Implied future returns have been derived via an approximation to a three-stage dividend discount model. Consensus expectations collected from market analysts have been applied as expectations of growth in earnings, combined with long-term growth expectations that are equal to the realised average real GDP growth plus 2 percentage points. The risk-free interest rate is the yield on a 10-year Danish government bond.  
 Source: Thomson Reuters Datastream and own calculations.

8 A dividend discount model can be used to decompose the drivers behind changes in equity prices. The value of equities reflects investor expectations of firms' future earnings and their willingness to undertake the risk related to investing in equities rather than e.g. bonds.

9 See Deanie Marie Haugaard Jensen and Rasmus Mose Jensen, 2019, Heightened risk of a global recession, Danmarks Nationalbank, Analysis No. 16.

### Higher equity risk premia have contributed to more expensive equity financing

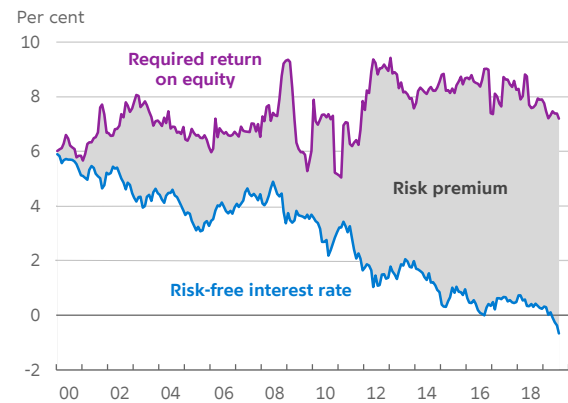
Since before the financial crisis, investors have demanded a largely unchanged return on investments in equities, although risk-free interest rates have declined sharply. As a result, the equity risk premium<sup>10</sup> has increased from 3-4 per cent to 7-8 per cent, cf. Chart 14.

Developments in the price of equity financing depend on equity market developments: the higher the required return on equity is, the higher the costs of equity financing will be for firms. Consequently, the equity risk premium has implications for the financing costs of firms. With the increase in the risk premium, equity financing has become more expensive compared with investments financed by debt.

However, since 2018, the price of equity financing has declined slightly, reflecting that equity prices have not been supported by higher earnings and earnings expectations to the same extent as previously, cf. above.

### The equity risk premium continues to rise

Chart 14



Note: Based on OMXC20. Implied future returns have been derived via an approximation to a three-stage dividend discount model, see Fuller and Hsia (1984). Consensus expectations collected from market analysts have been applied as expectations of growth in earnings, combined with long-term nominal growth that is equal to the realised average real GDP growth for the past 20 years plus 2 percentage points. The risk-free interest rate is the yield on a 10-year Danish government bond.  
 Source: Thomson Reuters Datastream.

## Credit and money

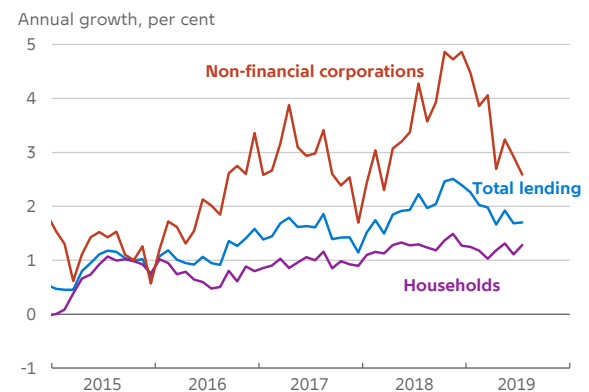
### Credit growth has been moderate in 2019 despite the decline in interest rates

Year-on-year growth in total lending by banks and mortgage credit institutions has been declining in 2019, standing at 1.7 per cent in July, cf. Chart 15. Overall, growth in lending has been lower than growth in nominal GDP in 2019.

Households' mortgage loans make up a large share of total lending. So far, the decline in lending growth in 2019 has been driven, in particular, by more subdued growth in household mortgage loans, despite lower lending rates on bank loans and mortgage loans during this period. According to Danmarks Nationalbank's lending survey, the possibility of lower interest rates did exert upward pressure on demand for mortgage loans from the 2nd quarter of 2019, es-

### Credit growth has been declining

Chart 15



Note: Lending by banks and mortgage credit institutions in all currencies to Danish residents. Selected reclassifications have been adjusted since April 2019. Households comprise employees, etc. and sole proprietorships. Farms account for most of the lending to sole proprietorships.  
 Source: Danmarks Nationalbank.

<sup>10</sup> The risk premium is a measure of the additional return required as compensation for investing in equities rather than "risk-free" assets (bonds). All else equal, the equity risk premium will fall when equity prices rise.



pecially in connection with the refinancing boom, cf. below. This could contribute to higher credit growth in the 3rd quarter of 2019.

The slowdown in mortgage loans to households has been particularly pronounced in the growth areas<sup>11</sup>, which have otherwise experienced substantially higher lending growth than the rest of Denmark over the past few years. This should be seen in the context of stagnant prices of owner-occupied flats in these areas and compliance with the “good practice” rules for mortgage lending, which limit the availability of specific loan types for highly leveraged households. At the same time, the good practice rules may support the continued movement towards more secure loan types. Most new mortgage loans, including refinanced loans, are issued with fixed rates and repayments.

### Historic refinancing boom leads to increase in additional borrowing by households

In 2019, for the first time, Danish homeowners could raise 30-year fixed-rate mortgage loans with coupons of 0.5, 1 and 1.5 per cent, respectively. This triggered a wave of refinancing activity at the July and October pay dates, cf. Chart 16.

