Productivity growth in the Danish economy has been weak in the wake of the financial crisis. This is especially the case from the 2nd half of 2015 and onwards when the decoupling of output and the labour market situation calls into question future productivity growth and the actual sustainability of the growth in employment seen during the last year or so. Nevertheless, the wage share of the employment-intensive private non-primary sector excluding transport does not indicate a general imbalance between productivity and wages. Consequently, the increase in employment is assessed to be sustainable. The low productivity growth is attributable to a series of factors, including falling North Sea production, lower capital intensity and between-sector shifts. Although productivity is a key driver of economic growth, it is not the only source of enhanced prosperity. A substantial improvement of the terms of trade and increasing return on foreign assets have contributed to prosperity in Denmark developing in line with that of other advanced economies since the financial crisis.

The article analyses the pass-through from Danmarks Nationalbank's interest rates to bank deposit and lending rates for households and non-financial corporations. As regards bank lending rates, the pass-through from Danmarks Nationalbank was reduced significantly in connection with the financial crisis in the autumn of 2008, when bank lending rates were slow to follow the sizeable reductions of Danmarks Nationalbank's interest rates in the following months. The pass-through was relatively quickly restored, however. The banks determine their lending rates on the basis of the costs of funding the loans and the risk on the loans. When bank funding costs are taken into account in the explanation of the pass-through from the rate of interest on certificates of deposit, there is no notable difference in the pass-through to lending rates before and after the financial crisis. The pass-through from Danmarks Nationalbank's interest rates to bank corporate and household deposit rates has been reduced due to the low level of interest rates. The banks have been hesitant to pass on Danmarks Nationalbank's negative rate of interest to small firms and especially to households, which have been exempt from negative deposit rates.
65 SCENARIOS FOR NORMALISATION OF THE LEVEL OF INTEREST RATES

Long-term interest rates are historically low. This article looks at interest rate developments in previous cyclical upswings and considers various scenarios for the future path of interest rates. There have been previous examples of substantial increases in long-term interest rates over a short period of time, e.g. in both 1994 and 1999, when the 10-year bond yield rose by more than 2 percentage points. There is a risk of large capital losses on bond portfolios if long-term interest rates rise substantially. It is important that both investors and credit institutions focus on risk management and have the necessary buffers against potential losses.

85 LENDING IN A LOW INTEREST RATE ENVIRONMENT
Svend Greniman Andersen and Andreas Kuchler, Economics and Monetary Policy

Competition among credit institutions for corporate customers has intensified in recent years because interest rates are low and demand for loans is subdued. For the most creditworthy firms, this has led to lower loan costs and a slight easing of the terms and conditions for obtaining a loan from a bank. On the other hand, there are no indications that low interest rates and increased competition have prompted credit institutions to ease credit conditions for less creditworthy corporate customers. The demand for loans from Danish firms is relatively subdued and they have relatively good access to finance, by international comparison. Thus, there are no indications that credit constraints are dampening the current upswing in the Danish economy.

97 CURRENT TRENDS IN THE GREENLANDIC ECONOMY
Anders Møller Christensen, Economics and Monetary Policy

Economic growth in Greenland was positive in 2015, following three years of contraction. Nevertheless, there was considerable emigration so that the population declined further in spite of an excess of births. Greenland has benefited from rising prices for fish and shellfish. Catch volumes declined, but price developments meant that earnings were good in large parts of the fisheries sector, and revenue from direct taxes increased. Combined with lower-than-planned expenditure this meant that a government deficit envisaged in the Finance Act made way for a small surplus. The liquidity of the government is good, and gross debt is modest, constituting less than 5 per cent of the gross domestic product, GDP. Activities in connection with extraction of and exploration for raw materials have diminished considerably. Two small projects will start extracting minerals in 2016 and 2017. Investment in building and construction increased in 2015 and further growth is expected in 2016. At the same time, statistics indicate that private consumption is rising strongly. Together with larger quotas for especially prawns, this will result in higher economic growth in 2016 than for many years. But no solution has been found to the major structural problems in Greenland, i.e. the very narrow business sector.
CURRENT ECONOMIC AND MONETARY TRENDS

SUMMARY

The advanced economies are moving ahead at a moderate pace. Growth is driven primarily by domestic demand, which is being boosted by low interest rates and oil prices, among other factors. Although economic growth in the euro area and the USA is moderate, employment is rising strongly and unemployment is falling. The rate of wage increase remains low, however. Growth in a number of emerging market economies, including China, is slowing down. Overall, growth in the global economy is expected to be a little higher in the coming years, but in the assessments of the international organisations the risk of more subdued growth has increased.

In the USA, the Federal Reserve has begun to raise interest rates. The background is mounting capacity pressures, e.g. in the labour market. In the euro area, monetary policy is still being eased. This should be viewed in the light of very low price inflation.

In Denmark, employment continued to increase in the first part of 2016, rising by 11,000 persons in the 1st quarter. The real gross domestic product, GDP, increased by 0.5 per cent, driven by growth in both domestic demand and exports. In the labour-intensive private non-primary sector excluding transport, there has been a reasonable balance between developments in employment and production. The rise in employment since the beginning of 2013 is therefore assessed to rest on a solid foundation.

Productivity growth is expected to recover to some extent, and growth in real GDP is forecast at 1.0 per cent in 2016, rising to 1.6 per cent in 2017 and 1.8 per cent in 2018. This is slightly weaker than forecast in the most recent projection. From the 1st quarter of 2016 to the end of 2018, employment is expected to increase by 60,000 persons.

By the end of the projection period, the economy is forecast to be close to the highest degree of capacity utilisation that is compatible with stable price developments. Fiscal policy should therefore be planned with a view to achieving equilibrium on the structural balance within the next few years.

House prices have risen less steeply in recent months, while there are no signs of any dampening of the prices of owner-occupied flats in Copenhagen and other cities.

The government has announced that it will present a new medium-term fiscal policy strategy until 2025 in the autumn. Key elements of this 2025 plan should be to strengthen the automatic stabilisers in the economy and to remove asymmetry in the tax system in order to strengthen economic and financial stability and support productivity growth.

THE INTERNATIONAL ECONOMY AND THE FINANCIAL MARKETS

MODERATE GROWTH IN THE EURO AREA AND THE USA, DRIVEN BY DOMESTIC DEMAND

Euro area growth rose to 0.6 per cent in the 1st quarter of 2016, cf. Chart 1 (left). The recovery was broad-based across member states. Among the large euro area member states, growth in activity was strongest in Germany and Spain, at 0.7 and 0.8 per cent, respectively, while it was 0.6 per
cent in France and 0.3 per cent in Italy. The Greek economy contracted. The Purchasing Managers’ Index, PMI, which provides a good indication of where the economy is heading, points to further growth in the euro area in the 2nd quarter, albeit at a slower pace.

US economic growth was weak in the 1st quarter, mainly reflecting fewer investments in the energy sector and lower exports. These two factors reduced GDP growth by 0.3 percentage point each, i.e. by a total of 0.6 percentage point. This is attributable to, inter alia, low energy prices, which reduced the volume of new investments in the energy sector. In addition, the dollar strengthened by approximately 20 per cent against a large basket of currencies from mid-2014 until the end of 2015, which pushed up the prices of US goods and services in other countries, thereby dampening exports. However, in 2016 the dollar’s appreciation was replaced by a slight depreciation from January to early June. The PMI indicator points to growth at the same level or slightly lower in the 2nd quarter, cf. Chart 1 (right).

In the period 2008-13, the economies of the euro area and the USA were supported by exports to emerging market economies. In contrast, domestic demand declined or rose only a little, cf. Chart 2 (left).

Growth is currently more broad-based and driven mainly by domestic demand. In the euro area, growth in e.g. investments has increased, cf. Chart 2 (right). It is supported by very low interest rates and easing of credit standards. In the USA, on the other hand, investment growth has declined as a result of lower energy prices, but domestic demand is being buoyed up by solid growth in private consumption.

In the UK, growth declined in the 1st quarter of 2016, but from a high level. The reasons include falling energy sector investments and increased uncertainty up to the June referendum on whether the UK should remain in the EU or leave. The uncertainty is most pronounced in the financial markets, where e.g. the exchange rate of the pound has been strongly affected by fluctuations in opinion polls in recent months, cf. Chart 3. A number of studies, including by the OECD and HM Treasury, have pointed to substantial long-term economic costs to the UK if the voters choose to leave the EU. This will have a knock-on effect on neighbouring countries, notably Ireland, but also on the rest of the EU.

The Japanese economy has not grown overall since late 2013, although activity in the 1st quarter rose by 0.5 per cent on the preceding quarter. Background factors include declining growth in China and other Asian countries and stagnant private consumption. Leading indicators point to the weak development having continued in the 2nd quarter.
introduced so that all new housing loans must be with amortisation until the debt constitutes less than 50 per cent of the value of the home, cf. the Swedish Financial Supervisory Authority.

In Norway, economic activity decreased in the 2nd half of 2015, but the 1st quarter of 2016 saw a moderate increase of 0.3 per cent. The weak development is mainly due to low investment in the energy sector, which has spills over to the rest of the economy. But private consumption is being buoyed up by low interest rates, accommodative fiscal policy and a steady increase in house prices.

In the emerging market economies, economic growth has slowed down, cf. Chart 4 (left). One of the reasons is that commodity prices have fallen, which means that the terms of trade have deteriorated strongly for a number of commodity-producing countries, including Russia and Brazil. This reduces domestic demand and leads to substantially lower import growth.

China’s production is also growing at a slower pace than previously, cf. Chart 4 (right). This is mainly because growth in investments is lower, reflecting excess capacity in a number of industries as well as an oversupply of housing in some cities. In the largest Chinese cities demand is high, however, and house prices are rising strongly, while the rate of increase is more subdued in other cities. Private consumption is growing considerably, but not quite enough to fully offset the
dampening of investments. These developments indicate an ongoing transition, whereby China’s economic growth will gradually become less dependent on exports and investments and will increasingly be driven by private consumption. Besides this transition, China is challenged by high and rising debt, especially in the corporate sector, cf. Chart 5 (left), with an increasing volume of debt.
of non-performing loans. Part of the rise in debt is attributable to firms, some of them state-owned, with low profitability. To support the real economy, the People’s Bank of China in 2015 reduced its monetary policy interest rate, cf. Chart 5 (right). This has reduced the costs of debt, thereby supporting consumption and investment in the short term. But it may also cause debt to rise further, so there is a risk of a hard landing in the slightly longer term.

In the coming years, growth in the large advanced economies is generally expected to accelerate a little, cf. Table 1, but the risk of a more dampened growth scenario has risen. In most cases, growth forecasts for 2016-17 have been adjusted a little downwards since November 2015. Among the emerging market economies, China is expected to see gradually declining growth due to its transition process, while the economic downturn in Russia and Brazil will continue during 2016 and in the case of Brazil also into 2017. In contrast, India’s economy is expected to continue to grow by some 7.5 per cent p.a. in 2016-17.

LABOUR MARKETS IN THE ADVANCED ECONOMIES ARE IMPROVING STRONGLY

Although economic growth in the euro area and the USA is moderate, employment has risen strongly and unemployment has fallen. In the euro area, unemployment is falling at more or less the same rate as during the pre-crisis boom, but the level remains somewhat higher. In the USA, unemployment has decreased steadily since early 2010, standing at 4.7 per cent in May, cf. Chart 6 (left). This is approximately what the Federal Reserve deems to be the level of structural unemployment in the USA. This strong trend in the labour markets is also seen in other advanced economies, including the UK and Japan.

Despite the recovery in the labour markets, wage growth is moderate in the USA and the euro area, cf. Chart 7. One reason is that there are still spare labour resources. A wider definition of unemployment (which – besides the number of unemployed – also includes those marginally attached to the labour market and those working part time for economic reasons) shows that in both economies it is still somewhat higher than before the crisis. Furthermore, the US participation rate (15-64-year-olds) is 2.5 percentage points lower than in 2007, cf. Chart 6 (right), but this is partly attributable to demographic changes (shifts in age groups among the 15-64-year-olds). The euro area labour force grew during the crisis and has continued to do so in recent years. This is a result of, inter alia, labour market and pension reforms.

Another reason for the low wage growth could be that the weak trend in prices has influenced wage formation via inflation expectations, cf. below. Price inflation has declined considerably in both economies since 2012, and in the euro
area it has been close to 0 per cent since mid-2014, cf. Chart 8 (left). This is mainly attributable to a strong fall in oil prices from July 2014 until the beginning of 2016. In the USA, the rate of increase in the deflator for Personal Consumption Expenditures, PCE, which is the Federal Reserve’s preferred measure of inflation, has risen a little since the autumn of 2015, but remains below the inflation target of 2 per cent. Especially in the euro area, there are indications that the low level of increase has affected inflation expectations. Above all, short-term expectations have fallen in recent years, while longer-term expectations have been more stable, cf. Chart 8 (right).

If prices are expected to rise more slowly in the future, employees will typically ask for smaller wage increases. If inflation is low, even low nominal wage increases will entail higher real wages and hence purchasing power. In the euro area, collectively based contracts typically run for 1-2 years, but with considerable variations across member states. Developments in inflation expectations have given the European Central Bank, ECB, cause for concern precisely because there is a risk that they will affect wage formation, which will contribute to keeping inflation down (second-round effects).

A third potential reason for the weak wage growth is that productivity growth is low compared with previously, cf. Chart 9. This means that value added per hour is growing only slowly. Viewed in isolation, this reduces growth in firms’ earnings and consequently their possibilities of offering higher wages.

Several potential explanations for the low productivity growth have been put forward. The OECD has demonstrated that the pace of knowledge dissemination from the most productive to the less productive firms has declined. In addition, a gradual transition is taking place, so that employment is shrinking in e.g. the industrial sector,
which has a high productivity level, while it is rising in the service industries, where productivity is lower. That is also the case in Denmark, cf. the article “Danish Productivity during the Upswing” in this Monetary Review. During the current upswing in the euro area, employment has risen most strongly in industries with relatively low productivity, cf. Chart 10. This has reduced average productivity growth a little. Analyses show that the same applies in the USA.

Another reason for the weak wage growth could be that the wage level is already high. Although the US labour market was very weak during the crisis, many firms were unable or unwilling to reduce wages, according to Janet Yellen, Chair of the Board of Governors of the Federal Reserve.

The weak trend in prices has affected inflation expectations in the euro area

![Chart 8](chart8.png)

Note: Left-hand chart: The EU Harmonised Index of Consumer Prices, HICP, for the euro area and the Personal Consumption Expenditures, PCE, deflator for the USA. Right-hand chart: Data based on the Survey of Professional Forecasters. Short-term expectations are expectations of inflation two years ahead; long-term expectations are five years ahead.

Source: Macrobond.

Lower productivity growth may reduce wage growth

![Chart 9](chart9.png)

Note: Productivity growth measured by gross value added in chained values per hour worked in the private sector. Excluding construction in the euro area.

Source: Macrobond and OECD.

In the euro area, low-productivity industries have the highest employment growth

![Chart 10](chart10.png)

Note: Productivity level measured by gross value added, GVA, in chained values.

Source: Macrobond and own calculations.
Reserve System. Subsequently they have therefore been able to attract labour without raising wages. Changes in the composition of the labour force could also be an explanatory factor. Analyses show that, inter alia, the flow to and from full-time employment has pushed down US wage growth because the new full-time employees earn less than typical full-time employees, while those who have left the labour market (mainly due to retirement) typically earned more. This effect is particularly pronounced these years, as the large post-war generations are beginning to retire.

**THE ECB’S MONETARY POLICY SUPPORTS THE ECONOMY**

Having fluctuated strongly at the beginning of the year, the financial markets have calmed down in recent months. Equity prices have risen, and in the USA they are back at the level from the autumn of 2015, cf. Chart 11. Yields on 10-year government bonds have been more or less flat in both the euro area and the USA since early March.

At its interest rate meeting on 2 June, the ECB decided to keep its monetary policy interest rates unchanged, cf. Chart 12 (left). The programme for purchasing government and corporate bonds also remains unchanged. Hence, these purchases, amounting to 80 billion euro a month, will continue until and including March 2017. Total purchases in 2015 and 2016 until May accounted for most of the expansion of the ECB’s balance sheet, cf. Chart 12 (right). The financial markets expect the ECB to reduce its interest rates further within the next year.

The ECB’s purchases of corporate bonds began on 8 June, but yields on corporate bonds fell as soon as the announcement had been made on 10 March, cf. Chart 13 (left). The ECB intends to buy euro-denominated bonds issued by non-fi-
Financial corporations with remaining maturities of between 6 months and 31 years and a minimum credit rating of BBB- (i.e. Investment Grade). Yields have fallen most strongly for bonds with low credit ratings, meaning that the yield spreads for corporate bonds have narrowed. There are also signs that the expansion of the purchase programme has led firms to issue more bonds. Accumulated issuance from January to May is somewhat above the corresponding levels in previous years, cf. Chart 13 (right).

Lending by banks to households and non-financial corporations in the euro area has also increased, the latter especially since December 2015, cf. Chart 14 (left). This reflects a combination of easing of the banks’ credit standards and higher demand for credit, cf. Chart 14 (right). Furthermore, the banks have indicated that the...
ECB’s purchase programme and targeted longer-term refinancing operations, TLTROs, have had a positive impact on their lending, cf. the ECB’s lending surveys from January and April.

In March, the Federal Open Market Committee, FOMC, of the Federal Reserve adjusted its expectations of developments in the Fed funds target rate downwards. This should be viewed against the backdrop of e.g. the strong fluctuations in the financial markets in the first months of the year. The FOMC now expects a total increase of 0.5 percentage point in the target rate by the end of 2016, rather than 1 percentage point, cf. Chart 15. Market participants have not factored in an interest rate increase of 0.25 percentage point until mid-2017. So there is a wide spread between the expectations of the FOMC and those of market participants.

The article “Scenarios for Normalisation of the Level of Interest Rates” in this Monetary Review considers various potential future interest rate paths in the USA. If long-term interest rates rise suddenly in connection with an abrupt adjustment of market expectations to match the FOMC’s expectations, investors may suffer considerable losses on their bond portfolios. This underscores the need for both investors and credit institutions to focus on risk management and ensure that they are resilient against losses.

Norges Bank reduced its key policy rate by 25 basis points, to 0.5 per cent, on 17 March, citing that the growth outlook for the Norwegian economy had weakened and that inflation was expected to decline further. Norges Bank indicated that the rate of interest could be reduced further later this year. However, it was kept unchanged at the monetary policy meeting in May.

In April, Sveriges Riksbank decided to increase its purchases of government bonds by 45 billion Swedish kronor in the 2nd half of 2016, bringing total purchases to 245 billion kronor (corresponding to 6 per cent of GDP) by the end of 2016. According to the Riksbank, the aim is to reduce the risk of a too rapid strengthening of the krona and to ensure that inflation continues to rise.

**MONETARY AND EXCHANGE RATE CONDITIONS**

**INCREASED DEMAND FOR KRONER**

The exchange rate of the krone vis-à-vis the euro is stable and very close to its central rate in ERM2, cf. Chart 16. Danmarks Nationalbank neither bought nor sold foreign exchange for intervention purposes in March and April. The krone strengthened in late March. A contributory factor may have been that liquidity in the money market tightened a little at the turn of the quarter, when the banks’ and mortgage banks’ net deposits in Danmarks Nationalbank (their net position) temporarily decreased. Since then, the krone has been slightly on the strong side of the central rate. Several market participants pointed out that some foreign investors chose to purchase kroner as they expected turmoil in the euro area and the UK in connection with the June referendum on the UK’s membership of the EU.

Initially, the most visible shifts in the market for kroner were seen in the forward market in late March, but later on demand also shifted to the spot market.¹ Consequently, Danmarks Nationalbank purchased foreign exchange for kr. 24 billion in connection with intervention in May. The foreign

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¹ In connection with a forward contract, currency is exchanged at a given future date at a predetermined exchange rate. In connection with a spot transaction, the exchange takes place immediately at the current spot rate.
exchange reserve was kr. 427 billion at the end of May 2016.

Danmarks Nationalbank has not changed the rate of interest on certificates of deposit since January. The monetary policy interest rate spread to the ECB narrowed in three stages, from -0.55 to -0.25 percentage point, from December 2015 to March 2016, and has since remained unchanged. On two occasions it narrowed because the ECB lowered its interest rates, on one occasion because Danmarks Nationalbank increased its interest rates. The narrowing should be viewed in the light of intervention sales of foreign exchange in late 2015 and early 2016.

With effect from 27 May 2016, Danmarks Nationalbank has adjusted the banks’ and mortgage banks’ individual current account limits at Danmarks Nationalbank, i.e. their maximum deposits when the overall limit for all institutions has been reached. The overall limit remains unchanged at around kr. 31 billion. The adjustment provides for a simpler and more objective allocation and also ensures that the individual limits to a larger extent take into account the various credit institutions’ payments and liquidity fluctuations in kroner.

**MONEY MARKET INTEREST RATES REMAIN LOW**

Money market interest rates are virtually unchanged since mid-March and have been relatively stable at approximately 0.3 percentage point more than the rate of interest on certificates of deposit, cf. Chart 17 (left). The banks’ net position vis-à-vis Danmarks Nationalbank has declined further this year and briefly fell below kr. 80 billion in late March in connection with VAT settlement and payment of corporate tax to the central government, cf. Chart 17 (right). This is the lowest level since November 2014.
When the net position is high, so that the monetary policy counterparties need to place sizeable funds, monetary policy deposit rates determine Danish money market interest rates. When the net position is low, the usual fluctuations in government payments may at times reduce liquidity so much that money market interest rates rise. In connection with the decrease in krone liquidity in late March, very short-term money market interest rates rose. This may have contributed to the inflow of capital and the strengthening of the krone.

In the last three months, the spread between short-term money market interest rates in Denmark and the euro area has been stable at a level close to zero, cf. Chart 18 (left). Market prices for financial products and questionnaire surveys among bank analysts indicate that since mid-March there has been a slight strengthening of expectations that the ECB’s monetary policy interest rates may be reduced further and will remain low for a long period. Developments in the euro area have also affected expectations of Danish money market interest rates. The markets now operate with a slower increase in the Danish overnight interest rate than they did in mid-March 2016, cf. Chart 18 (right). The implied overnight interest rate does not reach 0 per cent until in four years. That is more than one year later than indicated by market-based expectations in mid-March.

**NO SIGNS OF EXTRAORDINARY DEMAND FOR CASH**

There are still no signs that the negative interest rates have led to unusually strong demand for cash, cf. Chart 19. There does not seem to be any extraordinary demand for cash in the sectors experiencing negative rates of interest, and nor has demand for the large banknote denominations been exceptionally high.
BOND YIELDS HAVE FALLEN A LITTLE

Yields on Danish government bonds have been affected by a slight decline in euro area government bond yields since mid-March, as well as a small narrowing of the spread between Danish and German government bond yields, cf. Chart 20. Developments in the euro area mainly reflect further postponement of the time when short-term interest rates are expected to begin to rise, and presumably also intensification of the ECB’s monetary policy purchases of government and other bonds since April. Over the last three months, the yield spread to Germany has narrowed. This should be viewed in the light of a widening after the pressure on the krone eased in the spring of 2015. Furthermore, the spread was wide seen in a longer perspective. This may have attracted both Danish and foreign investors and contributed to narrowing the spread. Moreover, a fall in mortgage yields may have pushed up demand

Mortgage bond yields and yield spreads have also declined

Note: Left-hand chart: The 1-, 3- and 5-year mortgage yields are based on fixed bullets. The 30-year yield is an average yield to maturity based on callable mortgage bonds. Right-hand chart: Zero-coupon rates. Source: Nordea Analytics and Danmarks Nationalbank.
for long-term government bonds among pension funds. The narrowing of the yield spread to Germany has taken place in spite of the ECB’s expansion of its purchase programme, which is keeping euro area yields at an extraordinarily low level.

Since March, the yield on mortgage bonds has fallen more sharply than the yield on government bonds, cf. Chart 21 (left). This is presumably because the yield spread between government and mortgage bonds is wide, cf. Chart 21 (right). There are indications that foreign investors are continuing to increase their portfolios of Danish mortgage bonds. The ECB purchases two types of mortgage-like bonds in the euro area, which has pushed down yields on these bonds, so a natural alternative for investors in those markets could be to invest in Danish mortgage bonds. Increased investor interest could have a downward impact on mortgage yields, thereby reducing the spread to government bonds.

**DANISH EQUITY PRICES HAVE RISEN MORE STRONGLY THAN THOSE OF THE EURO AREA IN RECENT YEARS**

The Danish equity market as a whole has risen in the last three months, thereby making up for part of the loss seen in the turbulent first two months of 2016. Overall, Danish equities have fallen by 3 per cent since the beginning of the year, compared with a fall of 7 per cent in the euro area. In recent years, Danish equity prices have risen more strongly than those of the euro area. This can be explained by the development in earnings and expected earnings in Danish firms, cf. also Danmarks Nationalbank, *Monetary Review*, 1st Quarter 2016. The earnings of the largest Danish firms have more or less met expectations and have also been rising, cf. Chart 22 (left). This does not apply in the euro area even though a large share of Danish-based firms’ revenues and earnings are generated outside Denmark. The firms in the Euro Stoxx index have not performed as expected in terms of earnings, cf. Chart 22 (right). In addition, growth in earnings has been low. These are some of the reasons why equity prices have shown a stronger trend in Denmark than in the euro area.

**THE INTRODUCTION OF NEGATIVE INTEREST RATES HAS NOT FUNDAMENTALLY CHANGED THE TRANSMISSION TO RETAIL INTEREST RATES**

The banks’ interest rates on lending to households and non-financial corporations have fallen slightly in recent months, while deposit rates have been broadly unchanged. The continued fall in lending rates means that they have, overall, fallen by more or less the same as Danmarks Nationalbank’s rate of interest on certificates of deposit since the pressure on the krone in January last year, cf. Chart 23 (left).
Viewed over a longer period, there has generally been close to full pass-through from the rate of interest on certificates of deposit to the banks’ lending rates. This has also been the case in recent years’ low interest rate environment. In connection with the financial crisis in the autumn of 2008, the pass-through decreased strongly for a brief period, however, as the banks’ lending rates were slow to follow the sizeable reductions of Danmarks Nationalbank’s interest rates in the following months.

The banks set their lending rates on the basis of the costs of funding the loans and the risk on the loans. When the banks’ funding costs are taken into account, the pass-through from the rate of interest on certificates of deposit to lending rates does not differ materially before and after the financial crisis. The interest rate reductions in response to the pressure on the krone in January and February last year have had a smaller impact on lending rates, cf. Chart 23 (right). The banks have been hesitant to pass on the negative rate of interest at Danmarks Nationalbank to small enterprises and especially to households. The latter have been completely exempt from negative deposit rates. The transmission from the monetary policy interest rates to the banks’ retail interest rates is analysed in more detail in the article “Pass-Through from Danmarks Nationalbank’s Interest Rates to the Banks’ Interest Rates” in this Monetary Review.

Danmarks Nationalbank has performed a survey analysis which shows that the share of deposits from non-financial corporations that accrue interest at a negative rate has been approximately 30 per cent since the spring of 2015, cf. Chart 24 (left). Negative deposit rates are in widespread use for insurance and pension companies, for which the alternatives to bank deposits are placement on money market-like terms, e.g. in short-term securities, likewise at negative rates of interest. The survey also shows that around half of all household deposits are at zero interest, while the rate of interest is positive for the other half, cf. Chart 24 (right). Two thirds of deposits at positive interest rates are deposits on special terms, e.g. in connection with mortgage-like bank loans or loans that are tied up for a certain period. It should be emphasised that the results in Chart 24 are based on a survey, not on all credit institutions.

The pass-through from lower monetary policy interest rates is higher for lending rates than for deposit rates

<table>
<thead>
<tr>
<th>Lending rates (accumulated changes)</th>
<th>Deposit rates (accumulated changes)</th>
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<tr>
<td>Percentage points</td>
<td>Percentage points</td>
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<tr>
<td>Certificate of deposit</td>
<td>Non-financial corporations</td>
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<td>Household</td>
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Note: Monthly observations. Accumulated changes from August 2014 until and including April 2016. Source: Danmarks Nationalbank.

2 The banks included jointly account for just over 35 per cent of total deposits from Danish counterparties, and for selected sectors, e.g. non-financial corporations and wage earners, pensioners, etc., for 62 and 57 per cent, respectively, of total deposits. For insurance companies and pension funds, coverage is just over 57 per cent.
MODERATE LENDING GROWTH AND SLIGHTLY TIGHTER CREDIT STANDARDS

The banks’ and mortgage banks’ aggregate lending to households and the corporate sector has increased a little in recent months, cf. Chart 25 (left). For the corporate sector, lending has risen by 1.3 per cent over the last year. This masks a continued downward trend in corporate lending by banks and an upward trend in lending by mortgage banks, cf. Chart 25 (right). The pattern is the same for lending to households, which has risen by 0.8 per cent overall in the last year. The mortgage banks are by far the largest source of funding for both the corporate sector and households, accounting for around 75 per cent of total lending, and the banks’ share is still diminishing.

In the 1st quarter of 2016, the mortgage banks tightened their credit standards, while those of...
the banks were virtually unchanged, cf. Chart 26. So all in all, firms were faced with slightly tighter credit standards in the 1st quarter. One of the reasons for the tightening by mortgage banks was that the Danish Financial Supervisory Authority introduced a new Executive Order stating that loans for mortgaging of commercial rental properties require positive liquidity. The mortgage banks also tightened their credit standards a little in 2015, while they were eased in late 2014.

While the banks overall kept their credit standards unchanged, the group 1 banks tightened theirs marginally, whereas group 2 continued to ease theirs in the 1st quarter of 2016. Although 1st quarter easing was very modest, total easing by this group over the last two years is notable compared with the changes made by the large banks and the mortgage banks, respectively. The smaller banks stated that especially competitor behaviour contributed to their easing of credit standards for firms.

Although firms were met with tighter credit standards overall in the 1st quarter, this did not have any negative impact on lending. In March lending volumes were higher than one year earlier for both group 1 and group 2 banks and also for mortgage banks – but the increase was strongest for group 2 banks. Explanations could be that the tightening was relatively modest and that it affected particular types of firms. Mortgage lending continued to rise.

**THE DANISH ECONOMY**

**SOLID GROWTH IN THE LABOUR MARKET**

Employment continued to increase in the first part of 2016, rising by 11,000 persons in the 1st quarter. Real GDP increased by 0.5 per cent in the 1st quarter, driven by domestic demand and exports.

Over the last year, GDP has shown a relatively weak trend compared with employment. This to a large extent reflects a downturn in extraction of raw materials and in sea transport, two sectors that employ relatively few people. In contrast, there has been a strong rise in both output and employment in the industrial sector, in building and construction and in various service sectors,
cf. Chart 27. This shows that unilateral focus on real GDP for the economy as a whole can give a very misleading picture of how the Danish economy is performing. In the labour-intensive private non-primary sector excluding transport, there is a reasonable balance between developments in employment and output. The increase in employment since the beginning of 2013 is therefore assessed to rest on a solid foundation.

Productivity is expected to recover to some extent, and growth in real GDP is forecast at 1.0 per cent in 2016, rising to 1.6 per cent in 2017 and 1.8 per cent in 2018. This is slightly weaker than in the most recent projection. Overall, the forecast has been adjusted downwards by 0.5 percentage point over the three years. The main contributions to growth come from private consumption and to some extent private investment and exports, cf. Chart 28. Employment is expected to grow by 60,000 persons from the 1st quarter of 2016 to the end of 2018, cf. Table 2.

The output gap, which indicates how much employment can rise without causing inflationary pressures, will narrow, and by the end of the projection period the economy will be close to a neutral level of capacity utilisation.

The expected higher growth in the coming years is closely linked to exports. In recent years,
several emerging market economies, including China, have slowed down somewhat, while Denmark’s nearest export markets are expected to grow. Overall, growth in Denmark’s export markets is forecast to be a little weaker than in the March projection, cf. Appendix 1. Furthermore, the effective exchange rate of the krone rose a little in the 1st quarter of 2016, which, all else equal, weakens Denmark’s competitiveness. As a result, exports will contribute very little to growth in GDP in 2016, but will pick up in the coming years.

In the 1st quarter, private consumption rose by 0.6 per cent over the preceding quarter. This follows consumption growth of 2.1 per cent in 2015, the highest annual growth rate since 2006. The underlying drivers are broadly unchanged compared with the most recent projection. Rising employment and disposable incomes continue to point to growth in private consumption, and house prices are still rising so that the owners have more home equity. Long-term interest rates fell in the 1st quarter, thereby fuelling private consumption and residential investment. Moreover, the consumption ratio is low viewed in a longer perspective and household wealth is substantial. In other words, there is a considerable potential for growth in private consumption, as has been the case for some time. Growth in private consumption is forecast at 1.8 per cent in both 2016 and 2017, rising to 1.9 per cent in 2018. This means that the consumption ratio will rise towards 2018, but will remain at a low level.

Residential investment fell during most of 2015, but rose in the first part of 2016. Over the last year, there has been an increase in new construction, while major repairs, which account for a large share of residential investment, have also had an upward impact. Residential investment is expected to continue to increase.
Business investment declined a little in the 1st quarter of 2016. For a long time, growth has been driven by corporate investments in plant and equipment in particular, while building and construction investments have been flat. Growth in investments in plant and equipment has mirrored value added in the private sector in recent years, so that the investment ratio for plant and equipment has been practically unchanged. In contrast, the investment ratio for non-residential construction has been falling for many years. At present there are many vacant office premises, although their number has fallen a little over the last year. The combination of rising activity and capacity utilisation on the one hand and low interest rates and considerable corporate savings surpluses on the other hand is expected to boost business investment.

The projection involves both downside and upside risks. The flattening of the hourly productivity growth curve over the last year leads to uncertainty as to whether productivity growth will recover to the extent assumed in the projection.

In the short term, the UK referendum on continued EU membership on 23 June 2016 creates considerable uncertainty. Furthermore, there is general uncertainty linked to the strength of the international upswing, as growth in many emerging market economies, including China, has slowed down.

On the other hand, the very low level of interest rates and oil prices could have a more expansionary effect on the economy than predicted. And finally both the consumption and investment ratios are well below their historical averages and have been for some years, and savings in the corporate sector remain high.

**THE PRICES OF OWNER-OCUPIED FLATS ARE STILL RISING STRONGLY**

House prices have risen less steeply in recent months, while there are no signs of any dampening of the prices of owner-occupied flats in Copenhagen and other cities, cf. Chart 29 (left). In the first months of this year, the price of single-family houses rose by around 4 per cent year-on-year, while the rate of increase for owner-occupied flats was more than 10 per cent, as it has been since late 2012. The highest increases have been seen in the Copenhagen area.

The number of sales of owner-occupied flats registered in the land register is high, cf. Chart 29 (right). Activity was extraordinarily high in the first part of 2015, when interest rates dived in connection with the upward pressure on the Danish krone. Since then, trading activity has fallen back a little. For houses, the number of trades has been more constant.

Combined with enhanced solvency requirements for home buyers in the cities, the Danish Financial Supervisory Authority’s recommendation that the down payment should constitute at least 5 per cent of the purchase price is expected to curb demand.
for new homes. But this is not yet reflected in the households’ expectations of future house prices.

House prices for Denmark overall are forecast to grow by approximately 3 per cent p.a. in 2016 and the following years. This is a lower growth rate than in the previous years. The sustained increase in prices should be viewed in the light of the very low interest rates, which fell further at the beginning of this year, and the general economic recovery. The households’ continued high expectations of future house price rises also play a role. But in many parts of Denmark there is a backlog of houses for sale, which exerts downward pressure on prices in those areas.

DECLINE IN EXPORTS – OF SEA FREIGHT IN PARTICULAR

The value of both imports and exports of goods fell slightly in the first four months of 2016, especially for fuel on account of lower oil prices. At the same time, exports of sea transport continued to fall for the fourth consecutive quarter. This should be viewed against the backdrop of lower growth in China and reduced freight rates. However, other services also have a downward impact, while industrial exports, on the other hand, rose in both value and volume terms, cf. Chart 30 (left). This is in line with the overall tendency in recent years, i.e. industrial output, employment and exports have grown at a sound pace.

The current outlook provides a good basis for growth in Danish exports. Although it rose in the first part of 2016, the effective exchange rate of the krone is still relatively low in a 10-year perspective, and from the financial crisis in 2008 until the end of 2015, wage increases were lower in Denmark than abroad. This is reflected in an improvement of Denmark’s competitiveness. Exports are expected to grow more or less in step with the increase in global trade and the export market recovery. But energy exports will continue to have a downward impact on exports of goods. Extraction of North Sea oil and gas is decreasing, and due to the low oil prices it is not profitable to invest in new extraction facilities.

The current account surplus was kr. 17 billion lower in the first four months of 2016 than in the corresponding period of 2015. This is mainly attributable to lower exports of services, especially sea transport. In the 12 months up to and including April 2016, the current account surplus was kr. 124 billion, corresponding to 6 per cent of GDP. This is a decrease of kr. 25 billion compared with the preceding 12-month period, cf. Chart 30 (right). The large current account surpluses are expected to continue in the coming years.

PRICE PRESSURES REMAIN LOW

Price inflation is still very low, cf. Chart 31 (left). The annual rate of increase in the EU Harmonised Index of Consumer Prices, HICP, was negative in March, April and May, mainly due to falling oil prices. But in recent months the price of oil has risen a little, to just under 50 dollars per barrel in early June.

### Fall in exports in value terms and in the current account surplus

**Chart 30**

- **Exports in value terms**
  - Kr. billion
  - 80
  - 70
  - 60
  - 50
  - 40
  - 30
  - Sea transport
  - Other services
  - Other goods
  - Industrial exports (r.h. axis)

- **Balance of payments, current account**
  - Kr. billion
  - 0
  - 50
  - 100
  - 150
  - 200
  - -50
  - 06 07 08 09 10 11 12 13 14 15 16
  - Total
  - Services
  - Income
  - Goods
  - Current transfers

**Note:** Right-hand chart: 12-month sums.
**Source:** Statistics Denmark and Danmarks Nationalbank.
Core inflation, i.e. prices excluding energy and unprocessed food, was 0.4 per cent in May. It has fallen in step with the lower prices for imported consumer goods. The lower price of oil exerts downward pressure on core inflation as energy prices ripple through to consumer goods and services in general. Especially the prices of goods, including clothing, have shown a weak trend.

Consumer prices in Denmark generally develop more or less in line with those of the euro area. For a while around the turn of the year, the rate of increase in consumer prices was a little higher in Denmark than in the euro area, but in March and April it was slightly lower, cf. Chart 31 (right). Core inflation has also been lower in Denmark than in the euro area in recent months.

Import prices have fallen in the last half year, reflecting factors such as an increase of almost 4 per cent in the effective exchange rate of the krone since the spring of 2015. Domestic market-determined inflation, IMI, was 1.2 per cent in May. In the longer term, IMI is determined by developments in the level of costs in the economy, including wages. In the short term, IMI often moves in the opposite direction of import prices, indicating that rising import prices are not fully passed on to domestic prices at once, but squeeze profit margins – and vice versa when import prices rise.

All in all, the levels of both IMI and core inflation show that domestic price pressures are modest. Consumer expectations of price developments in the next 12 months have, however, been virtually unchanged for the last five years, and wage growth is accelerating. Hence, inflation expectations are well-anchored and consumers do not expect more sustained price falls and resultant deflation.

In April, the price index for the domestic supply of goods excluding energy was at the same level as one year earlier. This means that overall price pressures from the wholesale link are limited. Producer prices for Danish goods for the domestic market excluding energy are also showing a weak trend.

The low price of oil will dampen price inflation throughout 2016, with HICP expected to rise to 0.3 per cent year-on-year. In 2017 and 2018, the pass-through from the low oil prices will no longer have any impact, and at the same time the economy will be approaching its capacity limit. Therefore, consumer prices are expected to grow by 1.5 and 1.7 per cent, respectively, cf. Table 3.

**MODERATE WAGE GROWTH AND IMPROVED COMPETITIVENESS**

Private sector wage growth remains moderate. In the 1st quarter of 2016, the annual rate of increase was 1.8 per cent according to Statistics Denmark. Private sector wage growth has been highest in the service sectors, but also within building and construction, where it was around 2 per cent higher in the 1st quarter than one year earlier. The same applied to wages in manufacturing, much of which is for exports, cf. Chart 32.
In contrast, wage growth in e.g. business service and trade and transport is lower. Annual wage growth in the manufacturing industries is expected to be around 2.5 per cent p.a. in the coming years, i.e. a little higher than in recent years. Combined with the current weak trend in consumer prices, this will boost real wages considerably.

A broader measure of competitiveness includes not only wages, but also relative productivity growth and the prices at which Danish firms’ products can be sold relative to the prices of

### Consumer prices

<table>
<thead>
<tr>
<th>Per cent, year-on-year</th>
<th>Weights&lt;sup&gt;1&lt;/sup&gt;</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>may</th>
<th>june</th>
<th>july</th>
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<tbody>
<tr>
<td>HICP</td>
<td>0.2</td>
<td>0.3</td>
<td>1.5</td>
<td>1.7</td>
<td></td>
<td>0.1</td>
<td>-0.2</td>
<td>0.2</td>
<td>-0.1</td>
<td>-0.1</td>
<td>-0.1</td>
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<tr>
<td>Index of net retail prices</td>
<td>100.0</td>
<td>0.7</td>
<td>0.6</td>
<td>1.8</td>
<td>1.9</td>
<td>0.6</td>
<td>0.3</td>
<td>0.5</td>
<td>0.4</td>
<td>0.5</td>
<td>0.4</td>
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<tr>
<td>Exogenous:</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Energy</td>
<td>6.9</td>
<td>-9.9</td>
<td>-5.6</td>
<td>4.2</td>
<td>2.7</td>
<td>-8.5</td>
<td>-9.0</td>
<td>-4.6</td>
<td>-8.9</td>
<td>-8.4</td>
<td>-7.4</td>
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<tr>
<td>Food</td>
<td>4.8</td>
<td>2.6</td>
<td>2.3</td>
<td>1.8</td>
<td>1.4</td>
<td>2.3</td>
<td>2.5</td>
<td>2.1</td>
<td>2.8</td>
<td>2.5</td>
<td>2.4</td>
</tr>
<tr>
<td>Adm. prices</td>
<td>4.1</td>
<td>0.9</td>
<td>2.2</td>
<td>2.8</td>
<td>2.7</td>
<td>2.3</td>
<td>2.1</td>
<td>2.0</td>
<td>2.0</td>
<td>2.1</td>
<td>2.1</td>
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<td>Rent</td>
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<td>2.1</td>
<td>1.9</td>
<td>1.8</td>
<td>2.5</td>
<td>2.2</td>
<td>2.0</td>
<td>1.9</td>
<td>2.1</td>
<td>2.0</td>
<td>2.2</td>
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<tr>
<td>Excl. exogenous:</td>
<td>58.2</td>
<td>1.3</td>
<td>0.7</td>
<td>1.5</td>
<td>1.5</td>
<td>0.8</td>
<td>0.7</td>
<td>0.5</td>
<td>0.7</td>
<td>0.7</td>
<td>0.3</td>
</tr>
<tr>
<td>Imports</td>
<td>18.7</td>
<td>2.4</td>
<td>0.2</td>
<td>1.1</td>
<td>1.3</td>
<td>1.5</td>
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<td>-0.3</td>
<td>-0.5</td>
<td>-0.6</td>
<td>-0.4</td>
</tr>
<tr>
<td>IMI</td>
<td>39.5</td>
<td>0.9</td>
<td>0.9</td>
<td>1.7</td>
<td>1.7</td>
<td>0.6</td>
<td>1.0</td>
<td>0.8</td>
<td>1.2</td>
<td>1.3</td>
<td>0.7</td>
</tr>
</tbody>
</table>

Note: The most recent actual figures are from May 2016. <sup>1</sup> Weight in the index of net retail prices, per cent. The weights are from January 2016.

Denmark’s competitiveness has improved

Wages in manufacturing

<table>
<thead>
<tr>
<th>Per cent, year-on-year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>95</td>
</tr>
<tr>
<td>Denmark</td>
</tr>
</tbody>
</table>

Note: Left-hand chart: Wages in manufacturing. Foreign wages have been weighted using the weights from the effective krone rate index.

Denmark’s competitiveness

Index, 2000 = 100

<table>
<thead>
<tr>
<th>Index, 2000 = 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
</tr>
<tr>
<td>95</td>
</tr>
<tr>
<td>Relative unit labour costs in industrial sector</td>
</tr>
<tr>
<td>Relative wage share in industrial sector</td>
</tr>
</tbody>
</table>

Note: Right-hand chart: Competitiveness, taking into account not only relative wages but also relative productivity (equals relative unit labour cost) and furthermore relative price development (equals relative wage share). A rise in the index indicates improved competitiveness. 4-quarter moving averages.

Source: OECD, Statistics Denmark and Danmarks Nationalbank.
imports, i.e. the terms of trade. Both these factors are captured by developments in the relative wage share. According to this measure, the Danish industrial sector has improved its wage competitiveness in recent years, cf. Chart 32 (right). Irrespective of the measure applied, Denmark’s competitiveness is good, which contributes to the sizeable surpluses on both the balance of trade and the current account.

Public sector wage growth is subdued. Wage growth is affected by developments since 2008, when wages for a while rose at a faster pace than in the private sector. However, they are regulated so that they move in parallel with private sector wages in the long run. This means that public sector wage growth will be relatively low in the coming years, especially for central government employees as their agreed wage increases will come at the end of the collective agreement period, i.e. in 2018.

EMPLOYMENT IS RISING AND UNEMPLOYMENT IS FALLING

According to the national accounts, employment was up by 11,000 in the 1st quarter of 2016. It has been rising constantly since the 4th quarter of 2012, by a total of 86,000 persons, cf. Chart 33 (left). Growth has solely taken place in the private sector, where employment has increased by 94,000 persons. The increase has been broad-based, but most pronounced within a number of service sectors and in building and construction. Conversely, employment in public administration has decreased.

Since the turn of the year, gross unemployment has decreased by almost 5,000 persons, to 115,000 in April, or 4.3 per cent of the labour force. This means that unemployment is close to its structural level, which has been estimated at around 110,000. By the end of the projection period, gross unemployment will be below the cyclically neutral level.

The labour shortage indicators point to increasing capacity utilisation in the labour market. This is particularly true within construction, where 15 per cent of firms (weighted by number of employees) indicate that shortage of labour impedes production. For the other sectors, the indicator has been more flat.