Due to low interest rates and rising home equity values in recent years, many Danes raise additional borrowing in connection with refinancing. Additional borrowing supports the otherwise declining credit growth. Historically, homeowners have used part of the additional borrowing raised in connection with refinancing to increase repayments on more expensive bank debt, which has also been the case in connection with the 2019 refinancing boom. This has led to substitution of mortgage debt for bank debt, so that households have been able to reduce their bank loans further in 2019.

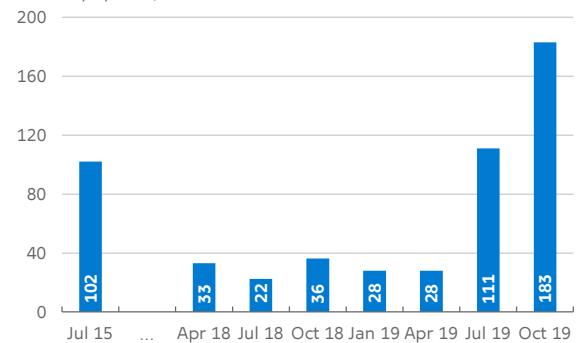
### Danish firms have increased their robustness

During the upswing, firms have more than doubled their liquid funds and other assets, reflecting the relative capital strength of Danish firms at present after several years with a combination of growing profits and savings surpluses. The accumulated liquid funds have been used, inter alia, to reduce banks loans since October 2018.

### High refinancing activity at historically low mortgage yields

Chart 16

Termination of fixed-rate mortgage loans at each pay date, kr. billion



Source: Terminations by mortgage credit institutions from Scanrate RIO.

### Large share of corporate deposits with negative interest rates

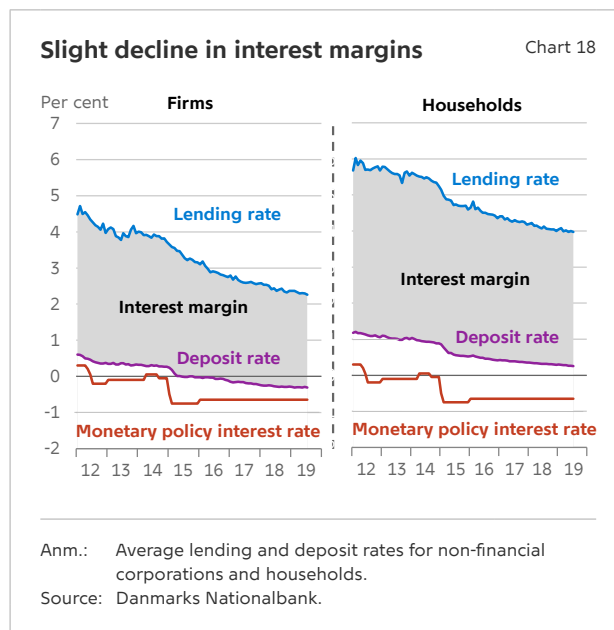
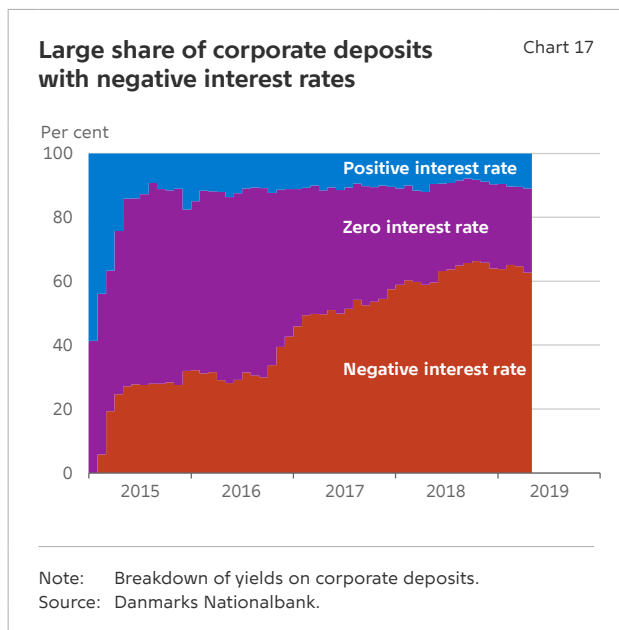
Corporate deposits have been stagnant since late 2017. This may reflect that a gradually increasing share of corporate deposits earn negative interest, cf. Chart 17. At present, 60-65 per cent of corporate deposits earn negative interest. There are still no indications that firms are holding more cash to avoid negative deposit rates.

### Corporate deposit rates have remained unchanged in 2019

After years of declining deposit rates, average corporate bank deposit rates have stagnated in 2019, cf. Chart 18. However, corporate deposit rates are still more negative in Denmark than in other European countries, possibly because Denmark has had negative monetary policy rates for longer and they are deeper into negative territory than in other countries.

The average household deposit rate in Denmark was 0.3 per cent in July 2019. Households are, by and large, not exposed to negative deposit rates. Their interest margin, i.e. the difference between lending and deposit rates, has decreased by 0.9 percent points since Danmarks Nationalbank’s introduction

11 Growth areas comprise Copenhagen, Copenhagen environs, Frederiksberg and Aarhus.



of negative monetary policy interest rates in 2012. This may reflect that banks have been reluctant to pass on negative rates to household deposit rates. By way of comparison, firms' interest margin has declined by 1.3 percentage points in the same period. During this period, banks have increased their profits, despite lower interest margins, on account of higher fees and lower impairment charges on loans and guarantees.

## ABOUT ANALYSIS



As a consequence of Danmarks Nationalbank's role in society we conduct analyses of economic and financial conditions.

Analyses are published continuously and include e.g. assessments of the current cyclical position and the financial stability.

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

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