The labour market gap, which indicates how much employment can rise without causing inflationary pressures in the economy, is estimated at approximately 20,000 at present. From the 1st quarter of 2016 to the end of 2018, employment is expected to increase by 60,000 persons. This means that a substantial share of the expected employment growth must come from people currently outside the labour force. The projection assumes that the structural labour force will rise in the coming years, reflecting measures such as the retirement reform from 2011, which will increase the participation rate in the older age groups. Just

![The labour market is strong, with still fewer spare labour resources](chart33)
under half of the total increase in employment is attributable to cyclical improvements, while the rest can be attributed to the rise in structural employment, cf. Chart 33 (right).

**GOVERNMENT BUDGET DEFICITS ARE WITHIN THE LIMITS**
Public consumption is forecast to grow by 1.0 per cent in 2016, followed by zero growth in 2017 and a rise of 1.2 per cent in 2018. This is in line with the government’s projection in the Economic Survey from May 2016.

In recent years, public investment as a share of GDP has been at a historically high level and there have been repeated budget overruns, cf. Chart 34 (left). The government has announced an adjustment of the level of investment. Hence, public investment is expected to fall by approximately 5 per cent over the projection period.

A government deficit of 2.0 per cent of GDP is forecast for this year. That is 1.2 percentage points better than in the March projection, reflecting, inter alia, higher proceeds from pension yield tax as a result of lower bond yields. The deficit is expected to shrink further to 1.9 per cent of GDP in 2017 and 1.7 per cent in 2018, mainly as a result of a stronger cyclical position and subdued growth in spending. So it looks as if the government deficit will remain within the 3 per cent limit set in the Stability and Growth Pact with a relatively wide margin, but there have previously been large fluctuations relative to the projection, especially due to uncertainty about the proceeds from pension yield tax – and currently about costs related to asylum seekers.

In the Economic Survey from May 2016, the government forecasts the structural deficit at 0.4 per cent of GDP this year, corresponding to fiscal tightening of 0.2 percentage point relative to 2015, cf. Chart 34 (right). The structural balance is also expected to show a deficit of 0.4 per cent of GDP next year, but will then gradually converge towards equilibrium in 2020 according to the government’s convergence programme from April. The size of the structural deficit does not leave much room for meeting unexpected expenses before the Budget Act’s limit is exceeded.

**ECONOMIC POLICY**
The labour market is strong, with rising employment and falling unemployment. This reflects growth in production, especially in the industrial sector, building and construction and business service. The projection forecasts gradually stronger growth in real GDP over the next couple of years, and the output gap is expected to close towards the end of 2018. Given the cyclical outlook, fiscal policy should be aimed at achieving equilibrium on the structural balance within the next few years.

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**Chart 34**

**Public investment is high and the structural balance is close to the limit set in the Budget Act**

<table>
<thead>
<tr>
<th>Public investment ratio</th>
<th>Structural government balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Per cent of GDP</td>
<td>Per cent of structural GDP</td>
</tr>
<tr>
<td>4.5</td>
<td>3</td>
</tr>
<tr>
<td>4.0</td>
<td>2</td>
</tr>
<tr>
<td>3.5</td>
<td>1</td>
</tr>
<tr>
<td>3.0</td>
<td>0.5</td>
</tr>
<tr>
<td>2.5</td>
<td>0.1</td>
</tr>
<tr>
<td>2.0</td>
<td>-0.5</td>
</tr>
<tr>
<td>0.0</td>
<td>-1.0</td>
</tr>
</tbody>
</table>

**Note:** Right-hand chart: Ministry of Finance’s calculation of structural balance. The broken horizontal line indicates the Budget Act’s limit for the structural deficit.

**Source:** Statistics Denmark and Ministry of Finance.
Over the last decade, a number of reforms have been introduced with a view to increasing the supply of labour so as to ensure sustainable public finances. Looking ahead, the greatest potential for strengthening the supply of labour lies in enhancing integration efforts and upgrading the skills of the labour force. If the level of prosperity in Denmark is to continue to rise it is step with levels in comparable countries, focus must also be on increasing productivity.

Although it is important to boost productivity growth, higher real GDP growth should not be the only focus area. A broader comparison with e.g. Sweden, where growth in real GDP has been higher than in Denmark for some years, shows that Danish prosperity per capita has developed in line with that of Sweden, reflecting factors such as continuous improvement of Denmark’s terms of trade and a high return on foreign assets. Growth in Sweden has been driven mainly by strong domestic demand, due to e.g. pressures on the housing market and high population growth, while exports in the two countries have moved more or less in tandem since the financial crisis in 2008. Conversely, Sweden’s industrial output has risen far less than Denmark’s since 2008.

Given the moderate trend in real GDP, the strong rise in employment in Denmark has entailed low growth in productivity, particularly over the last year. The projection assumes that productivity growth will recover to some extent so that it will be closer to its historical level. As pointed out by the Danish Productivity Commission, a number of levers may be adjusted with a view to boosting productivity growth. Above all, competitiveness must be strengthened. This requires open markets, both domestically and vis-à-vis other countries. There are sectors in Denmark where competition is low, and this is reflected in high price levels. An adjustment of the educational system so that students are encouraged to enrol for programmes with good employment prospects could also contribute to strengthening productivity growth. The low level of interest rates is buoying up demand in the economy, but also keeping low-productivity firms afloat that would sink in normal circumstances. That reduces overall productivity growth in Denmark.

The government has announced that it will present a new medium-term fiscal policy strategy until 2025 in the autumn, including the 2nd phase of the job reform initiated in 2015 (tax reform). Key elements of this 2025 plan should be to strengthen the automatic stabilisers in the economy and to remove asymmetry in the tax system in order to strengthen economic and financial stability and support productivity growth.
APPENDIX 1: ASSUMPTIONS IN THE PROJECTION FOR THE DANISH ECONOMY

The projection has been prepared using the macroeconomic model MONA\(^4\) and is based on the available economic statistics, including Statistics Denmark’s preliminary quarterly national accounts for the 1st quarter of 2016. The projection involves a number of assumptions concerning the international economy, financial conditions and fiscal policy.

THE INTERNATIONAL ECONOMY

The international economy and most of Denmark’s trading partners are picking up steam. The international growth outlook is supported by continued low oil prices and interest rates. Compared with the previous projection, growth forecasts have been adjusted a little downwards, especially for 2016. This is mainly attributable to weaker import growth in the emerging market economies, including China, and weaker-than-expected growth in the USA in early 2016. Overall, growth in the markets for Danish industrial exports is assumed to increase by 3.1 per cent this year, 4.3 per cent in 2017 and 4.2 per cent in 2018, cf. Table 4.

Foreign wage growth is expected to be modest, but will rise a little towards 2018 as the labour markets improve. Lower oil prices this year than last year contribute to a fall in export prices this year among most of Denmark’s key trading partners. Moderate foreign export price increases are expected next year and in 2018.

INTEREST RATES, EXCHANGE RATES AND OIL PRICES

Developments in short-term and long-term interest rates in the projection are based on the expectations of future developments that can be derived from the interest rate curves in the financial markets. The 3-month money market interest rate, measured by the CITA swap rate, is expected to be negative throughout the projection period, at approximately -0.4 per cent in 2016 and 2017, rising to -0.2 per cent by the end of 2018.

The average bond yield is an average of the yields to maturity on outstanding government and mortgage bonds. It is expected to rise slightly over the projection period, from 0.8 per cent initially to 1.4 per cent by the end of 2018.

US interest rates are no longer expected to rise in the immediate future, which has made the euro appreciate a little vis-à-vis the dollar. Furthermore, the turmoil in connection with the UK referendum on continued EU membership on 23 June has made the pound depreciate. Both these factors have strengthened the effective exchange rate of the krone relative to the point of departure for the last projection; it is expected to remain at this level throughout the projection period. In the projection, the dollar rate is also assumed to remain unchanged at the current level.

In early June 2016, the price of oil was just under 50 dollars per barrel. The oil price is assumed to develop in line with futures prices, rising to just under 55 dollars towards the end of 2018. This is an upward adjustment of 5-10 dollars throughout the period compared with the most recent projection.

FISCAL ASSUMPTIONS

The projection is based on the planned fiscal policy in the Economic Survey from May 2016, including the agreement on the Finance Act for 2016, local and regional government budgets and Denmark’s Convergence Programme 2016.

Real public consumption is assumed to rise by 1.0 per cent this year and by 0.0 and 1.2 per cent in 2017 and 2018, respectively, while public investment is assumed to fall by 1.9 per cent this year and by 1.3 and 1.5 per cent in 2017 and 2018, respectively, cf. Table 4.

---

\(^4\) The model is described in Danmarks Nationalbank, MONA – a quarterly model of the Danish economy, 2003.
### Overview of projection assumptions

<table>
<thead>
<tr>
<th></th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
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<td><strong>International economy:</strong></td>
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<td></td>
<td></td>
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<td>Export market growth, per cent year-on-year</td>
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<td>3.1</td>
<td>4.3</td>
<td>4.2</td>
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<tr>
<td>Export market price¹, per cent year-on-year</td>
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<td>-1.5</td>
<td>1.4</td>
<td>1.5</td>
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<td>Foreign price², per cent year-on-year</td>
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<td>-1.5</td>
<td>1.4</td>
<td>1.5</td>
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<td>Foreign hourly wages, per cent year-on-year</td>
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<td>1.7</td>
<td>2.3</td>
<td>2.5</td>
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<td><strong>Financial conditions, etc.:</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-month money market interest rate, per cent p.a.</td>
<td>-0.4</td>
<td>-0.4</td>
<td>-0.4</td>
<td>-0.3</td>
</tr>
<tr>
<td>Average bond yield, per cent p.a.</td>
<td>1.0</td>
<td>0.9</td>
<td>1.0</td>
<td>1.3</td>
</tr>
<tr>
<td>Effective krone rate, 1980 = 100</td>
<td>99.2</td>
<td>100.6</td>
<td>100.7</td>
<td>100.7</td>
</tr>
<tr>
<td>Dollar exchange rate, DKK per USD</td>
<td>6.7</td>
<td>6.6</td>
<td>6.6</td>
<td>6.6</td>
</tr>
<tr>
<td>Oil price, Brent, USD per barrel</td>
<td>52.4</td>
<td>45.1</td>
<td>52.1</td>
<td>54.0</td>
</tr>
<tr>
<td><strong>Fiscal policy:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public consumption, per cent year-on-year</td>
<td>0.6</td>
<td>1.0</td>
<td>0.0</td>
<td>1.2</td>
</tr>
<tr>
<td>Public investment, per cent year-on-year</td>
<td>-1.0</td>
<td>-1.9</td>
<td>-1.3</td>
<td>-1.5</td>
</tr>
<tr>
<td>Public sector employment, 1,000 persons</td>
<td>815</td>
<td>811</td>
<td>813</td>
<td>816</td>
</tr>
</tbody>
</table>

¹ Weighted import price for all countries to which Denmark exports.
² Weighted export price for all countries from which Denmark imports.
APPENDIX 2: REVISIONS IN RELATION TO THE PREVIOUS PROJECTION

Compared with the March projection, the forecast for GDP growth in Denmark this year has been revised downwards by 0.3 percentage point. This is partly due to lower-than-expected exports for 2016, reflecting lower export market growth and a higher effective krone rate, and partly to a revision of the quarterly national accounts so that the point of departure for 2016 is lower.

Lower export market growth and a higher effective exchange rate of the krone are also the reasons for the 0.2 percentage point downward adjustment of GDP growth in 2017. Bond yields have been adjusted downwards and are now assumed to rise less steeply. Viewed in isolation, this points to lower capital costs and higher GDP growth.

The HICP inflation forecast has been adjusted downwards relative to the March projection despite rising oil prices in the spring. For 2016, this is because both domestic market-determined inflation and imported inflation were substantially lower than expected in February-April 2016, which will also reduce the rate of increase in 2017 due to a lower point of departure for 2016. For 2017 and 2018, the higher effective krone rate and downward adjustment of import prices point to lower domestic consumer prices.

Revisions in relation to the previous projection

<table>
<thead>
<tr>
<th>Per cent, year-on-year</th>
<th>GDP</th>
<th>Consumer prices, HICP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Projection, March 2016</td>
<td>1.3</td>
<td>1.8</td>
</tr>
</tbody>
</table>

Contribution to revised forecast from:

- Export market growth: -0.1, -0.1, 0.0
- Interest rates: 0.0, 0.2, 0.1
- Exchange rates: -0.1, -0.1, 0.0
- Oil prices: 0.0, 0.0, 0.0
- Other factors: -0.2, -0.2, -0.1

This projection: 1.0, 1.6, 1.8

0.3, 1.5, 1.7

Note: The transition from the previous to this projection may not add up due to rounding. “Other factors” includes data revisions.
INTRODUCTION AND SUMMARY

Productivity is a key driver of economic growth. However, productivity growth in the Danish economy, measured by gross value added, GVA, per hour has been weak since the financial crisis. This is especially the case from the 2nd half of 2015 and onwards when the decoupling of output and the labour market situation calls into question future productivity growth and the actual sustainability of the growth in employment seen during the last year or so. Nevertheless, the wage share of the employment-intensive private non-primary sector excluding transport does not indicate a general imbalance between productivity and wages. The adjustment for fluctuations related to the transport industry reflects that this industry is currently characterised by declining earnings in shipping, which has a limited content of domestic employment. Consequently, the increase in employment is currently assessed to be sustainable, albeit with potential regional and industry-specific differences.

The low productivity growth of the Danish economy as a whole is attributable to a series of factors. Since the mid-2000s, declining North Sea activity has been reducing productivity growth for the overall economy by around 0.3 percentage point per year. In addition, during the upswing employment growth has been higher in industries with below-average productivity. This, in itself, contributes to weaker aggregate productivity growth. The analysis finds that between-sector shifts reduced productivity growth in the private non-primary sector by 0.3 percentage point per year from 2011 to 2015. On the other hand, within-sector shifts boosted productivity growth by 0.7 percentage point.

A comparison of the survival rate of firms during various recessions also indicates that the low level of interest rates may have prevented productivity-enhancing reallocation of production resources and dampened productivity growth during the upswing. Moreover, productivity growth is also curbed by lower capital intensity, both as a result of the structural shift from manufacturing to services and due to the limited level of investment in recent years.

Productivity growth is not the only source of enhanced prosperity. For a prolonged period of time, Denmark’s terms of trade have been improving substantially and the return on foreign assets has been increasing. This has expanded consumption opportunities and brought greater prosperity, even if productivity growth has been weak. In practice, distinguishing between quality improvements and price developments can be difficult. The analysis finds that nominal value added per hour in the non-primary sector has increased more than real productivity compared with previous upswings.

In principle, the slowdown in productivity growth may reflect temporary fluctuations as well as factors of a more structural nature. Danmarks Nationalbank’s projection is based on an assumption of gradual restoration of productivity growth over the next couple of years to a level more or less matching the long-term level since the mid-1990s. In the coming years, sector shifts and lower capital intensity may put more downward pressure on productivity growth than assumed in the projection. This would entail a long period of low growth.
WEAK DANISH PRODUCTIVITY GROWTH DURING THE UPSWING

A prolonged trend of low productivity growth in Denmark seems to have been reinforced in the wake of the financial crisis. Real productivity in terms of GVA per hour for the entire economy has not grown for the last five years, cf. Chart 1. Productivity growth was particularly weak in the 2nd half of 2015 when the gross domestic product, GDP, stagnated following eight quarters of steady growth. The slowdown would seem to be in contrast to a strong labour market with rising employment and falling unemployment, which has continued into 2016, cf. Chart 2. Weak productivity growth is not an isolated Danish phenomenon, but very much part of an international trend. Thus, most of our usual European benchmark countries have experienced lower productivity growth since the crisis, cf. Box 1.

DECLINING NORTH SEA PRODUCTION CONTRIBUTES TO WEAK PRODUCTIVITY GROWTH

The modest productivity growth of the Danish economy as a whole is, to some extent, attributable to declining North Sea activity since the mid-2000s. The fall means that the high level of GVA per hour that characterises oil and gas extraction has less and less weight in the total productivity of the economy. Viewed in isolation, this has weakened productivity growth by approximately 0.3 percentage point in recent years, cf. Chart 3. Although declining North Sea production contributes to the moderate productivity growth, it constitutes a longer-term trend, which does not imply a structural productivity challenge for the economy in general. Thus, in the remaining part of the analysis, the focus will be primarily on the private non-primary sector, i.e. the market-related part of the economy less raw material extraction, housing and agriculture.²

¹ There are several relevant productivity measures. This analysis generally focuses on hourly productivity, i.e. output measured by GVA in volumes divided by the number of hours worked.

² This delineation is assessed to give the truest and fairest view of underlying productivity growth. Mining and quarrying, agriculture and housing tend to experience wide fluctuations in productivity and have a relatively limited employment content. Public sector productivity measurement is subject to uncertainty, given that the output is not sold in a market and thus does not necessarily reflect the consumers’ assessment of the quality. Consequently, the focus is on the market-related part of the economy.
Weak productivity growth in the post-crisis period is an international phenomenon

Subdued productivity growth is not an isolated Danish phenomenon. Thus, productivity growth has also slowed in our European benchmark countries in the wake of the financial crisis, although the trend is particularly pronounced in Denmark, cf. the chart.

Several possible explanations have been offered for the declining productivity growth in the advanced economies. For instance, private investment dropped to low levels due to the need for consolidation among firms, a decline in demand and increased uncertainty in the aftermath of the financial crisis, cf. Kramp and Pedersen (2015). This may have contributed to dampening productivity growth. Moreover, several advanced economies are gradually undergoing a transition in which less capital-intensive services sectors account for a growing share of employment.

Productivity growth may be further hampered by less dynamic resource reallocation, for example due to fewer business openings and closures, as is the case in the USA, and less knowledge dissemination. An OECD study (2015) finds that innovative technology firms continue to experience strong productivity growth. It is the pace of knowledge dissemination from high-productivity firms to less productive firms which has slowed down.

Another explanation is linked to measurement errors, for instance due to technological advances where online shopping, free web applications and quality improvements of e.g. smartphones may be difficult to measure.

International productivity growth

<table>
<thead>
<tr>
<th>Avg. annual growth, per cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5</td>
</tr>
<tr>
<td>3.0</td>
</tr>
<tr>
<td>2.5</td>
</tr>
<tr>
<td>2.0</td>
</tr>
<tr>
<td>1.5</td>
</tr>
<tr>
<td>1.0</td>
</tr>
<tr>
<td>0.5</td>
</tr>
<tr>
<td>0.0</td>
</tr>
<tr>
<td>-0.5</td>
</tr>
</tbody>
</table>

Note: EU-19 covers euro area member states.
Source: OECD.

Weak productivity growth since the crisis has amplified the debate about whether future technological advances will make substantial contributions to productivity growth. Gordon (2012), among others, argues that the productivity gain from technological advances has diminished and will not necessarily increase in the future. According to Gordon, the technological breakthroughs of the 19th and early 20th centuries, for instance electricity and the internal combustion engine, boosted productivity more than the breakthroughs of recent decades, including flat screen televisions, smartphones, etc.

Others take a more optimistic view of the future, including Brynjolfsson and McAfee (2011), Byrne et al. (2013) and Miller and Atkinson (2014). They argue, inter alia, that we are still in the early stages of a process in which digitisation will continue to produce efficiency gains in individual sectors of the economy, while interconnected innovations and spin-offs will be the source of increased productivity growth in the future. However, history shows that technological breakthroughs and their impacts on productivity growth are subject to considerable uncertainty.
Output and employment in the Danish economy

Chart 2

Output and employment

Index, 2012 = 100

GDP

Employment


97 98 99 100 101 102 103

Note: Right-hand chart: Productivity is measured as GVA per hour for the whole economy.
Source: Statistics Denmark.

Contribution to overall productivity growth from mining and quarrying

Chart 3

Percentage points

-0.6 -0.4 -0.2 0.0 0.2 0.4

95 97 99 01 03 05 07 09 11 13 15

Note: The broken line indicates a simple average since 2006 when North Sea production began to decrease.
Source: Statistics Denmark.

SUBDUED PRODUCTIVITY GROWTH IS BROADLY BASED ACROSS INDUSTRIES

Sluggish productivity growth during the upswing is broadly based across the non-primary sector, but seems to be particularly pronounced in construction, finance and insurance and trade and transport, etc., cf. Chart 4. Part of the decline in trade and transport, etc., probably reflects a reduction in sea transport during 2015. In manufacturing, productivity has generally been increasing in recent years, albeit with some volatility. Productivity in information and communication has been rising steadily for a long period of time.

PRODUCTIVITY GROWTH HAS BEEN PARTICULARLY SLUGGISH DURING THE CURRENT UPSWING

Sluggishness in the adjustment of labour often entails more intensive resource utilisation among firms as demand picks up. Thus, productivity will tend to increase the most in the early stages of a cyclical recovery. However, this does not seem to be the case during the current upswing in which productivity in the non-primary sector has been very modest, cf. Chart 5 (left). As capacity pressures build during the upswing, persons with a weaker attachment to the labour market will typically account for a larger share of the growth in employment, which normally dampens productivity growth.

In practice, distinguishing between quality improvements and price developments can be difficult, especially at industry level, cf. Danish Productivity Commission (2013). Nominal value added per hour in the private non-primary sector has risen more than real productivity compared with previous upswings, cf. Chart 5 (right). Especially manufacturing and finance and insurance have benefited from relatively favourable price developments.

3 Productivity developments at industry level, especially in construction, may be subject to statistical uncertainty, cf. Danish Productivity Commission (2015).
Productivity development in the private non-primary sector, broken down by industry

Chart 4

Note: The chart is based on GVA per hour for industries in the private non-primary sector, excluding some small industries. In the non-primary sector, the industries’ share of GVA is: manufacturing 22 per cent; trade and transport, etc. 28 per cent; business service 13 per cent; finance and insurance 10 per cent; information and communication 7 per cent; and construction 7 per cent.

Source: Statistics Denmark and own calculations.

Real and nominal hourly productivity in the private non-primary sector during economic upswings

Chart 5

Note: Productivity is defined as real and nominal GVA per hours worked, respectively, in the private non-primary sector. The definition of upswing periods follows Pedersen et al. (2015).

Source: Statistics Denmark.
SECTOR SHIFTS CONTRIBUTE TO WEAK PRODUCTIVITY GROWTH

Productivity growth in individual industries naturally has an impact on aggregate productivity developments in the economy. However, the relationship is not necessarily one-to-one, given that aggregate productivity growth also depends on the relative sizes of the industries and their levels of productivity. Even if no individual industry experiences productivity growth, productivity growth could still be achieved for the economy as a whole by shifting resources to more productive industries and vice versa.

THE GROWTH IN EMPLOYMENT IS MAINLY IN SERVICES

Throughout the upswing, the increase in employment has occurred primarily in the private sector where the number of hours worked has increased by around 5 per cent since 2012. This means that just under half of the decline in hours worked from 2008 to 2012 in the private sector has been reversed over the past three years. The rise is broad-based, but seems to be particularly pronounced among industries with low GVA per hour, cf. Chart 6. A few industries have experienced an actual contraction in employment. These include industries with high GVA per hour, such as finance and insurance where the number of hours worked has decreased in recent years.

Some industries, especially in the services sector, have contributed more to a higher number of hours worked, cf. Table 1. These include employment and temp agencies, cleaning and other operational services, hotels and restaurants, postal and courier services, wholesale trade and education-intensive sectors such as lawyers, accountants, architects and engineers. In construction and the pharmaceutical industry, the number of hours worked has also increased substantially.

In some sectors, developments in employment may be affected especially by political measures or changes in underlying trends. As a case in point, tax deductibility of home repairs and improvements has presumably contributed to shifting demand to construction and cleaning, both of which have relatively low GVA per hour. Growing online trade may also have helped to increase employment in postal and courier services.

SECTOR SHIFTS HAVE DAMPENED PRODUCTIVITY GROWTH DURING THE UPSWING

When an industry such as business services, with relatively low GVA per hour as a whole, accounts for an increasing share of employment, this per se contributes to weaker aggregate productivity growth, cf. Chart 7. Similarly, viewed in isolation, the decrease in employment in, for instance, finance and insurance has contributed to lower aggregate productivity growth, since GVA per hour is generally relatively high.

A decomposition indicates that between-sector shifts alone detracted 0.3 percentage point from productivity growth in the non-primary

---

4 Business services comprise the industries travel agents, cleaning and other operational services as well as knowledge-based services.

5 A sector shift may occur both as a result of a change in the allocation of industries’ share of hours worked and as a result of new relative prices. If a high-productivity industry experiences a relatively deterioration in prices, this may lead to lower aggregate productivity growth, given that it subsequently has less weight in the total output of the economy.
Increase in hours worked, broken down by industry 2012-2015

<table>
<thead>
<tr>
<th>Industry</th>
<th>Increase in hours worked</th>
<th>Share of total increase in hours worked</th>
</tr>
</thead>
<tbody>
<tr>
<td>Travel agents, cleaning and other operational services</td>
<td>16</td>
<td>19</td>
</tr>
<tr>
<td>Knowledge-based services</td>
<td>10</td>
<td>18</td>
</tr>
<tr>
<td>Construction</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>Hotels and restaurants</td>
<td>15</td>
<td>12</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>Transport</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>Trade</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Other industries</td>
<td>0</td>
<td>6</td>
</tr>
</tbody>
</table>

Note: The table is based on figures for the whole economy. The industry travel agents, cleaning and other operational services includes, inter alia, temp agencies, while knowledge services include lawyers, accountants, architects, engineers, etc. Collectively, travel agencies, cleaning and other operational services and knowledge services are referred to as business services. In addition to postal and courier services, transport also includes shipping and air transport as well as land transport, while trade includes car sales, wholesale and retail trade. Collectively, hotels and restaurants and trade are often referred to as trade, etc.

Source: Statistics Denmark.

Sector shifts in the private non-primary sector during the upswing

Note: The chart focuses on industries in the private non-primary sector, excluding some small industries. The shaded area indicates that sector shifts have contributed negatively to aggregate productivity growth. The sizes of the bubbles are proportional to the industries’ share of nominal GVA in the private non-primary sector. Trade, etc. includes trade, hotels and restaurants.

Source: Statistics Denmark and own calculations.
DECOMPOSITION OF PRODUCTIVITY GROWTH IN THE PRIVATE NON-PRIMARY SECTOR

Chart 8

Percentage points

1.5
1.0
0.5
0.0
-0.5
1995-2010 2011-15

Contributions from sector shifts
Within-sector contributions
Total productivity growth

Note: The decomposition used is based on the approach in Tang and Wang (2004). A simple average of annual growth contributions is used.

Source: Statistics Denmark and own calculations.

This indicates that between-sector shifts have, to some extent and to a greater extent than previously, contributed to weak productivity growth during the upswing. Sector shifts may reflect efficient adjustments to changes in demand patterns that are appropriate from an overall perspective, although they may, in the first instance, have a negative impact on productivity growth at the macro level.

Viewed in isolation, within-sector productivity growth boosted productivity growth by 0.7 percentage points from 2011 to 2015. However, this is less than previously, which also contributed to weaker productivity growth in the private non-primary sector.

LOWER CAPITAL INTENSITY DAMPENS PRODUCTIVITY GROWTH

Labour productivity refers to the amount of output produced per hour, without taking the use of any other production factors into account. However, efficiency in the production of goods and services also depends on firms’ capital stock such as machinery and buildings and on other resources in the economy such as the quality and educational level of the labour force. To take these factors into account, productivity can be decomposed into contributions from observable input factors and total factor productivity, i.e. the portion of productivity growth that cannot be immediately explained by input factors. Total factor productivity includes technical advances in the broad sense of the word, but also between-sector shifts.

Results indicate that reduced capital intensity has contributed to declining productivity growth in the Danish economy since the mid-1990s, cf. Chart 9, partly reflecting a structural shift from manufacturing to services. There are indications that the trend towards lower capital intensity has accelerated during the upswing, for instance as a result of subdued investment activity after the crisis. The decline in productivity growth should also, to a great extent, be attributed to the cessation of strong growth in total factor productivity, the reason for which is not clear.

Part of the explanation could be that the survival rate of firms has been relatively high after the financial crisis compared with earlier recessions. This is likely to have weakened productivity-enhancing reallocation of economic resources, cf. Box 2.

Chart 9

Percentage points

4
3
2
1
0
-1

Total factor productivity
Other capital intensity
IT capital intensity
Total productivity growth

Note: The chart shows a simple average of annual growth contributions to productivity in the market economy measured by gross domestic product at factor cost, GDPFC, per hour.

Source: Statistics Denmark.

6 The decomposition of productivity growth into contributions from sector shifts and within-sector productivity developments is based on 16 individual industries in the private non-primary sector, for which data is available until and including 2015. The calculation does not take possible within-sector shifts into account.
Is the low level of interest rates buoying up low-productivity firms? 

The establishment of new firms and closure of old ones are important aspects of the dynamic resource allocation process to ensure that production is optimised. Economic growth is not just about the creation of new jobs and firms – it also entails that a number of existing firms and jobs become superfluous and disappear. Lower demand in an economic downturn tends to stimulate this adjustment process. The reason is that corporate earnings are reduced, which may lead to employment reductions or defaults, especially among low-productivity firms. This will have a negative short-term economic impact on the economy, but in the process resources and labour will be released, which can be used by more productive firms during a subsequent economic upswing.

Six years after the financial crisis, the survival rate of firms in the private non-primary sector has been higher than during the downturn in the early 2000s, cf. the chart. This is despite the fact that the negative shock to the economy in 2008 and the subsequent recession were considerably stronger. A key difference between the two periods is that the current level of interest rates is lower, which may have helped to buoy up highly leveraged, low-productivity firms and prevent productivity-enhancing allocation of economic resources.

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**Share of surviving firms in the private non-primary sector and GDP during various economic downturns**

<table>
<thead>
<tr>
<th>Year</th>
<th>Share of surviving firms</th>
<th>GDP per capita</th>
</tr>
</thead>
<tbody>
<tr>
<td>t</td>
<td>100</td>
<td>110</td>
</tr>
<tr>
<td>t+1</td>
<td>95</td>
<td>105</td>
</tr>
<tr>
<td>t+2</td>
<td>90</td>
<td>100</td>
</tr>
<tr>
<td>t+3</td>
<td>85</td>
<td>95</td>
</tr>
<tr>
<td>t+4</td>
<td>80</td>
<td>90</td>
</tr>
<tr>
<td>t+5</td>
<td>75</td>
<td>85</td>
</tr>
<tr>
<td>t+6</td>
<td>70</td>
<td>80</td>
</tr>
</tbody>
</table>

**2000**

**2007**

Note: On the x-axis, t denotes the first year of the downturn. Only firms with at least 10 employees are included. A detailed description of the sample is provided in Kuchler (2015).

Source: Own calculations based on firm data for the private non-primary sector from Statistics Denmark.

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SUSTAINABLE EMPLOYMENT GROWTH

NO INDICATIONS OF IMBALANCE BETWEEN DEVELOPMENTS IN PRODUCTIVITY AND WAGES

The decoupling of output and the labour market situation calls into question future productivity growth and the actual sustainability of the growth in employment seen during the last year or so. The wage share, reflecting the relationship between product real wages and productivity, can be used to assess whether the growth in employment is sustainable or not. If productivity is out of sync with firms’ prices relative to hourly wages, the wage share will be increasing. Thus, in principle, wage increases are compatible with unchanged productivity and will not, per se, result in adjustment of employment, provided prices rise similarly.

Wage share developments do not indicate a general imbalance in the employment-intensive private non-primary sector excluding transport. The adjustment for fluctuations related to the transport industry reflects that this industry is currently characterised by declining earnings.

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7 Product real wages measure firms’ hourly payroll costs relative to the price of their products measured by the GVA deflator.
from shipping, which has a limited content of domestic employment. Although the wage share in the private non-primary sector excluding transport has risen in recent quarters, there was a similar fall towards the end of 2014, and, viewed over a longer period, the wage share is in line with its average since 2000, cf. Chart 10. This indicates low risk of labour market moderation, and the growth in employment is currently assessed to be sustainable, albeit with potential regional and industry-specific differences.

The wage share in the manufacturing industry has been declining in recent years. This is partly attributable to a sector shift of activities towards sectors with relatively low wage shares. This is particularly true of the pharmaceutical industry, whose progress alone accounted for almost half of the decrease in the manufacturing industry’s total wage share from 2008 to 2014.\(^8\) However, the wage restraint of recent years is also contributing to a falling wage share in the manufacturing industry.

Construction is one of the industries experiencing the greatest increase in the wage share during the upswing. This indicates that capacity pressures are building, which is also underpinned by labour shortage indicators. In the services sectors, wage shares are high, seemingly trending upwards.

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\(^8\) Data at detailed industry level is available only until 2014.
WEAK PRODUCTIVITY DEVELOPMENT COULD LEAD TO A PROLONGED PERIOD OF LOW GROWTH

In principle, recent productivity developments may reflect temporary fluctuations as well as factors of a more structural nature. GDP growth in Danmarks Nationalbank’s projection is based on an assumption of restoration of productivity growth to a level roughly matching the average level since 1995, cf. Chart 11 (left). In the coming years, sector shifts and lower capital intensity may put more downward pressure on productivity growth than assumed in the projection. If so, this will entail a prolonged period of low output growth. If weak productivity growth persists over the projection period, the expected increase in demand will cause capacity pressures to tighten faster than assumed. This may result in upward pressure on wages – and there is some scope for this without the emergence of imbalances. The possibilities of higher wage increases should be seen in light of persistently large current account surpluses.

PRODUCTIVITY IS NOT THE ONLY SOURCE OF INCREASED PROSPERITY

Productivity is a key driver of economic growth, but it is not the only source of increased prosperity. For a prolonged period of time, Denmark has benefited from substantially improved terms of trade, i.e. the prices at which Danish exporters are selling goods and services in the world market have increased more than the import prices at which Danish households and firms are buying. This, in combination with a high return on foreign assets, has expanded consumption opportunities and brought greater prosperity, even if productivity growth has been weak. This is in contrast to the situation in several of our neighbouring countries, where the terms of trade have been either constant or deteriorating, cf. Chart 11 (right). Productivity gains are often passed on to consumers in the form of lower prices. When countries have specialised in industries with high productivity growth such as IT and electronics products, this is typically accompanied by downward pressure on prices. This way, Denmark has also benefited from productivity gains generated abroad. This has helped to ensure that the Danish economy has performed in line with comparable countries since 2007 when the focus is on prosperity developments in the broader sense of the word, cf. Chart 12.

Danmarks Nationalbank’s projection and development in terms of trade

Chart 11

<table>
<thead>
<tr>
<th>Percentage points</th>
<th>Index, 1995 = 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>-6</td>
<td>70</td>
</tr>
<tr>
<td>-4</td>
<td>80</td>
</tr>
<tr>
<td>-2</td>
<td>90</td>
</tr>
<tr>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>110</td>
</tr>
<tr>
<td>4</td>
<td>120</td>
</tr>
<tr>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

Note: Left-hand chart: productivity is measured as GDP per employee. Source: Danmarks Nationalbank and Eurostat.
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Danish Productivity Commission (2013), Danmarks produktivitet – hvor er problemerne? (Danish productivity – where are the problems? – in Danish only), *Analyserapport 1*.

PASS-THROUGH FROM DANMARKS NATIONALBANK’S INTEREST RATES TO THE BANKS’ INTEREST RATES

Rasmus KofOed Mandsberg, Financial Statistics and Søren Lejsgaard Atrup and Lars Risbjerg, Economics and Monetary Policy

INTRODUCTION AND SUMMARY

Danmarks Nationalbank sets its interest rates in accordance with the fixed exchange rate policy against the euro. Monetary policy rates are fully passed through to money market rates, which determine the exchange rate of the krone.

Danmarks Nationalbank’s interest rates also have a marked impact on bank interest rates to households and the corporate sector. As regards bank lending rates, the pass-through from Danmarks Nationalbank was reduced significantly in connection with the financial crisis in the autumn of 2008, when bank lending rates were slow to follow the sizeable reductions of Danmarks Nationalbank’s interest rates in the following months. The pass-through was relatively quickly restored, however.

The banks determine their lending rates on the basis of the costs of funding the loans and the risk on the loans. When bank funding costs are taken into account in the explanation of the pass-through from the rate of interest on certificates of deposit, there is no notable difference in the pass-through to lending rates before and after the financial crisis. Thus, the banks did not fundamentally change their setting of lending rates in connection with the financial crisis. The lending rates are set in the same way, irrespective of whether Danmarks Nationalbank’s interest rates are positive or negative.

The pass-through from Danmarks Nationalbank’s interest rates to bank corporate and household deposit rates has been reduced due to the low level of interest rates. The banks have been hesitant to pass on Danmarks Nationalbank’s negative rate of interest to small firms and especially to households, which have been exempt from negative deposit rates.

The first section provides a brief outline of the link between Danmarks Nationalbank's interest rates and bank interest rates. The pass-through from Danmarks Nationalbank’s interest rates to bank interest rates for households and non-financial corporations is then estimated. In the final section, bank funding costs are taken into account in the estimation of the pass-through.

MONETARY POLICY TRANSMISSION

The fixed exchange rate policy against the euro means that Danmarks Nationalbank’s interest rates are solely used to manage the exchange rate of the krone vis-à-vis the euro. For the banks, monetary policy rates function as alternatives to the interest rates on loans and placements in the money market, whereby monetary policy rates determine money market rates, which are key to the exchange rate of the krone.

Money market rates are determined by Danmarks Nationalbank’s deposit rate, i.e. the rate of interest on certificates of deposit, CD rate, when the monetary policy counterparties need to deposit substantial funds with Danmarks Nationalbank. Banks and mortgage banks can invest liquidity in certificates of deposit or deposit funds in current accounts with Danmarks Nationalbank. At times of negative CD rate, the current account limits for the banks ensure that an increase in to-
tal deposits with Danmarks Nationalbank will earn interest at the CD rate, which then becomes key for money market rates.

Negative deposit rates are widespread for pension and insurance companies, as their alternatives to bank deposits are placement on money market-like terms. The pressure on the krone at the beginning of 2015 was driven by the demand from insurance and pension companies and foreign investors for placements in kroner. The latter could place their krone funds via credit institutions. Bank deposit rates for insurance and pension companies and credit institutions have been clearly negative, cf. Chart 1.

Monetary policy rates and money market rates also determine bank interest rates for households and non-financial corporations. For the individual banks, money market placements and loans offer an alternative to bank retail lending and deposits.

THREE EPISODES OF FALLING INTEREST RATES

Interest rates in the economy have fallen to an extraordinarily low level, cf. Chart 2. Overall, there are three episodes of falling interest rates associated with the following events: the financial crisis, the sovereign debt crisis in a number of euro area member states and the pressure on the krone in early 2015. Interest rates declined already prior to the pressure on the krone in the light of low inflation in the euro area and the European Central Bank’s, the ECB’s, easing of monetary policy.

In general, bank interest rates to households and non-financial corporations did not fully mirror the fall in the CD rate during the three episodes, with the exception of the lending rate during the latest interest rate decline, cf. Chart 3. The development is reflected in interest margins, which widened espe-
cially in connection with the financial crisis, but also during the sovereign debt crisis, cf. Chart 4.

On the deposit side, one potential explanation is the intensified competition for deposits, fuelled by liquidity problems in the banking sector in connection with the financial crisis. Many banks tried to raise liquidity by maintaining high deposit rates despite the declining monetary policy rates.

Until the financial crisis, deposit rates for households and the corporate sector were lower than the CD rate. During the interest rate drop in connection with the financial crisis, deposit rates crossed the CD rate and have since then generally been higher than the CD rate. The main driver of this development is the low level of monetary policy rates since 2010. The prevalence of negative deposit rates is limited for households and non-financial corporations – households are exempt and around 30 per cent of deposits from non-financial corporations have negative interest rates. The banks’ hesitation to introduce negative deposit rates for households probably reflects that negative interest rates could induce some households to cash in their bank deposits. Handling large cash amounts would entail substantial costs for banks, as their facilities are not designed for a large increase in cash positions, and higher insurance payments would also be required, cf. Jensen and Spange (2015). Moreover, unless all banks introduce negative interest rates at the same time, this would prompt customers to switch banks.

Heightened risk is an important reason why lending rates did not mirror the fall in the CD rate during the financial crisis and the sovereign debt crisis. The banks’ expected losses related to credit risk on borrowers constitute a lending cost for which the banks must be compensated. The compensation is in the form of an interest premium added to funding costs and other lending costs, cf. Abildgren and Kuchler (2013).

MEASURING PASS-THROUGH

Changes in bank interest rates may occur with some lag, e.g. due to incomplete competition and adjustment costs, and it is relevant to decompose the pass-through from the CD rate into an immediate short-term effect and a total long-term effect. Finally, it is relevant to find out how quickly the total adjustment happens. This is possible to assess by estimating an error correction model, cf. Box 1. The model is also used to estimate the average spread between bank interest rates and monetary policy rates as an expression of the average deposit or lending margin in the estimation period. The model is estimated on monthly
Model for estimation of the pass-through from monetary policy rates to bank interest rates

For measurement of the pass-through, an error correction model is estimated, described by the following equation:  

$$\Delta br_t = \alpha \Delta pp_{t} + \gamma [br_{t-1} + \beta br_{t-1} + \mu - \beta pp_{t-1}] + e_t$$

where $\Delta$ denotes the change from one period to the next, $br$ is bank deposit or lending rates, and $pp$ is the monetary policy rate (CD rate). The short-term pass-through from the monetary policy rate to bank interest rates is given by the coefficient $\alpha$. If the model is estimated on monthly data, the coefficient gives the pass-through in the same month. $\beta$ is the long-term total pass-through from the long-run relation:  

$$br_{t-1} = \mu + \beta pp_{t-1}$$

$\mu$ is a constant denoting the average spread between the bank’s interest rate and the monetary policy rate, i.e. the deposit and lending margin. $\gamma$ is an expression of the monthly adjustment to the total pass-through after the short-term pass-through. The average number of months, after the adjustment in the first month, it takes to reach the total pass-through to bank interest rates can be given as $(\beta \cdot \alpha)/(\gamma - \beta)$.

In order to ensure a stationary relationship between the lending rate and the monetary policy rate, the following must apply: $\gamma < 0$ (and $\gamma > -2$) and $\beta > 0$. If $\gamma$ is not lower than zero, the lending rate will rise when it is higher than its long-term value.

Impact of the financial crisis

There are clear indications of structural changes in the pass-through from the CD rate in connection with the financial crisis, especially for lending rates. In order to assess whether the pass-through has changed in connection with the financial crisis, the period since 2003 is divided into three sub-periods: pre-financial crisis (January 2003-August 2008), the intensive part of the financial crisis (September 2008-December 2008) and post-financial crisis (January 2009-). By means of dummy variables the model parameters are allowed to be different in the three periods, and the estimates before and after the financial crisis are compared.

As a robustness check, estimations are made for an extended financial crisis period including the first three months of 2009 and the full year 2009. After the peak of the financial crisis in September and October 2008, the focus was on the global slowdown until March 2009, followed by signs of stabilisation, cf. BIS (2009). ECB (2011) and Avouyi-Dovi (2015) operate with a financial crisis period from September 2009 to December 2009, after which time the ECB began to phase out its crisis-related measures.

Impact of a negative CD rate, sovereign debt crisis and pressure on the krone

In the post-financial crisis period we also test whether the estimates change in the periods related to the sovereign debt crisis in the euro area (July 2011-July 2012), a negative CD rate (July 2012-April 2014 and September 2014- ) and the pressure on the krone and subsequent low interest rate level (January 2015-February 2016).


In general, the pass-through can be affected by different characteristics of bank interest rates and monetary policy rates, such as maturity. The analysis is performed for interest rates on outstanding loans and deposits rather than new business, as there is less noise in outstanding loan series. Interest rates on new lending may be sensitive to customer and product structures. The pass-through to outstanding loans may be affected by the administrative adjustment of retail interest rates with some lag. However, lending consists primarily of variable rate loans, while deposits are mostly demand deposits. As a result, interest rate changes will still be passed through, even if it is not solely new business.¹

Estimations are made for the whole period, i.e. the pre-financial crisis period (January 2003-August 2008), and the post-financial crisis period (January 2009-February 2016). As a robustness check, estimation is also performed of the pass-through in the low interest rate environment from 2010 (January 2010-February 2016). The results are summarised in Table 1.

For the post-crisis period, it is examined whether the pass-through differs between months with a negative and positive CD rate. Furthermore, it

¹ See Carlsen and Fæste (2007) for a description of statistics for deposits and lending rates. Carlsen and Fæste (2007) and Drejer et al. (2011) also perform estimations of the pass-through from monetary policy rates to the banks’ retail interest rates.
is examined whether the pass-through changed after the pressure on the krone in early 2015 and the subsequent clearly negative CD rate. Finally, it is examined whether the pass-through changed in connection with the sovereign debt crisis in a number of euro area member states.

**PASS-THROUGH TO DEPOSIT RATES**

As expected, the banks’ restraint in following the decline in the CD rate in connection with the financial crisis and not introducing negative deposit rates for households in particular caused the pass-through to deposit rates to fall, cf. Table 2. After the financial crisis, the pass-through was around half, or less, of the pre-crisis level.

Before the financial crisis, full total pass-through was seen from the CD rate to both corporate and household deposit rates. The coefficient on total pass-through was practically 1, while the short-term pass-through was 0.6 for both the corporate sector and households. The adjustment to total pass-through happened quickly for corporate deposit rates. After the initial adjustment of 0.6 in the first month, the gap was further reduced by 0.4 in the following month. The adjustment to total pass-through thus took about two months. It took a little longer for households – about three months.

---

### Pass-through from Danmarks Nationalbank’s interest rates to bank deposit and lending rates

<table>
<thead>
<tr>
<th>Deposit rates</th>
<th>Post-financial crisis 2009-16</th>
<th>In low interest rate environment 2010-16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lending rates</td>
<td>Pass-through lower than pre-crisis level</td>
<td>Pass-through close to pre-crisis level</td>
</tr>
</tbody>
</table>

---

### Estimation of pass-through from the CD rate to deposit rates for the whole period, pre-financial crisis, post-financial crisis and change in the pass-through

<table>
<thead>
<tr>
<th>Non-financial corporations</th>
<th>Whole period</th>
<th>Pre-crisis</th>
<th>Post-crisis</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spread between deposit rate and CD rate</td>
<td>0.20 *</td>
<td>-0.40 ***</td>
<td>0.34 ***</td>
<td>0.74 ***</td>
</tr>
<tr>
<td>Short-term pass-through</td>
<td>0.61 ***</td>
<td>0.63 ***</td>
<td>0.25 ***</td>
<td>-0.38 ***</td>
</tr>
<tr>
<td>Total pass-through</td>
<td>0.82 ***</td>
<td>0.97 ***</td>
<td>0.52 ***</td>
<td>-0.45 ***</td>
</tr>
<tr>
<td>Adjustment to total pass-through</td>
<td>0.09 **</td>
<td>0.43 ***</td>
<td>0.24 ***</td>
<td>-0.19 *</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Households</th>
<th>Whole period</th>
<th>Pre-crisis</th>
<th>Post-crisis</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spread between deposit rate and CD rate</td>
<td>0.32</td>
<td>-1.16 ***</td>
<td>0.93 ***</td>
<td>2.09 ***</td>
</tr>
<tr>
<td>Short-term pass-through</td>
<td>0.48 ***</td>
<td>0.55 ***</td>
<td>0.19 ***</td>
<td>-0.35 ***</td>
</tr>
<tr>
<td>Total pass-through</td>
<td>0.95 *</td>
<td>1.09 ***</td>
<td>0.32 ***</td>
<td>-0.77 ***</td>
</tr>
<tr>
<td>Adjustment to total pass-through</td>
<td>0.01</td>
<td>0.21 ***</td>
<td>0.20 ***</td>
<td>-0.01</td>
</tr>
</tbody>
</table>

Note: Estimated on monthly data for interest rates on outstanding domestic loans in kroner from January 2003 to February 2016. The pre-crisis period is January 2003-August 2008. The post-crisis period is January 2009-February 2016. Change is the difference between pre-crisis and post-crisis estimates. *, ** and *** denote levels of significance of 10, 5 and 1 per cent, respectively, based on Newey-West standard errors.
Deposit rates during the episodes of negative CD rate, sovereign debt crisis and pressure on the krone

Deposit rates did not mirror the CD rate either during the sovereign debt crisis or during the episode of pressure on the krone in early 2015, cf. Chart 5. As expected, the lower level of interest rates reduced the pass-through to corporate deposit rates, especially during the pressure on the krone, cf. Table 3.

Conversely, the total pass-through for households increased during the pressure on the krone. This reflects more stickiness in household deposit rates in response to the changes in the CD rate in the period up to the pressure. Especially the time deposit rate fell in connection with the pressure on the krone, while the pass-through for demand deposits did not change to any significant degree. The fall was most pronounced for deposit rates in medium-sized banks. Medium-sized banks typically have poorer access to market-based funding sources such as bond issuance than large banks, which gives them a greater incentive to retain depositors. Moreover, time deposits or deposits redeemable at notice make up a large share of their deposits. The need to attract funding via time deposits thus seems to have diminished.

**PASS-THROUGH TO LENDING RATES**

Before the financial crisis, there was close to full total pass-through to lending rates for both non-financial corporations and households, cf. Table 4. During the period of falling interest rates in connection with the financial crisis, bank lending rates did not mirror the CD rate all the way down. Consequently, the pass-through was reduced considerably in the period of strongly heightened financial and economic risks.

In the period after the financial crisis, the strength of the pass-through depends on the estimation period chosen. Measured in the period from immediately after the intensive part of the financial crisis, the total pass-through for non-financial corporations was reduced after the financial crisis.² If the financial crisis period is extend-

² If the financial crisis period is extended to include the first three months of 2009, the change is not statistically significant either for households or for non-financial corporations.
Accumulated changes in deposit rates on reduction of the CD rate in connection with the sovereign debt crisis and low inflation in the euro area and pressure on the krone

Chart 5


Source: Danmarks Nationalbank.

Pass-through from the CD rate to lending rates for the whole period, pre-financial crisis, post-financial crisis and change in the pass-through

Table 4

<table>
<thead>
<tr>
<th>Non-financial corporations</th>
<th>Whole period</th>
<th>Pre-crisis</th>
<th>Post-crisis</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spread between lending rate and CD rate</td>
<td>3.54 ***</td>
<td>2.73 ***</td>
<td>3.84 ***</td>
<td>1.11 ***</td>
</tr>
<tr>
<td>Short-term pass-through</td>
<td>0.42 ***</td>
<td>0.18 **</td>
<td>0.35 ***</td>
<td>0.17</td>
</tr>
<tr>
<td>Total pass-through</td>
<td>0.67 ***</td>
<td>0.86 ***</td>
<td>0.61 ***</td>
<td>-0.25 **</td>
</tr>
<tr>
<td>Adjustment to total pass-through</td>
<td>0.07 *</td>
<td>0.14 ***</td>
<td>0.16 ***</td>
<td>0.03</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Households</th>
<th>Whole period</th>
<th>Pre-crisis</th>
<th>Post-crisis</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spread between lending rate and CD rate</td>
<td>4.90 ***</td>
<td>3.36 *</td>
<td>5.13 ***</td>
<td>1.76</td>
</tr>
<tr>
<td>Short-term pass-through</td>
<td>0.54 ***</td>
<td>0.29 ***</td>
<td>0.47 ***</td>
<td>0.17</td>
</tr>
<tr>
<td>Total pass-through</td>
<td>0.70 ***</td>
<td>1.17 **</td>
<td>0.30</td>
<td>-0.87</td>
</tr>
<tr>
<td>Adjustment to total pass-through</td>
<td>0.05 ***</td>
<td>0.05 *</td>
<td>0.07 **</td>
<td>0.03</td>
</tr>
</tbody>
</table>

Note: Estimated on monthly data for interest rates on outstanding domestic loans in kroner from January 2003 to February 2016. The pre-crisis period is January 2003-August 2008. The post-crisis period is January 2009-February 2016. Change is the difference between pre-crisis and post-crisis estimates. *, ** and *** denote levels of significance of 10, 5 and 1 per cent, respectively, based on Newey-West standard errors.
ed to include the full year 2009, the difference in total pass-through before and after the financial crisis is neither particularly large nor statistically significant. Given this delineation, there is no significant difference between the short-term pass-through before and after the financial crisis either. This applies to both households and non-financial corporations. Thus, the pass-through from Danmarks Nationalbank’s interest rates to lending rates was restored relatively quickly after the financial crisis, and there was close to full pass-through both in the pre-crisis period and in the low interest rate environment from 2010.

**Lending rates during the episodes of negative CD rate, sovereign debt crisis and pressure on the krone**

A negative CD rate did not as such imply a lower pass-through from the CD rate to lending rates, cf. Table 5.

In connection with the sovereign debt crisis, lending rates followed the CD rate down only to a limited extent, cf. Chart 6 (left). The sovereign debt crisis led to a larger average spread between lending rates and the CD rate, i.e. the lending margin, for both non-financial corporations and households in the light of the heightened financial and economic risk.

In the period of pressure on the krone, corporate lending rates did not fall immediately, but matched the fall in the CD rate over time, cf. Chart 6 (right). This may reflect that the banks did not lower their lending rates until it was clear that the interest rate reduction was more prolonged. Since then, the ECB lowered its key interest rates further due to a weak growth and inflation outlook in the euro area, and the market expects interest rates to remain low for a long time. In general, the fixed exchange rate policy against the euro means that Danmarks Nationalbank adjusts its interest rates in step with the ECB’s key interest rates in a calm foreign exchange market. In situations with upward or downward pressure on the krone, Danmarks Nationalbank unilaterally changes its interest rates in order to stabilise the krone. If the banks perceive unilateral Danish interest rate adjustments as temporary, they are less likely to pass on the adjustments to retail rates. The estimation of the pass-through shows a reduction in the short-term pass-through for corporate lending,

<table>
<thead>
<tr>
<th>Change in pass-through to lending rates during the episodes of negative CD rate, sovereign debt crisis and pressure on the krone in early 2015</th>
<th>Table 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Non-financial corporations</strong>&lt;br&gt;Spread between lending rate and CD rate</td>
<td>-0.05</td>
</tr>
<tr>
<td>Short-term pass-through</td>
<td>-0.11</td>
</tr>
<tr>
<td>Total pass-through</td>
<td>0.61 **</td>
</tr>
<tr>
<td>Adjustment to total pass-through</td>
<td>-0.05</td>
</tr>
</tbody>
</table>

**Households**

| Spread between lending rate and CD rate | -0.11 | 0.79 *** | 0.02 |
| Short-term pass-through | -0.11 | -0.15 | 0.01 |
| Total pass-through | 0.91 | -0.14 | 0.81 *** |
| Adjustment to total pass-through | -0.08 | 0.66 *** | 0.29 ** |

Note: Estimated on monthly data for interest rates on outstanding domestic loans in kroner from January 2009 to February 2016. Negative CD rate is the period July 2012-April 2014 and September 2014-February 2016. Sovereign debt crisis is the period July 2011-July 2012. Pressure on the krone is the period January 2015-February 2016. *, ** and *** denote levels of significance of 10, 5 and 1 per cent, respectively, based on Newey-West standard errors.
while the change in the long-term pass-through was not statistically significant.

The total pass-through to lending rates for households increased significantly during the pressure on the krone. This may reflect the lower pass-through during the preceding period of a generally higher risk level.

LENDING RATES, RISK AND FUNDING COSTS

When setting lending rates, the banks take into account that they may incur losses on lending and that they have to raise funds for lending. Consequently, the final interest rate that the banks offer their customers is influenced by the risk on lending and the price of funding.

The banks raise funding, inter alia, via deposits from households and firms, borrowing in the money market, debt issuances and by increasing equity. In the literature, money market rates are often used to express marginal bank funding costs, because the individual bank is able to raise funding in the money market immediately and at its own initiative.

It is standard practice to use the overnight interest rate in pass-through studies, since this rate is the operational monetary policy target, cf. Gambacorta et al. (2014). On average, the overnight rate closely mirrors monetary policy rates. Overnight loans in the money market with limited risk and a certain trading activity account for only a very limited share of bank funding.

Funding via deposits has accounted for just under 80 per cent on average of Danish banks’ balance sheets since 2003. Moreover, since 2003 the banks have, on average, raised 8 per cent of their funding via equity, while the remainder comes from debt instruments.

Although a bank can raise very short-term funding for a loan via the margin, it cannot do so on average for the entire balance sheet. It is thus relevant to take the average cost into account when examining a bank’s funding costs. Box 2 outlines the development in an index for banks’ average funding costs.

The funding index followed the development in Danmarks Nationalbank’s CD rate closely until the financial crisis escalated in the autumn of 2008, cf. Chart 7 (left).

The financial crisis gave rise to a gap between the CD rate and the funding index. The gap arose because of the market perception of increasing total risk on banks and was evidenced by two factors. It became very expensive – if not impossible – for the banks to issue equity in the form of...
Index for bank funding costs

We derive an average shadow price for bank funding based on data on the banks’ use of the various funding sources and derived market prices for the funding sources.

<table>
<thead>
<tr>
<th>FUNDING SOURCES</th>
<th>FUNDING PRICE</th>
<th>WEIGHTED</th>
<th>LENDING RATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deposits</td>
<td>8%</td>
<td>6.8%</td>
<td>2.3%</td>
</tr>
<tr>
<td>Debt</td>
<td>14%</td>
<td>3.5%</td>
<td>5.6%</td>
</tr>
<tr>
<td>Equity</td>
<td>78%</td>
<td>1.6%</td>
<td></td>
</tr>
</tbody>
</table>

Note: The figures are examples of actual averages for 2003-15.

The funding index is based on a breakdown of the banks’ total balance sheets by deposits, debt funding and equity funding. A price is derived for each of the three funding sources, and on the basis of the prices a weighted price for bank funding is calculated – 2.3 per cent in the above illustration. It is important to apply an average approach, taking into account both volumes and prices of funding sources, as a change in e.g. the equity share could, all else equal, have an impact on the price of equity funding and debt funding.

The three components are derived as:
- **Deposits**: The rate of interest on deposits from households and non-financial corporations is calculated as the average of new time deposits and outstanding demand deposits. The interest rate on deposits from financial corporations is the overnight money market rate.
- **Debt**: The cost of debt issuance varies with the credit quality of the issuing bank. The proxy for the cost of debt funding is the 5-year swap rate (against 6-month Cibor) plus the 5-year CDS spread for senior debt issued by Danske Bank. This means that the proxy is most representative for uncollateralised debt issuances.
- **Equity**: The implied required return derived from bank share prices is used as the proxy for the cost of equity funding. It has been calculated indirectly by deriving a share risk premium for Euro Stoxx 600 and a loading factor (“CAPM beta”) for a Danish bank stock index (Nasdaq OMX Copenhagen Banks) relative to Euro Stoxx 600. This has formed the basis for calculation of the expected implied required return on the Danish bank stock index, cf. the method described in Danmarks Nationalbank (2016).

The funding index has declined in recent years, pushed down by falling prices for debt and deposit funding.

3 The funding index does not take into account that Bank Rescue Package 2 enabled the banks to raise equity funding via Additional Tier 1 capital from the government and to issue government-guaranteed bonds. However, the final interest rate on Additional Tier 1 capital and issuance with government guarantee did not differ materially from the derived implied price based on market information. Shares, and the spread between the CD rate and the debt funding rate widened. Lending risks are incorporated into the funding rate to the extent that depositors and purchasers of the banks’ debt issuances and shares as well as creditors and shareholders take the risk into account in the pricing of funding. On average, the required returns on both equity and debt are lower for banks with better capitalisation, cf. Danmarks Nationalbank (2016). A high level of equity enables the banks to suffer large losses without becoming distressed.

The funding index has declined in recent years, pushed down by falling prices for debt and deposit funding.
The interest margin calculated as the spread between the lending rate and the weighted funding rate is more stable over the period 2003-16 than the interest margin calculated as the spread between the lending rate and the CD rate, cf. Chart 7. The different developments in the two margins are particularly pronounced around the financial crisis in 2008-09 and the sovereign debt crisis in the euro area in 2011-12.

If the spread between the funding index and the CD rate is included in the pass-through model, the long-term pass-through increases, measured
Neither the short-term nor the total pass-through is statistically different before and after the financial crisis. As expected, the margin between lending rates and the CD rate is also reduced, and, moreover, it is roughly the same size before and after the financial crisis. Funding costs thus contribute to explaining the change in the lending margin level in connection with the financial crisis.

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4 See Illes et al. (2015) for calculation of funding costs and pass-through to lending rates for non-financial corporations.
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SCENARIOS FOR NORMALISATION OF THE LEVEL OF INTEREST RATES


INTRODUCTION AND SUMMARY

Bonds have generated large capital gains and positive returns over the last decades, because long-term interest rates have declined continually. Forecasts for the euro area and the USA do not reflect beliefs that we are heading towards a period of lengthy stagnation, permanent spare capacity in the economy and persistent low inflation, indicating that long-term interest rates will not remain at the historically low levels of recent years.

There is a risk of large capital losses on portfolios of long-term bonds if long-term interest rates rise from the current very low level. This article looks at interest rate developments in previous cyclical upswings and considers various scenarios for the future path of long-term interest rates. There have been previous examples of substantial increases in long-term interest rates over a short period of time, e.g. in both 1994 and 1999, when the 10-year bond yield rose by more than 2 percentage points. In view of the currently very narrow spread between long-term and short-term interest rates, this article discusses scenarios with a gradual rise in long-term interest rates as well as more abrupt scenarios. In the USA, the market expects a somewhat slower normalisation of monetary policy than does the Federal Reserve. This entails a risk of a large bond yield hike if the market adapts to the Fed’s expectations. The increase may be self-reinforcing and could be even stronger if it triggers fire sales of bonds by some investors. Developments in US interest rates may cause spillover effects on the euro area and Denmark.

If long-term interest rates rise, most of the capital losses on bonds in Denmark will hit the pension sector, but the sector has, to some extent, hedged its interest rate risk via pension commitments and financial instruments. According to the Danish Financial Supervisory Authority, the effect of a 0.7 percentage point rise in long-term interest rates will have a positive impact on equity for the pension sector as a whole. The return on pension funds’ financial instruments may vary considerably, however, depending on the size of the rise in interest rates. Complete information on the impact of major increases in long-term interest rates is not available, however. Some pension companies have reported to the Danish Financial Supervisory Authority that substantial interest rate hikes would be the worst scenario imaginable for them.

In the short term, Danish banks would suffer losses on their long-term bond portfolios, as would other investors, if long-term interest rates were to rise. The same applies to their fixed rate loans. In the longer term, a steeper yield curve would potentially increase banks’ earnings through a wider margin between lending and deposit rates. The interest margin has been under pressure from the low level of interest rates in recent years.

If everything runs smoothly, the level of long-term interest rates in the USA and Europe will normalise gradually in step with the continued economic recovery, higher inflation and lower unemployment. The real economic risks associated with the normalisation therefore concern a situation with a sudden increase in the level of in-
Interest rates without a simultaneous improvement of the economy, due to a marked shift in market expectations. Viewed in isolation, this may have a negative impact on growth and house prices in Denmark as well as abroad.

Overall, the scenarios described in this article illustrate that both institutional and private investors such as credit institutions in Denmark and abroad may suffer considerable losses on their bond portfolios, if long-term interest rates rise suddenly in connection with normalisation of the level of interest rates. This underscores the need for both investors and credit institutions to focus on risk management and ensure that they are resilient against losses.

**INTEREST RATES, PRICE CHANGES AND RETURNS ON BONDS**

The period since the early 1980s has been characterised by a more or less sustained decline in long-term interest rates and considerable capital gains on bonds in many countries, cf. Chart 1. In Denmark, nominal yields to maturity on 10-year government bonds fell from more than 20 per cent in the early 1980s to under 0.5 per cent in the first half of 2016.

The sustained fall in interest rates should be viewed in the light of lower inflation expectations as a consequence of lower realised inflation, among other factors. In addition, the accompanying stability of inflation rates has reduced the uncertainty about future fluctuations in inflation. This has reduced the risk premium for uncertainty about the future development of inflation contained in long-term interest rates. It is worth noting, however, that long-term interest rates remained relatively high in the 1990s, even though all three countries had all but achieved “price stability” with annual growth rates in consumer prices of around 2 per cent. This reflects considerable stickiness in inflation expectations, as often found in empirical studies.

The total return on bonds over a given investment horizon consists of the return from coupon payments as well as capital gains/losses. Chart 2 shows the realised total returns over a 1-year horizon for 10-year government bonds in Denmark, Germany and the USA. Generally, large positive total returns have been achieved since the early 1980s due to the more or less continually declining level of interest rates. Since the mid-1990s alone, 1-year total returns have averaged 6-7 per cent. It is also worth noting the large year-on-year fluctuations, however. Since the mid-1990s, 1-year
Realised 1-year total returns on long-term bonds in Denmark, Germany and the USA

Chart 2

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Note: Monthly observations. Nominal returns. Calculated on the basis of 10-year benchmark bond yields. The realised total return over a 1-year horizon is calculated on an approximate basis according to yields to maturity and durations using Babcock’s formula, cf. Babcock (1984): Realised total return at time t = yield to maturity at time t – duration at time t * (yield to maturity at time t + 1 year - yield to maturity at time t). Germany refers to the reunified Germany since July 1990 and West Germany in the preceding period.

Source: Own calculations based on data from Statistics Denmark, Eurostat, OECD and Abildgren (2012).

Total returns in the three countries have fluctuated between -15 and +25 per cent.

Duration is often used as a summary expression of the price sensitivity of a bond or bond portfolio to changes in interest rates. For a non-callable fixed-rate bond, the duration is calculated as the average time of payments on the bond measured at present value, cf. Macaulay (1938). The duration also expresses how much a change in the level of interest rates impacts the bond price, all else equal. If the duration is e.g. seven years, the market value of a bond will fall by approximately 7 per cent on a general increase in the level of interest rates of 1 percentage point. The longer the duration of a bond, the more sensitive its market value will be to interest rate changes.

In purely mathematical terms, there is a negative relationship between duration and interest rates. The lower the level of interest rates, the longer the duration of fixed rate bonds will be. As a result, capital losses on bond portfolios due to a given increase in interest rates in percentage points are larger, if interest rates rise from a low level rather than a higher level.

In step with the decline in the level of interest rates over the last decades, the price sensitivity of long-term bonds has increased significantly. With interest rates close to zero, the duration of 10-year bonds is now close to 10 years in Denmark and Germany, up from around 7 years in the mid-1990s, cf. Chart 3. Capital losses or negative total returns on portfolios of long-term bonds are to be expected if interest rates normalise from the current very low level.

WHAT IS THE “NORMAL” LEVEL OF LONG-TERM INTEREST RATES IN THE LONGER TERM?

A fundamental question is what the “normal” level of long-term interest rates will be in the future.

1 The reason is that the lower the level of interest rates, the larger the proportion of the present value of the bond’s cash flow will be payments falling due further out in the future.
The long-term interest rate can be seen as an “average” of the expected future short-term interest rates plus a term-dependent risk premium (the “term premium”), reflecting e.g. the uncertainty about future short-term interest rates.

WHAT DETERMINES THE LEVEL OF SHORT-TERM INTEREST RATES?

The future short-term interest rate is dependent on the future development in growth and inflation. The literature often refers to the “natural rate of interest”. This is the monetary policy “equilibrium interest rate” that is consistent with full utilisation of the factors of production and unchanged inflation in the medium term, cf. Box 1. The natural rate of interest consists of two elements: inflation and real interest rates, where the latter can be approximated by the potential real growth rate of the economy. Over time, declining potential growth rates have contributed significantly to a fall in the natural rate of interest, cf. Laubach and Williams (2003, 2015). This means that the historical average for monetary policy interest rates is not necessarily always a good indicator of the future level.

The Federal Open Market Committee, FOMC, of the Federal Reserve regularly publishes forecasts of growth, inflation and monetary policy interest rates in the USA in the short and medium term. In the most recent forecast, the median estimate of the level of the monetary policy interest rate in five years is 3.3 per cent, cf. Chart 4. The level was gradually reduced from 4.25 per cent in 2012. The lower interest rate expectations reflect a downward adjustment of the potential growth rate over the same period from around 2.7 to 2.0 per cent. The FOMC’s forecast of inflation after five years has remained more or less unchanged at 2 per cent p.a.

A comparison of the medium-term forecasts from central banks (the ECB and the Federal Reserve), private forecasters and the International Monetary Fund, IMF, shows consensus on a real growth rate of 1.5-2.5 per cent and an inflation rate of 1.5-2.5 per cent, cf. Chart 5. Growth and inflation rates are expected to be higher in the USA than in the euro area. This reflects that the USA is further into the upswing, and that potential growth is deemed to be higher for the US economy than for the euro area because of demographic differences.

The forecasts for the euro area and the USA thus do not reflect beliefs that we are heading towards a period of lengthy stagnation and per-
The natural rate of interest

The so-called natural rate of interest is a key concept of the theories regarding the long-term level of short-term interest rates, cf. Pedersen (2015). Definitions of this concept vary slightly in the literature, but in the following, the natural rate of interest will be defined as the monetary policy interest rate that is consistent, in the medium term, with economic output at its potential level and unchanged inflation. Potential output is the output possible at full utilisation of the factors of production. The concept of the natural rate of interest is closely linked to the equilibrium rate of interest on savings and investment that will apply in the absence of temporary shocks to the economy.

The natural rate of interest consists of two elements: inflation and the real interest rate. Future inflation will normally correspond to the inflation target of central banks. Due to the fixed exchange rate policy, Denmark has indirectly adopted the same inflation target as the European Central Bank, which is an annual inflation rate below, but close to 2 per cent. The Federal Reserve also has an inflation target of 2 per cent. The inflation element of the natural rate of interest will be more or less constant, if the inflation target is seen as credible, thereby anchoring long-term inflation expectations. This has been the case in recent years, although there has been a slight tendency towards falling inflation expectations.

There are several reasons why the central banks have chosen to define price stability as an inflation rate of a few per cent rather than an inflation rate of zero (price level stability). Firstly, it may be easier to make room for the necessary real wage adjustments between firms, sectors and in the whole economy, if there is some positive inflation. This is because nominal wages are often found to be downwardly rigid, cf. Kristoffersen (2016). Similarly, some positive inflation may facilitate adjustments to relative prices of goods and services. Secondly, a positive inflation target creates more room for manoeuvre for monetary policy easing before the lower nominal interest rate bound is reached. Thirdly, experience shows that using the consumer price index as an indicator of the development in inflation may involve some measurement problems, because this fails to take all technological advances and quality improvements into account, cf. Boskin (1998). Hence, the consumer price index tends to overestimate the actual rate of inflation.

The level of the real interest rate element of the natural rate of interest varies over time and is determined by a number of factors that affect investment and savings. The most important factor is the potential growth rate of the economy. If expectations of future growth and hence income are high, households will reduce their savings to smooth their consumption over time. Similarly, higher growth will generate higher expected returns, thereby increasing firms’ incentive to invest (increased demand for savings). Both will contribute to increasing interest rates. Hence, there is a close relationship between the rate of growth in the longer term and real interest rates. In addition to potential growth, the real interest rate element of the natural rate of interest is also dependent on a time preference premium, reflecting that, other things being equal, households prefer consumption today rather than tomorrow.

Overall, the nominal natural rate of interest is approximated as the sum of future inflation, growth and the time preference premium. It is not possible to observe the level of the natural rate of interest; it has to be estimated instead. This gives estimates that are dependent on the assumptions made in connection with the calculations. However, it appears across studies that the natural rate of interest has fallen considerably in recent decades, e.g. Laubach and Williams (2003, 2015). This can be attributed, in part, to falling inflation expectations during the period in question.

The decline in nominal interest rates exceeds what can be attributed to the development in inflation, however, indicating that recent decades have also seen a gradual decline in real interest rates. Moreover, several studies document a convergence of monetary policy interest rates across countries. Hence, interest rates are increasingly determined by common global factors, cf. IMF (2014).

Several factors may be behind the fall in real interest rates observed in the developed economies in recent decades. Firstly, productivity and population growth have both declined. Secondly, a number of factors have affected savings conditions and hence the time preference premium and real interest rates overall in a more indeterminate direction. In China and other emerging market economies, savings have increased markedly. As large cohorts begin to retire in the coming years, this trend can be expected to reverse. Budget deficits in the developed economies and accumulation of substantial foreign exchange reserves in emerging market economies in the 2000s have contributed to reducing or increasing, respectively, global public sector savings. Rising inequality may also have helped boost savings if the marginal propensity to consume is decreasing in income.

Pursuing expansionary monetary policy in a situation of very low natural interest rates is difficult. This is particularly true if the natural rate of interest is close to zero or even negative. In such case it may be hard to lower monetary policy interest rates to a level that will have the necessary stimulating effect on the economy. This problem is amplified by falling inflation or actual deflation, as it makes real interest rates go up. Such a sustained low growth situation is referred to as ‘secular stagnation’ – a concept that was reintroduced by Larry Summers in a speech to the IMF in 2013. If this scenario is to be believed, it would imply a persistently low level of interest rates – including in the medium term. Most market participants and central bank forecasts are more optimistic, however.

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1. According to the theory of economic growth, (e.g. in a so-called Ramsey (1928) model), the real interest rate, \( r \), is given as \( r = \frac{1}{\sigma} g + \pi p \), where \( \sigma \) is the intertemporal substitution elasticity, \( g \) is real GDP growth and \( \pi \) is the time preference premium. The elasticity of substitution is typically estimated to be around 1, and the time preference premium to be relatively modest.

permanent spare capacity in the economy. If inflation
expectations are also taken into account, there
is consensus that monetary policy interest rates
will normalise at a level well above the current
one. The growth and inflation forecasts in Chart 5
implicitly result in a natural rate of interest of 3-4
per cent. By comparison, the average monetary
policy interest rate in the USA has been approxi-
mately 5 per cent since 1980. Due to demographic
differences, the natural level of short-term interest
rates can be expected to be higher in the USA
than in the euro area, and normalisation towards
the natural level will be faster in the USA because
of lower unemployment.
WHAT DETERMINES THE LEVEL OF LONG-TERM INTEREST RATES?

If the calculation is based on the expectation theory, long-term interest rates can approximately be seen as an average of the expected future short-term interest rates plus a term premium. If, say, the 1-year yield averages 3 per cent over the next 10 years, and the term premium is approximately 0.5 per cent, then the 10-year yield is 3.5 per cent. Assuming that the monetary policy interest rates fluctuate around the natural rate of interest in step with the business cycle, long-term interest rates will be affected mainly by the level of the natural rate of interest in the longer term. In the short term, long-term as well as short-term interest rates could deviate considerably from the natural level, which is reflected in strongly time-varying term premia.

Neither expectations of future short-term interest rates nor term premia can be observed directly. Instead, they must be estimated using interest rate models capable of forecasting interest rate trends based on e.g. the historical development in interest rates and the current term structure.\(^2\)

Term premia are normally estimated to be positive. This reflects that investors usually require positive additional returns to hold bonds with long maturities instead of regularly investing in bonds with short maturities. According to estimates based on the model by Adrian et al. (2013), the 10-year term premium on US government bonds was just under 1 per cent on average for the period 1999-2008.\(^3\) After the financial crisis, estimates of term premia in most countries have decreased considerably. The model in Adrian et al. (2013) even estimates a negative 10-year term premium for US government bonds in the 1st half of 2016. Lemke and Vladu (2014) also estimated negative term premia for the euro area from 2012 onwards.

If the FOMC members’ 5-year median estimate of 3.3 per cent for the monetary policy interest rate is used as an indication of the future natural rate of interest in the USA, the US long-term 10-year yield will be around 4.3 per cent, if the term premia return to their pre-crisis levels. This compares with a level of less than 2 per cent in the first part of 2016.

Estimates of term premia on Danish government bonds can be found in Christensen et al. (2016). It shows that the 10-year term premium averaged approximately 1.3 per cent in the period 1999-2008. By comparison, the 10-year term premium on Danish government bonds was estimated at just over 0.1 per cent at the beginning of 2016. Assuming a slightly lower long-term natural rate of interest in the euro area than in the USA, e.g. 3 per cent, this also results in a long-term 10-year yield of around 4.3 per cent in Denmark. This is significantly higher than the current level of under 0.5 per cent.

DISCUSSION OF A POTENTIAL NORMALISATION OF THE LEVEL OF INTEREST RATES

In the euro area, 3-month forward rates are negative until 2020, indicating that the market expects monetary policy interest rates in the euro area to remain low for a long time to come. Despite the fact that in December 2015 the Federal Reserve, the Fed, raised the monetary policy target rate for the first time since 2006, the market similarly expects only a slow tightening of US monetary policy. The expected tightening is somewhat slower than what is reflected in the FOMC members’ median forecast, cf. Chart 6 (left).

Unconventional expansionary monetary policy, such as purchases of long-term bonds, has contributed to low long-term interest rates by reducing the term premia. Studies show that the accommodative monetary policy in the wake of the financial crisis has affected long-term interest rates, especially through its impact on term premia, cf. e.g. Gagnon et al. (2011) and Joyce et al. (2011). Today, term premia are well below their

\(^2\) The use of models means that estimates of term premia may vary depending on the assumptions made in connection with the calculations. In some cases the differences can be substantial, cf. Swanson (2007).

\(^3\) Despite the fact that different models may give different term premia, the estimates in Adrian et al. (2013) are relatively close to estimates of other models, including Kim and Wright (2005).
If scenarios are to be set up for a normalisation of the level of interest rates, an assessment of the future path of term premia is important. The literature generally finds that the purchase programmes of central banks are the main reason for the currently very low term premia. A low degree of uncertainty about the future monetary policy stance in the wake of the major recession caused by the financial crisis has also contributed to the fall, however. In a scenario where monetary policy is normalised and there is uncertainty regarding the future monetary policy, a reversal of the impact of both these factors may lead to higher term premia and thus to higher long-term interest rates in the years to come.

EXPERIENCE FROM PREVIOUS PERIODS OF MONETARY POLICY TIGHTENING

In order to assess how interest rates may change in connection with a normalisation of monetary policy, it is useful to look at historical experiences. The point of departure is lessons from the USA, where the first monetary policy tightening began after the crisis, and where the purchase programmes has been put on hold. In the longer term, the Fed aims to hold financial assets only to the extent that this is necessary in order to ensure effective implementation of monetary policy.

From 1990 until today, the Fed has been through three cycles with hikes in the overnight target rate in the interbank market, the federal funds rate. These periods are 1994-95, 1999-2000 and 2004-06, cf. Chart 7. Moreover, the Fed raised the federal funds target rate by 25 basis points in December 2015.

In both 1994 and 1999, the 10-year zero coupon rate rose by more than 2 percentage points, but it did not increase noticeably in 2004-06. The latter development occurred despite the fact that monetary policy interest rates increased considerably more than during the preceding cycles. So far, the single interest rate increase in December 2015 has had no apparent effect on the 10-year yield.

The changes in the 10-year yield can be decomposed into a contribution from changed expectations of future short-term interest rates and a contribution from changes in term premia, cf. Chart 8. As shown, higher expectations of future short-term interest rates have historically been the main driver of increases in the 10-year yield. This was particularly true in 1994, when the market was surprised by the extent of the Fed’s monetary policy tightening.
The Federal Reserve’s monetary policy target rate and the yield on 2-year and 10-year US government bonds

Chart 7

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Note: The Federal Reserve’s federal funds target rate is used as the monetary policy target rate. Government bond yields are zero coupon yields from Gürkaynak et al. (2007).
Source: Bloomberg and Gürkaynak et al. (2007).

Decomposition of interest rate changes around monetary policy tightening in the USA

Chart 8

Changes in expectations of future short-term interest rates

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Changes in 10-year term premium

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Note: The changes considered are changes in zero coupon rates. Zero coupon rates are based on US government bond yields and are from Gürkaynak et al. (2007). Term premia are from Adrian et al. (2013), which uses a five factor model to decompose yields into one element attributable to future expected short-term interest rates and another element attributable to term premia. Changes in expectations of the average future short-term interest rate over a 10-year horizon have been calculated as the difference between the 10-year term premium and the 10-year zero coupon rate.
Source: Adrian et al. (2013), Gürkaynak et al. (2007) and own calculations.
There has been no tendency towards systematic increases in term premia during previous periods of monetary policy tightening. They even decreased around the 2004 tightening, illustrating how there is a strongly time-dependent variation in term premia.

The so-called “taper tantrum” that occurred in May 2013 further emphasises this point. During that event, the 10-year zero coupon rate on US government bonds increased by approximately 1.5 percentage points in four months. The background was that the then Fed Chairman Ben Bernanke indicated that the Fed would reduce the rate of bond purchases later that year, subject to continued improvement of the US economy. This prompted investors to sell off long-term US bonds, causing interest rates to rise substantially. The entire rise in interest rates could be explained by increasing term premia, cf. Chart 8 (right). Over the same period, the term premium on 10-year Danish government bonds rose by approximately 60 basis points, possibly indicating that investors globally sold off long-term bonds. This is a further indication that the purchase programmes of central banks largely explain the current low term premia. Hence, it cannot be ruled out that term premia will rise from their current low levels in connection with normalisation of monetary policy.

**SCENARIOS FOR NORMALISATION OF THE LEVEL OF INTEREST RATES**

In view of the above, a number of hypothetical scenarios for a normalisation of the level of interest rates are analysed below. The change in long-term interest rates is assumed to derive partly from changes in expectations of future short-term interest rates and partly from changes in the term premia. The scenarios are based on several simplifying assumptions and should be seen only as illustrations of a few among many possible scenarios.

Overall, the scenarios are based on experiences from the USA, where monetary policy tightening after the crisis has already begun and the Fed’s purchase programmes have been put on hold. Developments in the USA may give an indication of the way long-term interest rates may develop when the time comes to normalise monetary policy in the euro area. Furthermore, spillover effects from US interest rate developments on long-term interest rates in the euro area cannot be ruled out.

**SCENARIOS FOR THE DEVELOPMENT IN SHORT-TERM INTEREST RATES AND TERM PREMIA**

Historically, monetary policy tightening has not led to systematic increases in term premia. The currently very low level of term premia is to a large extent driven by unconventional monetary policy. This entails a risk that term premia may increase when monetary policy normalises. However, a potential increase would depend on several factors, especially the phasing-out of unconventional monetary policy and expectations to that effect.

The following analysis is based on two possible scenarios for the development in term premia:

1. A “run for the exit” scenario in which monetary policy is tightened and financial markets have doubts about the future monetary policy stance. This may cause investors to sell out heavily of bonds, or “run for the exit”. A sharp increase in the term premium is assumed, followed by convergence towards its pre-crisis level of just under 1 percentage point, cf. Chart 9. The scenario is based on the assumptions that the effects of unconventional monetary policy would rapidly evaporate and that liquidity in the financial markets can suddenly dry out for shorter periods of time, cf. IMF (2015). The increase to around 1.75 per cent would briefly bring term premia to around the level observed during the financial crisis, when uncertainty and risk aversion in the financial markets were extremely high.

2. The second scenario is based on the assumption of a “slow return” of term premia to their pre-crisis level. This is based on the fact that unconventional monetary policy is only expected to be phased out slowly, meaning that the

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4 Cf. Ben Bernanke’s testimony to the US Congress on 22 May 2013.

5 IMF (2013) estimated that the Fed’s purchase programmes, lower volatility in the financial markets and reduced uncertainty about the future monetary policy stance had led to a decrease of approximately 1.7 percentage points in the term premium on 10-year US government bonds from 2008 to 2013.
temporary effects from this will only evaporate slowly, cf. Chart 9.6

By comparison, the term premium increased to around 1.4 percentage points during the “taper tantrum” in the early summer of 2013. Hence, the “run for the exit” scenario is more severe in the short term. This should be viewed in the light of the assumption that market participants also have doubts about the path of future interest rates. That was not the case in May 2013, cf. Chart 8 (left).

In both cases, the basis for the changes in term premia is a reassessment of market expectations of future short-term interest rates. Hence, the assumption in both cases is that market expectations will increase to the same level as an interest rate path corresponding to the FOMC members’ median expectations. Following the market’s reassessment of its view on future interest rates, it is assumed that short-term interest rates will follow that path and that there will consequently be no further impact on long-term interest rates from that channel. The effect of changed expectations is thus a one-off effect in the scenarios shown, and it is assumed that the FOMC members’ interest rate predictions are correct. Those assumptions are a significant simplification with the sole purpose of illustrating the extent to which interest rates can change as a result of revised expectations of the future monetary policy stance.

The effects of both higher term premia and higher expectations of future short-term interest rates would tend to increase long-term interest rates. In the two scenarios, the development in the 10-year zero coupon rate on US government bonds would vary considerably in the short term.

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6 The exact phasing-out process is not known and would depend on the development in financial and economic factors, cf. https://www.federalreserve.gov/monetarypolicy/policy-normalization.htm. The scenario assumes that 3 per cent of the term premium gap up to its pre-crisis level is closed every month, meaning that after three years, the term premium will have made more than 60 per cent of its overall adjustment.
while converging to the same long-term level, cf. Chart 10. Finally, the development in the 10-year zero coupon rate that is in line with the forward curve, is illustrated. Under certain assumptions, this could be interpreted as market expectations of future long-term interest rates.

**TOTAL RETURN UNDER THE VARIOUS SCENARIOS**

In order to illustrate the increases in interest rates under the various scenarios, the development in the return on a 10-year US government bond with a coupon rate of 2 per cent is observed over the life of the bond. It is assumed that an investor purchases the bond, after which interest rates are adjusted in accordance with the scenarios in Chart 10.

In the scenario where market expectations are adjusted to the FOMC members’ expectations and investors “run for the exit”, there will be an instant capital loss of more than 20 per cent, cf. Chart 11. Market expectations subsequently adjust to the future interest rate path, and the term premium will gradually decline to its pre-crisis level. The term premium decline gives the bondholder a total return of more than 7 per cent in year 1 and subsequently positive 1-year total returns ranging from 0 to 5 per cent for the life of the bond.

In the scenario where term premia slowly reverse and future monetary policy expectations are adjusted, there will initially be a capital loss and negative total returns. Again, the higher rates of interest mean that the 1-year total returns will become positive over time.

In the scenario where interest rates follow the forward curve (i.e. the term premium is assumed to remain unchanged, thus not returning to its previous levels), 1-year total returns will be small, but positive throughout the period.

Alternatively, a situation could be considered in which a 10-year bond is purchased in each period and sold after one year, after which the total return is evaluated, cf. Chart 12. In this case, the “Run for the exit” scenario provides a negative total return in year 1 of 14 per cent. This is slightly less than the initial capital loss of 20 per cent due to the coupon rate and a fall in the term premium following its initial steep rise.

Despite the continued accommodative monetary policy in the euro area, spillover effects
Initial capital loss and development in 1-year total returns on 10-year US government bond during the term of the bond in the various scenarios

<table>
<thead>
<tr>
<th>Year</th>
<th>Expected monetary policy = FOMC expectations. Development in term premia = “Run for the exit”</th>
<th>Expected monetary policy = FOMC expectations. Development in term premia = “Slow return”</th>
<th>Yields follow the forward curve</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Average since 1995</td>
<td>Minimum since 1995</td>
<td></td>
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<tr>
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Note: See Chart 10. Bond with a coupon rate of 2 per cent. The total return for a given period is calculated as that period's coupon payment + price change divided by the price in the last period. Total return at time 0 indicates the immediate capital loss occurring when interest rates are adjusted in accordance with the scenarios in Chart 10. The broken lines indicate the average and lowest observed 1-year total return on a 10-year US government bond since 1995.

Source: Adrian et al. (2013), Gürkaynak et al. (2007), IMF (2013) and own calculations.

Development in 1-year total returns on 10-year US government bonds in the various scenarios

<table>
<thead>
<tr>
<th>Year</th>
<th>Expected monetary policy = FOMC expectations. Development in term premia = “Run for the exit”</th>
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Note: See Chart 10. It is assumed that a 10-year bond is purchased in each period and sold after one year, after which the total return is then evaluated. The total return for a given period is calculated as that period's coupon payment + price change divided by the price in the last period. The broken lines indicate the average and lowest observed 1-year total return on a 10-year US government bond since 1995.

Source: Adrian et al. (2013), Gürkaynak et al. (2007), IMF (2013) and own calculations.
Scenarios for the euro area

Monetary policy is further from a tentative normalisation in the euro area than in the USA. The ECB continues to increase its balance sheet via purchase programmes, and monetary policy interest rates have been reduced several times in recent years. The 1-year forward rates based on AAA-rated government bonds from the euro area are negative for almost four years into the future. This seems to indicate market expectations of very low monetary policy interest rates for quite some time to come.

The ECB and IMF forecasts do not indicate that we are heading towards a period of lengthy stagnation with a sustained low level of interest rates in the euro area. Instead, according to their medium-term forecasts for growth and inflation, the natural rate of interest will be around 3 per cent. This is not immediately consistent with market expectations – even when taking term premia into account. As is the case in the USA, term premia on European government bonds are very low and well below their pre-crisis levels. Lemke and Vladu (2014) estimate that the term premium on a 10-year Eonia swap rate was negative throughout most of 2012 onwards, and estimates of 10-year term premia on Danish government bonds are also low, cf. Chart 6.

So despite the continued accommodative monetary policy, long-term interest rates may increase in case of changed expectations of future short-term interest rates and/or term premia. Furthermore, spillover effects from the normalisation of US interest rates cannot be ruled out.

Based on the above, three scenarios are considered below:
1. Normalisation of monetary policy and reversal of term premia: Monetary policy is expected to normalise over the next decade to a level of around 3 per cent, and term premia will develop as seen in scenario 2.
2. Reversal of term premia: The 10-year term premium jumps by 60 basis points and subsequently converges to its pre-crisis level of 1.28 per cent.
3. Follow the forward curve: The future interest rates follow the forward rates.

The development in the 10-year zero coupon rate in the euro area under the various scenarios is illustrated in the left-hand chart below, while total return on a 10-year government bond in the euro area with a coupon rate of 1 per cent during the term of the bond is shown in the right-hand chart.

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Note: The euro area member states with government bonds AAA-rated by Fitch are the Netherlands, Luxembourg and Germany. The term premium on Danish government bonds, as estimated by Christensen et al. (2016), is used to approximate the term premium on government bonds from AAA-rated euro area member states. The broken lines in the right-hand chart indicate the average and lowest observed 1-year total return on a 10-year German government bond since 1995.

Source: ECB and own calculations.

Substantial initial capital losses will occur in scenarios 1 and 2. In the scenario with both reversal of term premia and normalisation of monetary policy, the capital loss amounts to more than 14 per cent, while a capital loss of just under 6 per cent occurs in the scenario that repeats events from May 2013. If yields follow the forward curve, the first years of the term of the bond will see negative total returns that will be followed by marginally positive returns.

1. For the sake of simplicity, the normalisation of monetary policy is assumed to be linear over the next 10 years. The natural level is assumed to be marginally lower than in the USA because of the lower growth and inflation outlook in the euro area.
2. The jump of 60 basis points is motivated by the rise in term premia on Danish government bonds during the taper tantrum. After the initial jump, 5 per cent of the gap is assumed to be closed every month.
of increasing term premia in the USA may contribute to higher long-term interest rates in the euro area and hence also in Denmark. Given the current very low levels of interest rates, this may generate substantial losses on bond portfolios, cf. Box 2.

**IMPLICATIONS FOR INVESTORS IN LONG-TERM BONDS**

The development in total returns in the scenarios described above illustrate that both institutional and private investors such as credit institutions in Denmark and abroad could suffer considerable losses on their bond portfolios in connection with normalisation of the level of interest rates. Consequently, it is important to focus on risk management and the necessary buffers or hedging to resist potential increases in interest rates, cf. ECB (2015).

Increases in long-term interest rates can set in quickly and unexpectedly. Increases in interest rates from a low level may be self-reinforcing and result in interest rates rising more than immediately warranted by fundamental factors. This may be attributable, inter alia, to portfolio allocations by investors using a particular measure of interest rate risk in their portfolios, including pension companies. When interest rates increase from a low level, the duration of callable mortgage bonds may rise substantially, cf. Mogensen (2002). Higher duration means that the interest rate risk of those investors' portfolios must be adjusted. This can be done e.g. by selling out other assets of high duration, including long-term government bonds, which may further increase interest rates.

Looking at the overall picture, it is seen that in Denmark the pension sector in particular has large portfolios of long-term bonds, meaning that it will suffer capital losses in case of an increase in interest rates. Overall, pension funds provide two types of pension products: average-rate products and market-rate products. With an average-rate product, pension savers are guaranteed a minimum pension benefit. In this case, the pension company bears the risk in the event of substantial drops in financial market prices. With a market-rate product, pension savings accrue interest at the rate of return the pension company is able to obtain in the financial markets. In this case, pension savers themselves bear the risk if prices fall (or increase).

The value of the pension companies' future commitments to customers with average-rate products is calculated by discounting future guaranteed payments by a discount rate curve. If interest rates rise, the value of their guaranteed commitments will fall. To hedge this risk, pension companies typically purchase bonds and other interest based financial instruments, the value of which will fall if interest rates rise. In case of a rise in interest rates, the value of both the companies' assets and guaranteed commitments (liabilities) will therefore depreciate.

According to the Danish Financial Supervisory Authority (2014), the effect of a 0.7 percentage point rise in long-term interest rates will have a positive impact on equity for the pension sector as a whole. The return on the pension funds’ financial instruments may vary considerably, however, depending on the size of the rise in interest rates. Complete information on the impact of strong increases in long-term interest rates is not available, however. Some pension companies have reported to the Danish Financial Supervisory Authority that substantial interest rate hikes would be the worst scenario imaginable for them.

In general, the share of average-rate products has been declining in recent years. Hence, the share of provisions with guarantees exceeding 0 per cent, declined from more than 80 per cent in 2010 to less than 60 per cent in 2014, cf. the Danish Financial Supervisory Authority (2014). Still, the increasing market-rate product activity entails the risk that pension savers could experience major losses in the event of falls in the financial markets, including capital losses on bonds. For people close to retirement, who have invested part of their pension savings in bonds, this may constitute a problem. With regard to the

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7 In addition to a 0.7 percentage point rise in long-term interest rates, the scenario also comprises a 1 percentage point rise in interest rates under 1 year and a 0.85 percentage point rise in interest rates between 1 and 3.6 years.
distribution of pension products, the majority of people close to retirement age have guaranteed products, cf. Chart 13. People with market-rate products normally have more years left until retirement, so higher interest rates over time will, all else equal, be positive for them. The explanation is that in the longer run they can increase the rate of return on their pension savings despite a capital loss in the coming years.

A related question is whether normalisation of the level of interest rates will give rise to price drops on other assets, e.g. shares. In so far as the rise in interest rates is driven by improvement of the economy, share prices will probably not be markedly affected. This is also the experience from previous periods of monetary policy tightening. If the rise in interest rates is only attributable to increases in term premia, negative spillover effects on other asset classes cannot be ruled out, however. In such case, general losses in the financial markets may have a substantial impact on pension savings.

In the short term, Danish banks would suffer losses on their long-term bond portfolios, as would other investors, if long-term interest rates were to rise. The same applies to banks’ fixed rate loans. Unlike the pension sector, banks invest primarily in short-term bonds, which are less sensitive to changes in interest rates. In the longer term, a steeper yield curve would potentially increase banks’ earnings through a wider margin between lending and deposit rates. The interest margin has been under pressure from the low level of interest rates in recent years.

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8 Experience shows that fluctuations in the market value of pension wealth do not have any major impact on private consumption either, cf. Bang-Andersen et al. (2013).

9 The duration of a bond portfolio can be interpreted as an expression of the number of years that will go by before the capital loss of a rise in interest rates will be offset by the higher interest rate on reinvesting interest and redemptions on the bond portfolio.
REAL ECONOMIC RISKS ON NORMALISATION OF INTEREST RATES

If everything runs smoothly, the level of long-term interest rates in the USA and Europe will normalise gradually in step with a continued economic recovery, higher inflation and lower unemployment. The real economic risks associated with a normalisation are therefore linked to a situation in which a sudden increase in the level of interest rates occurs without simultaneous improvement of the economy due to a marked shift in market expectations. This may potentially have a negative impact on real economic developments in Denmark as well as abroad.

This risk outlook can be illustrated by considering a scenario with a sudden increase in the entire yield curve of 1 percentage point in both Denmark and abroad, cf. Chart 14. Viewed in isolation, the rise in interest rates would dampen growth in the USA and the euro area, thereby giving rise to lower growth in Danish exports to those areas. Furthermore, the rise in interest rates itself would impact the level of activity in Denmark. When interest rates rise, it becomes more expensive to finance consumption by borrowing, so savings increase at the cost of consumption today. In addition, higher interest rates lead to lower housing prices, which pushes down housing investments and curtails household wealth and consumption. Higher interest rates also reduce corporate investments since loans become more expensive and passive investments yield higher returns. The decline in consumption and investments results in lower economic activity and employment.

Other things being equal, the overall effect of the shock to interest rates is that after a couple of years, the real gross domestic product, GDP, will be around 1 per cent lower than in the baseline scenario. All else equal, house prices will be 5-10 per cent lower after a couple of years than they would otherwise have been. Hence, the risk scenario may have a potentially dampening impact on the current upswing and reduce the value of the collateral basis for financial institutions to which the “last-ranking” part of property values is pledged as collateral. This underscores the need for both investors and credit institutions to focus on risk management and ensure that they are resilient against losses.

Impact on real GDP and house prices in Denmark in case of a global increase in interest rates by 1 percentage point across the yield curve

Chart 14

Source: Calculations based on Danmarks Nationalbank’s macroeconomic model, MONA, and OECD (2010).
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LENDING IN A LOW INTEREST RATE ENVIRONMENT

Svend Greniman Andersen and Andreas Kuchler, Economics and Monetary Policy

INTRODUCTION AND SUMMARY

Competition among credit institutions for corporate customers has intensified in recent years because interest rates are low and demand for loans is subdued. For the most creditworthy firms, this has led to lower loan costs and a slight easing of the terms and conditions for obtaining a loan from a bank. On the other hand, there are no indications that low interest rates and increased competition have prompted credit institutions to ease credit conditions for less creditworthy corporate customers.

Corporate loan demand has been much more subdued since the onset of the financial crisis than in the pre-crisis period. Many firms have wanted to deleverage in part to increase their resilience to economic shocks and in part to ensure more flexibility in future financing choices. Moreover, many firms have not applied for debt financing because they have had no need to do so. They have had a high positive savings surplus in the years since 2009 and are likely to be able to cover most of their financing needs through retained earnings.

Before the financial crisis, the correlation between firms’ financial ratios and the probability of obtaining bank loans was weak. But during the financial crisis, credit institutions tightened their excessively loose pre-crisis credit standards. The analysis shows that less creditworthy firms still face very tight credit conditions. Creditworthy firms, on the other hand, stand a good chance of having their financing needs met by both commercial banks and mortgage banks.

The analysis further shows that banks’ credit assessments to a large extent entail that loan capital flows to the most productive firms. However, there are also indications that the least productive firms in Denmark have relatively easy access to finance compared with low-productivity firms in other countries. During a period of exceptionally low interest rates, it is important to ensure that low-productivity firms with unprofitable operations are not kept artificially alive. If these firms are kept artificially alive, this will only delay the necessary adaptation processes in the corporate sector – to the detriment of both employment and prosperity.

In recent years, few firms have stated that lack of access to finance impedes their production. Seen in an international perspective, Danish firms have had good access to finance both during the crisis and in recent years. Thus, there are no indications that credit constraints are dampening the current upswing in the Danish economy.

LENDING TO FIRMS

Mortgage debt and bank debt account for the majority of Danish firms’ debt, and in the pre-financial crisis period the firms substantially increased their debt. However, since the onset of the financial crisis, corporate lending by commercial banks and mortgage banks has been virtually unchanged, cf. Chart 1 (left). This should be seen in light of the high positive savings surplus (positive net lending) in the corporate sector since 2009. Some firms have wanted to consolidate
their balance sheets to increase their resilience to future economic shocks and ensure more flexibility in future financing choices. Moreover, at the beginning of an economic upturn, Danish firms tend to be able to cover most of their financing needs through retained earnings. Thus, demand for loans has been limited for a number of years.

Loans from mortgage banks account for an increasing share of firms’ total bank and mortgage bank debt. This should be seen in light of the tightening of collateral requirements by commercial banks. Moreover, the increasing interest differential between commercial bank loans and mortgage loans has undoubtedly been a contributory factor for firms that are able to pledge real estate as collateral, cf. Chart 1 (right). Commercial banks are still an important source of finance, however. One reason is that mortgage loans are provided only against real property as collateral. Thus, commercial bank and mortgage bank financing varies considerably across industries. Moreover, financing from commercial banks is often used to cover firms’ operating financing needs, while mortgage bank financing tends to be more long term in nature.

Both commercial banks and mortgage banks tightened credit standards substantially at the beginning of the financial crisis, cf. Chart 2 (left). The tightening was primarily implemented in the form of price increases and higher collateral requirements. Prices have also become more differentiated. Since early 2014, commercial banks, in particular, have gradually eased their credit standards somewhat. The easing has especially taken the form of price reductions, cf. Chart 2 (right). It appears from the institutions’ responses to the lending survey that both credit standards and pricing policies have been eased for the most creditworthy firms in particular. In many cases, the reason given for the easing is increased competition among institutions, especially for the best customers. In March 2015, the Danish Financial Supervisory Authority published a survey of new corporate loans granted by selected commercial banks. This survey, like Danmarks Nationalbank’s lending survey, showed that intensified competition among commercial banks was reflected in lower lending rates for the most creditworthy customers and to a lesser extent in easing of other terms and conditions such as collateral requirements.

Danmarks Nationalbank’s lending survey indicates a slight increase in demand for mortgage loans among firms since 2012, cf. Chart 3. On
Change in credit standards and prices

Chart 2

<table>
<thead>
<tr>
<th>Year</th>
<th>Commercial banks</th>
<th>Mortgage banks</th>
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Note: The lending survey provides qualitative statistical data based on responses from the largest Danish commercial banks and mortgage banks. Each response is given a value of -100, -50, 0, 50 or 100, and the value is weighted according to the institution's share of total lending. The net percentage can therefore vary between -100 and 100. A negative figure indicates a tightening and a positive figure an easing of credit standards. For example, a net percentage of -100 (100) means that all institutions have tightened (eased) their credit standards considerably, while a net percentage of -50 (50) means that they have tightened (eased) them a little.

Source: Danmarks Nationalbank.

Change in demand

Chart 3

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Source: Danmarks Nationalbank.
the other hand, demand for loans from existing commercial bank customers has declined in most quarters since 2012. During the same period, commercial banks have eased credit standards slightly. Given that, other things being equal, existing customers are likely to be a larger customer group than new customers, the lending survey thus indicates that the slow growth in commercial bank loans over the last few years is driven, in particular, by low demand for loans.

As far as commercial banks are concerned, demand from new customers has been growing, showing a more positive trend than demand from existing customers. This could imply that firms are increasingly considering to switch banks or to use more than one bank. There are also indications that competition among commercial banks has intensified.

Danmarks Nationalbank’s lending survey gives an impression of firms’ access to finance as seen from the commercial banks’ and mortgage banks’ point of view. Surveys on firms’ perceived conditions for access to loans are also conducted at regular intervals. Statistics Denmark’s confidence indicators are based on surveys conducted among firms in the manufacturing, construction and services industries. On average, only a small share of firms have stated financial constraints as impediments to production, cf. Chart 4. It should also be mentioned that firms currently tend to state labour shortages rather than lack of finance as impediments to production.

**ACCESS TO FINANCE OF SMALL AND MEDIUM-SIZED ENTERPRISES**

The confidence indicators are weighted according to employment, entailing that large firms carry relatively large weights. Below, we examine the access to finance of small and medium-sized enterprises based on surveys conducted by Statistics Denmark. The detailed responses are compared with firm-level register data. This enables an analysis e.g. of whether there is link between firms’ financial ratios and the outcome of their loan applications. The method and results are reviewed and documented in Andersen and Kuchler (2016).

The most recent survey on this topic was conducted by Statistics Denmark in 2014. A similar survey was conducted in 2010, dealing with the access to finance in 2007 and 2010. An analysis of this survey shows that commercial banks tightened credit standards during the crisis from a very loose level in the run-up to the crisis, cf. Abildgren et al. (2013).

This analysis uses survey data for 2007, 2010 and 2014 for around 2,000 firms with between 5 and 249 employees. This data is linked with register data from Statistics Denmark’s account and firm statistics, containing information about the firms’ employment, turnover, result before financial items, equity and total assets.

The surveys deal with firms’ access to finance, including loans from commercial banks and mortgage banks, among other things. The vast majority of small and medium-sized enterprises included in the analysis, close to 80 per cent of the respondent firms in 2014, did not apply for debt financing in the year in question, cf. Chart 5. This percentage is in line with the corresponding percentage both before and during the crisis, and the changes between the three time periods can, to some extent, be attributed to statistical uncertainty of the sample survey.

Thus, firms that do not apply for debt financing make up the majority of the firms surveyed in 2014. Of these firms, 70 per cent did not apply...
because they did not need debt financing. On average, these firms are also the most solvent firms, cf. Chart 6.\(^1\) Low demand for loans should be seen in light of a large positive savings surplus in the corporate sector since 2009, and thus firms are likely to be able to cover much of their financing needs through retained earnings. In addition, a small group of firms do not apply for loans out of fear of rejection. On average, these firms are less solvent than other firms.

Firms whose loan applications with commercial banks and mortgage banks are fully or partly accepted are more solvent than firms whose applications are rejected, cf. Chart 6. If financial ratios other than the solvency ratio are used, e.g. the profit margin, the same pattern applies, cf. Andersen and Kuchler (2016). Loan applications from firms with high interest costs relative to their total debt are also rejected more often than the applications of other firms, cf. Chart 7. There is usually a close link between the interest rate a firm is charged and its creditworthiness. To summarise, the above clearly indicates that the most credit-worthy firms have easier access to debt financing than less creditworthy firms.

A more formal econometric analysis in Andersen and Kuchler (2016) also indicates that both in 2010 and 2014, more solvent firms had a higher probability of having their loan applications accepted than less solvent ones. This link did not exist before the crisis, in 2007, cf. Box 1.

A firm’s productivity level also impacts its decision of whether to apply for debt financing as well as the outcome if the firm does apply, cf. Chart 8. Overall, a slightly larger share of more productive firms apply for loans than less productive firms. The most productive firms are less inclined to apply for loans, however.

A firm’s productivity often determines its ability to generate a profit and profitable prospects for expanding the firm’s activities. There is a clear tendency for the most productive firms to have their loan applications accepted to a greater extent than less productive firms.

Commercial banks tightened their credit standards in the aftermath of the outbreak of the

\(^1\) A firm’s solvency ratio is calculated as the ratio of equity to total assets.
Firms' solvency ratios – according to loan application status

Chart 6

Average solvency ratio in 2014, per cent

<table>
<thead>
<tr>
<th>Category</th>
<th>Solvency Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not applied (no need)</td>
<td>35</td>
</tr>
<tr>
<td>Application for loan from commercial bank accepted</td>
<td>30</td>
</tr>
<tr>
<td>Application for loan from commercial bank not accepted</td>
<td>25</td>
</tr>
<tr>
<td>Application for loan from mortgage bank accepted</td>
<td>30</td>
</tr>
<tr>
<td>Application for loan from mortgage bank not accepted</td>
<td>20</td>
</tr>
<tr>
<td>Not applied (fear of rejection, etc.)</td>
<td>15</td>
</tr>
</tbody>
</table>

Note: Bank loans do not include overdraft facilities. A firm's solvency ratio is calculated as the ratio of equity to total assets. A loan application is classified as accepted if it has been accepted in full or in part.
Source: Own calculations based on firm-level data from Statistics Denmark.

Firms' implied interest rate level according to loan application status

Chart 7

Average implied interest rate on gross debt in 2014, per cent

<table>
<thead>
<tr>
<th>Category</th>
<th>Implied Interest Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not applied (no need)</td>
<td>0</td>
</tr>
<tr>
<td>Application for loan from commercial bank accepted</td>
<td>5</td>
</tr>
<tr>
<td>Application for loan from commercial bank not accepted</td>
<td>4</td>
</tr>
<tr>
<td>Application for loan from mortgage bank accepted</td>
<td>5</td>
</tr>
<tr>
<td>Application for loan from mortgage bank not accepted</td>
<td>4</td>
</tr>
<tr>
<td>Not applied (fear of rejection, etc.)</td>
<td>6</td>
</tr>
</tbody>
</table>

Note: Implied interest rates on gross debt are defined as the ratio of the firm's interest expenses, etc. to total debt at the end of the year. Bank loans do not include overdraft facilities. A loan application is classified as accepted if it was accepted in full or in part.
Source: Own calculations based on firm-level data from Statistics Denmark.
Andersen and Kuchler (2016) estimate an econometric model for the outcome of firms’ applications for bank loans for the years 2007, 2010 and 2014, based on survey data for about 2,000 firms with 5-249 employees. This data is linked with register data from Statistics Denmark’s account and firm statistics, providing information about the firms’ employment, turnover, result before financial items, equity and total assets.

Which firms apply for bank loans is not random. This may have an impact on the outcome of the loan applications. To take this into account, a bivariate probit model with sample selection is estimated for each of the three years.

The probability of having an application for a loan fully accepted is modelled in a standard probit model:

$$P(y_1 = 1 | x) = \Phi(x\beta),$$

where $y_1$ is a binary variable that takes the value 1 if the firm’s loan application is fully accepted, the value is set to 0. Furthermore, is a vector of explanatory variables, and $\Phi$ is the cumulative distribution function for the standard normal distribution.

The outcome of the loan application, $y_1$, is observed only when firms have applied for loans. Let $y_2$ be a new binary variable taking the value 1 if the firm has applied for a bank loan, and 0 if the firm has not applied. This allows us to construct a further probit model:

$$P(y_2 = 1 | z) = \Phi(z\delta),$$

where $z$ is a vector of variables explaining the selection. The two equations are estimated simultaneously by maximum likelihood. This is to take into account a potential correlation between the error terms in the two equations.

The table below shows the results, with sample selection correction as described above, in the form of coefficient estimates and marginal effects. The marginal effect indicates the change in the probability (in percentage points) of having the loan application accepted due to a one unit change in the explanatory variable. Marginal effects are evaluated at the mean of the values of the other explanatory variables.

Overall, the figures indicate that in 2007 there was no statistically significant link between firm characteristics and the firm’s probability of having a loan application accepted. On the other hand, both in 2010 and 2014, more solvent firms had a higher probability of having their loan applications accepted than less solvent ones. In 2010, firm profitability and liquidity also played a key role in the probability of having a loan application accepted.

<table>
<thead>
<tr>
<th></th>
<th>2007</th>
<th></th>
<th>2010</th>
<th></th>
<th>2014</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficient estimate</td>
<td>Marginal effect</td>
<td>Coefficient estimate</td>
<td>Marginal effect</td>
<td>Coefficient estimate</td>
<td>Marginal effect</td>
</tr>
<tr>
<td>Solvency ratio</td>
<td>0.334</td>
<td>0.038</td>
<td>0.865</td>
<td>0.203</td>
<td>1.858</td>
<td>0.391</td>
</tr>
<tr>
<td>Profit ratio</td>
<td>-0.019</td>
<td>-0.002</td>
<td>1.492</td>
<td>0.350</td>
<td>0.345</td>
<td>0.073</td>
</tr>
<tr>
<td>Implied interest rate</td>
<td>-1.088</td>
<td>-0.124</td>
<td>-1.963</td>
<td>-0.460</td>
<td>-5.297</td>
<td>-1.116</td>
</tr>
<tr>
<td>Liquidity ratio (narrow)</td>
<td>5.572</td>
<td>0.634</td>
<td>1.589</td>
<td>0.373</td>
<td>-2.020</td>
<td>-0.426</td>
</tr>
<tr>
<td>Short-term debt ratio</td>
<td>-0.932</td>
<td>-0.106</td>
<td>0.347</td>
<td>0.081</td>
<td>1.109</td>
<td>0.234</td>
</tr>
<tr>
<td>Log (number of employees)</td>
<td>-0.110</td>
<td>-0.013</td>
<td>-0.053</td>
<td>-0.012</td>
<td>-0.135</td>
<td>-0.028</td>
</tr>
<tr>
<td>Number of observations</td>
<td>927</td>
<td>1,035</td>
<td>625</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Results express the probability of having a loan application fully accepted. All specifications contain a constant. The model has been corrected for sample selection using similar control variables and an indicator of whether the firm has applied for debt financing other than bank loans. The marginal effect of a one unit change in the explanatory variable on the probability of having the application for a bank loan accepted. However, for categorical variables (dummy variables), the marginal effect is the difference in probability between two firms, the only difference being whether the category of the respective dummy variable is true or false. Marginal effects are evaluated at the mean of the values of the explanatory variables. * p<0.10, ** p<0.05, *** p<0.01.

Source: Andersen and Kuchler (2016).
Firms’ productivity and loan applications, 2014

<table>
<thead>
<tr>
<th>Quartile of total factor productivity (TFP)</th>
<th>Share of firms that applied for a bank loan</th>
<th>Share of firms that had their application accepted</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st quartile</td>
<td>12</td>
<td>80</td>
</tr>
<tr>
<td>2nd quartile</td>
<td>10</td>
<td>70</td>
</tr>
<tr>
<td>3rd quartile</td>
<td>8</td>
<td>60</td>
</tr>
<tr>
<td>4th quartile</td>
<td>6</td>
<td>50</td>
</tr>
</tbody>
</table>

Note: A loan application is classified as accepted if it has been accepted in full or in part. The right-hand chart includes only firms that applied for bank loans. Firms’ productivity is calculated as the total factor productivity, TFP, estimated based on data for the firms in question during the period 2001-14, cf. Andersen and Kuchler (2016).
Source: Own calculations based on firm-level data from Statistics Denmark.

Loan application status according to solvency ratios

<table>
<thead>
<tr>
<th>Solvency ratio</th>
<th>2007</th>
<th>2010</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 0.1</td>
<td>90</td>
<td>80</td>
<td>70</td>
</tr>
<tr>
<td>0.1-0.2</td>
<td>10</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td>0.2-0.3</td>
<td>5</td>
<td>15</td>
<td>25</td>
</tr>
<tr>
<td>≥ 0.3</td>
<td>5</td>
<td>15</td>
<td>25</td>
</tr>
</tbody>
</table>

Note: Bank loans do not include overdraft facilities. A firm’s solvency ratio is calculated as the ratio of equity to total assets.
Source: Own calculations based on firm-level data from Statistics Denmark.

financial crisis. In 2007, just over 80 per cent of the least solvent firms with a solvency ratio below 0.1 had their loan applications accepted, cf. Chart 9. In 2010, this number was down to just over 40 per cent. A similar tightening was introduced for firms with higher solvency ratios, although their loans applications were still accepted to a greater extent than those of firms with a low solvency ratio.
In 2014, credit standards tended to be looser for more solvent firms, especially for the group of
firms with solvency ratios in the range of 0.1-0.2. In this group, the share of firms having their loan applications fully accepted had risen from just under 40 per cent to about 75 per cent. Credit standards for the least solvent firms have not been eased. The tendency to ease credit standards for solvent firms is the same across the main industries, cf. Andersen and Kuchler (2016).

**FIRMS’ ACCESS TO FINANCE IN AN INTERNATIONAL PERSPECTIVE**

Despite international differences in corporate financing structures, debt financing is still a key source of finance for firms in most countries. The European Commission, in collaboration with the European Central Bank, ECB, conducts recurring surveys of the access to finance of small and medium-sized enterprises in all 28 EU member states. Unlike Statistics Denmark’s survey, which surveys firms with between 5 and 249 employees, the Commission’s survey also includes the smallest firms with just one employee. However, in general, the findings of the two surveys are reasonably consistent.

Compared with firms in other EU member states, a relatively small share of small and medium-sized Danish enterprises applied for financing in a commercial bank in 2014, cf. Chart 10 (left). Among other things, this reflects that mortgage credit is an important source of finance for these enterprises. According to the survey, 80 per cent of Danish firms applying for loans in a commercial bank in 2014 had their loan applications fully accepted, cf. Chart 10 (right). The corresponding share of firms across the EU was 66 per cent.

By analysing developments in firms’ financial figures, it is possible not only to get an indication of their perception of the access to finance, but also of the extent of financial constraints. Such an analysis has been conducted in a number of EU member states, including Denmark, cf. Box 2. The results generally indicate that, by international standards, Danish firms have good access to finance and that commercial banks’ credit assessments to a large extent mean that loan capital flows to the most productive firms.

However, there are also indications that the least productive firms in Denmark are relatively less financially constrained than firms in other countries. During a period of exceptionally low in-
An indicator of financially constrained firms, developed in the Competitiveness Research Network, CompNet, can be used to assess the extent of financial constraints in various countries. CompNet is a research network coordinated by the European Central Bank, ECB. A number of European central banks participate in the research network.¹

To establish the indicator, firm $i$’s financing gap, $F_{it}$, is defined as

$$F_{it} = I_{it} - CF_{it}$$

where $I_{it}$ is net real investment (i.e. investment in fixed assets and increase in current assets except for liquid assets) in year $t$ and $CF_{it}$ is the cash flow in year $t$ (defined as profit plus depreciation and amortisation). The financing gap can be seen as an indicator of the firm’s savings surplus (with the opposite sign). Firms with a positive financing gap need additional financing as they are unable to finance their real investment through their cash flow. Firms which have a positive financing gap but do not obtain external financing, e.g. by obtaining credit or raising additional capital from the stock market, are classified as financially constrained. Instead, they use internal financing, e.g. through retained earnings. In addition, firms with a positive financing gap that liquidate assets (i.e. firms which have negative net investment) are classified as financially constrained irrespective of whether they obtain external financing. This is based on the hypothesis that they are unable to raise sufficient external capital in order for them to be able to preserve their capital stock.

According to this approach, 6 per cent of Danish firms were classified as financially constrained in 2012, the most recent year of fully comparable data for the other countries. This level corresponds to the level e.g. of Statistics Denmark’s confidence indicators, cf. Chart 4.

A key assumption of this indicator is that firms use internal financing only if they are unable to obtain external financing. This assumption could be debated in a Danish context, given that Danish firms tend to finance themselves to a relatively high extent through retained earnings, cf. Petersen and Risbjerg (2009). Moreover, firms have had a high positive savings surplus since 2009, cf. Abildgren et al. (2014), entailing that financing through retained earnings must be expected to have been particularly significant in recent years. Adjusted for financing through retained earnings, the share of Danish firms classified as financially constrained is somewhat lower, cf. Andersen and Kuchler (2016).

Compared with other countries, the extent of financial constraints among Danish firms is relatively low, cf. the chart (left). The chart also illustrates the loose credit standards in Denmark in the period leading up to the crisis and the subsequent tightening, bringing the level of financially constrained Danish firms closer to the level of other Western European countries.

Both in Denmark and in the other countries, there is a link between firm labour productivity and financial constraints, cf. the chart (right). Firms with low labour productivity are more financially constrained than firms with high labour productivity. Thus, credit allocation supports a positive development in productivity. The results generally indicate that, by international comparison, Danish firms have relatively good access to finance.

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¹ Further information on the method can be found in Ferrando et al. (2015) and Lopez-Garcia et al. (2015).
terest rates, it is important to ensure that low-produc-
tivity firms with unprofitable operations are not kept artificially alive. Otherwise, this will only delay the necessary adaptation processes in the corporate sector – to the detriment of both em-
ployment and prosperity.

LITERATURE


Abildgren, Kim, Carina Moselund Jensen, Mark Strøger Hansen, Mark Strøm Kristoffersen, Andreas Kuchler and Oxana Skakoun (2014), Corporate capital structure, productivity and access to fi-


Petersen, Christina and Lars Risbjerg (2009), Danske virksomheders finansiering i et makroøkonomo-

CURRENT TRENDS IN THE GREENLANDIC ECONOMY

Anders Møller Christensen, Economics and Monetary Policy

INTRODUCTION AND SUMMARY

Economic growth in Greenland was positive in 2015, following three years of contraction. Nevertheless, there was considerable emigration so that the population declined further in spite of a large excess of births.

Greenland benefited from rising prices for fish and shellfish in 2015. Fisheries is the predominant Greenlandic export industry and prawn by far the most important species. Catch volumes declined, but price developments meant that earnings were good in large parts of the fisheries sector, and revenue from direct taxes increased. Combined with lower-than-planned expenditure this meant that a government deficit envisaged in the Finance Act made way for a small surplus. The liquidity of the government is good, and gross debt is modest, constituting less than 5 per cent of the gross domestic product, GDP.

Activities in connection with extraction of and exploration for raw materials have diminished considerably. Two small projects will start extracting minerals in 2016 and 2017.

Investment in building and construction increased in 2015 and further growth is expected in 2016. At the same time, statistics indicate that private consumption is rising strongly. Together with larger quotas for especially prawns, this will result in higher economic growth in 2016 than for many years. But no solution has been found to the major structural problems in Greenland, i.e. the very narrow business sector.

NATIONAL ACCOUNTS AND BALANCE OF TRADE

2015 saw renewed economic growth after three years of decline, cf. Table 1. This is mainly attributable to stronger investment in building and construction, as the predominant export industry, fisheries, decreased in volume terms. However, high prices for fish and shellfish meant that earnings in the sector rose despite the falling volumes. This rise in earnings contributed to buoying up private consumption. In 2016, economic growth will presumably be stronger than previously expected, as prawn quotas have been increased in accordance with biological advice, and building and construction investment is expected to rise further. In addition, there will be new mining operations linked to two small, but important projects. But exploration activity for oil and minerals is modest compared with previously.

The trade deficit was calculated at kr. 1.3 billion for 2015, the same as in 2014. Imports of oil and fuel fell by kr. 500 million, while there were small increases in most other imports of goods. Exports of goods consist almost entirely of fish and shellfish. The fall in export values in 2015 is presumably attributable to the price material not having been fully updated, cf. the section on fisheries.

The latest figures for overall inflation, stated as the annual rate of growth in the index of consumer prices, are from January 2016, when inflation was 1.2 per cent. In the same period, Danish prices rose by 0.6 per cent.
The economic downturn in the period 2012-14 is presumably the main reason why the population of Greenland has been declining in recent years. At the beginning of 2016, the population was just under 56,000. That means that it fell by approximately 200 during 2015. In the last three years, annual net emigration has been approximately 600, which is much higher than the excess of births, i.e. the number of live births less the number of people who die. By comparison, annual net emigration was approximately 200 in the boom years 2009-11.

Net emigration mainly comprises people born in Greenland who move to Denmark. Since 2000, the number of people born in Greenland and living in Denmark has risen by 4,000 to around 16,000, while the number of people born and living in Greenland has been more or less stable.
at 50,000, cf. Chart 1. So almost one quarter of the people born in Greenland live in Denmark. For those born in the period 1969-75, it is no less than one third. Emigrants can be found within all age groups, so it is not merely a question of many young people moving to Denmark to get an education and staying there for some years. Among those aged 21-30, the share of people born in Greenland who live in Denmark is now smaller than it was at the beginning of the century. This is probably because education and training opportunities in Greenland have improved.

The shrinking population meant that the government of Greenland in May 2016 launched an investigation into the reasons why so many people leave the country so that it could take initiatives to stem the tide.

**MOST RECENT CYCLICAL TENDENCIES**

There are clear indications that domestic demand in Greenland increased in 2015. For example, freight volumes transported to Greenland by the Royal Arctic Line, RAL, grew considerably, cf. Chart 2. It should be noted that most of the goods for meeting domestic demand, with oil as the main exception, are imported and transported by RAL, which also handles virtually all exports of fish and shellfish, with mackerel as a significant exception.

RAL freight volumes from Greenland have not shown the same rising tendency. However, the first months of 2016 seem to be an exception. This may be attributable to better weather than in the first months of 2015, but possibly also the higher prawn quotas.

The retail turnover index, which shows turnover in the three largest retail chains in Greenland, points unequivocally to a rise in private consumption during 2015, cf. Chart 3.

No current statistics of the development in unemployment figures are available, but monthly
compilations are made of the number of people registered as job seekers. This is a count of the people who have contacted the local authorities with unemployment problems at least once within that month. The figures for the first four months of 2016 show that the number of job seekers was somewhat lower than in the corresponding months of 2015. However, these figures have proved to be difficult to interpret as they are affected by e.g. local government administrative practices.

PUBLIC FINANCES

According to the Finance Act for 2015, the current and investment, CI, budget was expected to show a deficit of kr. 64 million. The deficit including lending – the CIL deficit – had been budgeted at kr. 27 million. However, the realised figures were considerably better, cf. Table 2. The accounts for 2015 show a CI surplus of kr. 137 million and a CIL surplus of kr. 188 million, i.e. improvements of approximately kr. 200 million on the budget. These improvements can be more or less equally distributed on lower expenses than budgeted for and higher proceeds, especially from direct taxes as a result of favourable income developments.

The main items of the government accounts are shown in Table 2.

Since 2010, the expected balance of the CI budget has been the key budget element when adopting the Finance Bill for the next year. The target is to have a CI surplus in normal years. With 2014 as an exception, this has also been the case, but deficits are budgeted for in both 2016 and 2017.

The assessment of the impact of public finances on activity must also take into account

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**Main items of the government accounts**

<table>
<thead>
<tr>
<th>Kr. million</th>
<th>2009R¹</th>
<th>2010R¹</th>
<th>2011R¹</th>
<th>2012R¹</th>
<th>2013R¹</th>
<th>2014R¹</th>
<th>2015R¹</th>
<th>2016L²</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Operational expenses</td>
<td>2,870</td>
<td>2,984</td>
<td>2,685</td>
<td>2,735</td>
<td>2,720</td>
<td>2,660</td>
<td>2,656</td>
<td>2,745</td>
</tr>
<tr>
<td>2. Statutory expenses</td>
<td>850</td>
<td>852</td>
<td>870</td>
<td>879</td>
<td>984</td>
<td>1,008</td>
<td>1,010</td>
<td>1,060</td>
</tr>
<tr>
<td>3. Subsidies</td>
<td>2,330</td>
<td>1,634</td>
<td>1,897</td>
<td>2,009</td>
<td>2,150</td>
<td>2,220</td>
<td>2,154</td>
<td>2,204</td>
</tr>
<tr>
<td>4. Capital expenditure</td>
<td>808</td>
<td>719</td>
<td>1,095</td>
<td>969</td>
<td>597</td>
<td>896</td>
<td>589</td>
<td>686</td>
</tr>
<tr>
<td>5. Total expenses</td>
<td>6,859</td>
<td>6,189</td>
<td>6,547</td>
<td>6,591</td>
<td>6,452</td>
<td>6,784</td>
<td>6,409</td>
<td>6,694</td>
</tr>
<tr>
<td>6. Agreed income¹</td>
<td>3,799</td>
<td>3,828</td>
<td>3,864</td>
<td>3,922</td>
<td>3,976</td>
<td>3,967</td>
<td>4,039</td>
<td>4,051</td>
</tr>
<tr>
<td>7. Direct taxes</td>
<td>828</td>
<td>1,019</td>
<td>1,135</td>
<td>1,143</td>
<td>1,051</td>
<td>1,027</td>
<td>1,112</td>
<td>1,062</td>
</tr>
<tr>
<td>8. Indirect taxes</td>
<td>776</td>
<td>772</td>
<td>800</td>
<td>860</td>
<td>824</td>
<td>936</td>
<td>907</td>
<td>987</td>
</tr>
<tr>
<td>9. Other revenue</td>
<td>509</td>
<td>567</td>
<td>593</td>
<td>601</td>
<td>672</td>
<td>700</td>
<td>538</td>
<td>515</td>
</tr>
<tr>
<td>10. Total income</td>
<td>5,913</td>
<td>6,187</td>
<td>6,392</td>
<td>6,526</td>
<td>6,523</td>
<td>6,630</td>
<td>6,596</td>
<td>6,594</td>
</tr>
<tr>
<td>11. Actual CIL balance: (10)-(5)</td>
<td>-946</td>
<td>-2</td>
<td>-156</td>
<td>-65</td>
<td>71</td>
<td>-154</td>
<td>188</td>
<td>-100</td>
</tr>
<tr>
<td>12. CI balance</td>
<td>-511</td>
<td>203</td>
<td>54</td>
<td>150</td>
<td>78</td>
<td>-222</td>
<td>137</td>
<td>-57</td>
</tr>
<tr>
<td>13. Increase in unused funds in Construction and Renovation Fund</td>
<td>87</td>
<td>214</td>
<td>148</td>
<td>-82</td>
<td>-198</td>
<td>470</td>
<td>-80</td>
<td>-100</td>
</tr>
<tr>
<td>14. CIL balance adjusted (11)+(13)</td>
<td>-859</td>
<td>212</td>
<td>-8</td>
<td>-147</td>
<td>-127</td>
<td>316</td>
<td>108</td>
<td>-200</td>
</tr>
</tbody>
</table>

**Note:** In 2011, block grants to local authorities were increased by kr. 302.6 million as care for the disabled was transferred to local authorities. Hence, this amount is transferred from the Greenlandic government’s operational expenses to expenses for subsidies.

**Source:** Government Accounts and Finance Act 2016.

¹ Accounts data.
² Finance Act 2016.
³ Agreed income mainly comprises the block grant from the Danish government (kr. 3,679 million in 2015), partnership and fisheries agreements with the EU (kr. 238 million in 2015) and sale of fishing rights (kr. 105 million in 2015).
the Construction and Renovation Fund. When capital expenditure is approved, it is charged to the investment budget, and the amount is transferred to the Fund. When the project is actually carried out and paid for, often in subsequent years, it is financed via disbursements from the Fund. In 2015, the Fund’s capital decreased by kr. 80 million, and hence activity financed by the Fund was not kr. 589 million, but kr. 80 million higher. In 2014, activity totalled approximately kr. 400 million.

The improved government finances mean that the government’s liquidity improved in 2015, to almost kr. 1.3 billion. The Greenlandic government did not raise any loans in 2015, so its gross debt is still below 5 per cent of GDP.

A special characteristic of the Greenlandic economy is that the most important source of income, the block grant from the Danish government, is not affected by the economic development in Greenland, but is adjusted annually over the Danish Finance Act to reflect the increase in the general price and wage index. Income from partnership and fisheries agreements with the EU is not cyclical either. This provides a good point of departure for the budget process, but also involves difficulties in that financing of higher public spending requires a more-than-proportional increase in revenue from taxes and duties.

In the slightly longer term, Greenland is faced with a challenge as the baby boomers from the 1960s and 1970s approach or reach retirement age. The Economic Council has calculated a fiscal indicator which shows that there is a need to continue to tighten fiscal policy by an amount almost equivalent to the government’s proceeds from direct taxes if government debt as a ratio of GDP is not to rise until 2040. If tightening is to take place on the income side, this will require a broader business sector than at present, e.g. based on extraction of raw materials and tourism. On the expenditure side, it is worth noting that public consumption is very high in Greenland.

In fact, public consumption per capita is 50 per cent higher than in Denmark, but there is nothing to indicate that the level of public service is correspondingly higher. This situation is primarily attributable to lack of economies of scale because the population is so scattered. In certain areas there may also be a greater preference for collective solutions than in Denmark.

**EDUCATION AND INFRASTRUCTURE**

In some respects, a high level of spending has clearly not resulted in a corresponding quality. In the spring of 2015, the Danish Evaluation Institute published a critical report on the primary and lower secondary school system in Greenland. It is simply assessed to be functioning poorly. In 2016, the report was followed by an even more critical evaluation of teacher training programmes, which “currently face a number of serious quality challenges and do not satisfactorily meet the need for qualified teachers in the primary and lower secondary schools” (Danish Evaluation Institute, Læreruddannelse. Evaluering af Grønlands læreruddannelse på Ilinniarfissuaq, 2016 (Teacher training. Evaluation of Greenland’s teacher training programme at Ilinniarfissuaq, 2016 – in Danish only)). This is disheartening as better functioning schools are an important key to economic development. Responsibility for schools was transferred to Greenland some years ago.

The problems related to the general lack of economies of scale may have intensified in recent years. On the one hand, the population has become more concentrated as people have migrated to Nuuk, Sisimiut and Ilulissat and away from most other towns and settlements, but on the other hand, the number of populated locations remains unchanged, which means that there are now far more very small settlements than previously. Today, some 30 settlements have a population of less than 100, meaning that the number has doubled since the millennium rollover. If those remaining in a very small settlement are to have the same level of service as the rest of society, costs per capita will inevitably be high.

An element of the coalition agreement from December 2014 between the parties Siumut, the Democrats and Atassut is to ensure development in all of Greenland. In continuation of this agreement, the coalition has concluded an agreement on the future airport structure. The runways in Nuuk and Ilulissat will be extended so that planes from e.g. Copenhagen can land directly in these two towns instead of the airport at Kangerlussuaq. Furthermore, there are plans to build airports at Qaqortoq in the south and Tasiilaq in the east of Greenland.

The aim is to facilitate access to the country and to make it less expensive for tourists and business
travellers so that the tourism sector can be developed. The background is some years with falling tourism. These airport investments will total more than kr. 2.5 billion. Profitability calculations have been performed for subelements of these very large investments, but not for the overall plan.

In 2011, a transport commission set up by the previous government concluded that it would be profitable to extend the runway in Nuuk if the airport at Kangerlussuaq were closed; otherwise it would not be profitable. Unless there is a very large increase in passenger numbers to Greenland, it could be feared that the forthcoming expansion without any closures will either put direct pressure on future public finances by way of expenses for maintaining both the new and the existing capital stock or that it will, despite the intentions, be necessary to charge so high airport taxes that business development is in fact impeded although actual flight prices will fall for the majority of passengers travelling to either Nuuk or Ilulissat. So an assessment is needed of the overall airport finances for the proposed expansion, taking into account all costs and the sensitivity to changes in passenger numbers.

Since no decision has been made to close any existing airports, the profitability of the airport project must be deemed to be doubtful. The largest airports were constructed by the US armed forces 75 years ago for military purposes during World War II. Hence, their locations are not optimum in relation to populated areas and tourism.

FISHERIES

Earnings in the fisheries sector were generally very good in 2015 thanks to favourable price developments. Some of the large companies within the industry, including the government-owned Royal Greenland, have posted three-digit million profits, and like many small-boat fishers, trawler crews have enjoyed high incomes. Prices were on average 33 per cent higher in 2015 than in 2012, which was not a bad year pricewise. Prices for the financially most important species, prawn, were more than 40 per cent higher than in 2012, while increases for cod and Greenland halibut were around 20 per cent in the same period.

In volume terms, the picture is less clear. Weighted by 2012 values, aggregate catches of prawn, Greenland halibut and cod were 6 per cent lower than in 2014 and 14 per cent lower than in 2012, cf. Chart 4. This masks prawn catches that were almost 40 per cent lower, while catches of Greenland halibut have risen a little and cod catches have almost tripled.

Prawn fishing is regulated by quotas and on the whole the politically determined quotas reflect biological advice. Catches are MSC certified as sustainable, which may have contributed to recent years’ favourable price developments. Quotas fell sharply for a number of years and reached 73,000 tonnes in 2015, down from 124,000 tonnes in 2011. But in 2016 they have been increased to 85,000 tonnes, which is a little lower than recommended by biologists. The reason why the quotas are not raised to the recommended level is that the administrative plan tries to ensure smaller fluctuations in quotas than in recommendations.

The background to the increased stocks of prawn is not fully known. The falling quotas in previous years were mainly attributed to climate changes as the prawns were caught in increasingly northern waters, but the climate cannot explain why stocks are increasing again. A positive interpretation could be that regulation of fisheries in the form of individual, tradable quota shares serves its purpose.

In other words, prawn catches are set to rise by around 20 per cent in 2016. If prices remain high, earnings in this branch of fisheries will rise corre-
spondingly. And the outlook may be even better. In the 4th quarter of 2015, prawn prices were 16 per cent higher than the average for 2015.

Fishing for Greenland halibut has increased slightly in recent years, but was unchanged from 2014 to 2015. Catches in sheltered waters in fjords and close to the coast fell slightly, but were offset by larger catches in open seas. Biologists are expressing concern as to whether the volume of fishing in sheltered waters is appropriate as the fish are getting still smaller. This is not promising in terms of future stocks, and in recent years a larger effort has also been required in order to catch the same volumes.

Stocks of cod are increasing in the waters off western Greenland, but in order to allow spawning stocks to build up in Greenlandic waters, biologists recommend a cautious approach to cod fishing. The Greenlandic government has fixed the quota at 25,000 tonnes for 2016.

All things considered, the prospects for traditional fisheries around Greenland are currently good. Volumes are increasing and prices are high. But no matter how well fisheries are regulated, nature will bring fluctuations in and limit the sizes of catches, and prices, which have risen strongly, may plummet.

Climate change means that mackerel, and possibly also other schooling fish, can be found in large numbers in Greenlandic waters for part of the summer. In 2014, almost 80,000 tonnes of mackerel were caught, but in 2015 this volume had fallen to approximately 30,000 tonnes. In 2016, the quota remains 85,000 tonnes, and it is assessed that it was pure chance that mackerel stocks did not stay in Greenlandic waters for as long as expected last year. The quota is determined unilaterally by Greenland with a view to being acknowledged as a coastal state and hence being granted a share of the overall North Atlantic mackerel quota. That would make it possible to plan fisheries in a more appropriate way. Since 2014, the overall quota has been shared between the EU, Norway and the Faroe Islands.

EXTRACTION OF RAW MATERIALS

Following some years without any mining operations, a company called True North Gems Greenland is expected to commence extraction during 2016, having made the necessary investments. The project will provide employment for about 80 people in the operating phase.

A project on the same scale linked to extraction of anorthosite is currently in the construction phase, after the authorities in 2015 granted an extraction licence to Hudson Greenland. The project is expected to start operations in 2017.

A somewhat larger project at the Citronen Fjord in the northernmost part of Greenland for extraction of zinc and lead applied for an extraction licence in 2015. If the project is realised, it will provide 300-500 jobs during the operating phase.

As regards other minerals, there has also been considerable exploration activity for some years, and in continuation of these activities the Greenlandic authorities have granted extraction licences for, inter alia, a large iron project in the Nuuk Fjord. But falling world market prices for iron and other metals, cf. Chart 5, have led to a change of ownership of the project. There is no prospect of the project being launched in the foreseeable future.

Extraction of raw materials offers the most realistic opportunity to expand the Greenlandic business sector. But Greenland has a substantial level of costs that is on the high side of the Danish level, a geographically very scattered population with a resultant lack of economies of scale, high transport costs and, not least, a low level of education. This makes it difficult to develop internationally competitive traditional industries. Oppor-
tunities to find employment in the raw materials sector may contribute strongly to raising the level of education.

In the spring of 2016, the Danish and Greenlandic governments agreed on the terms and conditions for extracting and exporting raw materials for both civil and military uses, notably uranium. Uranium is an unavoidable by-product of one of the projects aimed primarily at extracting rare earth elements. The company behind the project is expected to apply for an extraction licence in 2016. The Greenlandic authorities will decide whether a licence can be granted, but due to the nature of the product it is the responsibility of the Danish government to ensure that international agreements on extraction and trade are observed.

Back in 2010 and 2011 there was considerable exploration activity for oil and other types of hydrocarbon in the waters off western Greenland. The related costs amounted to approximately kr. 5 billion, which is included as part of the investment in oil and mineral exploration in the national accounts. Traces of hydrocarbon were found, but the amounts were insufficient for commercial exploitation. Since then, no exploratory drilling has taken place in Greenlandic waters, and given the current world market prices for oil, extraction in this area is not attractive for the companies. Consequently, exploratory activities have been put on the back burner.

The Greenlandic listed company Nuna Minerals, which explores for minerals in Greenland, suspended payments in May 2015. One year later, the fate of the company has not yet been decided.