EUROPEAN CENTRAL BANK

EUROSYSTEM

Occasional Paper Series

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The profitability of banks in a context of negative monetary policy rates: the cases of Sweden and Denmark

No 195 / August 2017

Contents

Abstract

This paper looks at how the profitability of banks in Sweden and Denmark has evolved in the context of negative interest rates. Overall, it finds that profitability has continued to improve, even with negative monetary policy rates. Data and model-based evidence confirm that the monetary policy transmission to bank lending rates has so far not been impaired, though they point to a downward stickiness in the bank deposit rate. Swedish and Danish banks rely mainly on wholesale funding to finance their activities, and the fall in wholesale funding costs has led to a significant decline in interest expenses, thereby bolstering the resilience of the net interest income margin. All in all, this has created the prerequisites for positive credit supply developments, and possible unintended consequences of negative monetary policy rates, such as a reduction in credit supply, have not materialised. However, according to Sveriges Riksbank and Danmarks Nationalbank, the prevailing low level of interest rates has aggravated financial stability risks stemming from the large exposure of the banking sector to the housing market in both economies, in a context of rapidly rising housing prices and the resultant growing indebtedness of the household sector.

Keywords: Banks' profitability, monetary policy pass-through.

JEL codes: E58

Executive summary

The recent introduction of negative monetary policy rates by some major central banks in Europe and Japan so as to provide additional monetary accommodation and thus achieve their primary objective has triggered concerns about the possible impact on banks' profitability. If introducing negative monetary policy rates squeezes banks' profitability, this could hamper monetary policy transmission, which would be counterproductive in terms of the central banks' objective. It could also aggravate risks to financial stability.

The experience of Sweden and Denmark is particularly interesting in this context, as the Riksbank and Danmarks Nationalbank have brought some of their main policy rates deeper into negative territory than most other central banks. Negative monetary policy rates were introduced to lift inflation towards the target in Sweden and to defend the ERM II peg in Denmark.

This paper focuses on how the profitability of banks in Sweden and Denmark has fared against a background of negative monetary policy rates. It finds that both profitability and cost efficiency have continued to improve on the back of rising bank operating incomes in Sweden and falling operating expenses in Denmark, even when faced with negative monetary policy rates and the banks' reluctance to introduce negative deposit rates. In particular, "realised and unrealised gains" on securities have helped improve the profitability of Swedish banks. Other contributory factors probably include the economic recovery and the government bond purchase programmes pursued by the Riksbank. In Denmark, banks' profitability has benefited from significant improvement in impairments, stemming from the recovery of the housing market and economic growth since 2014 and a significant decline in operating costs, as banks have focused on cutting costs while constantly adjusting their business models.

At the same time, the net interest income margin has remained broadly stable in Sweden and has declined only slightly in Denmark. This is because the fall in interest income has been contained by the rise in lending volumes, while the decline in interest expenses has provided partial compensation. As Swedish and Danish banks rely mainly on wholesale funding to finance their activities, the decline of wholesale market funding costs has helped maintain banks' profitability. This probably also explains why behaviour as regards setting interest rates for bank lending has not been affected so far. In addition, the high capital ratio of Swedish and Danish banks compared to global peers may have contributed to low funding costs and facilitated monetary policy transmission, even against a background of negative monetary policy rates.

To further investigate the monetary policy transmission to the bank lending and deposit rates in Sweden and Denmark, this paper presents a standard pass-through model relating to bank interest rates in an error correction framework. First, monetary policy rates are considered to be direct determinants of retail bank rates (lending and deposit) under the assumption of a low and stable level of risk and well-capitalised

financial institutions. Second, as Swedish and Danish banks rely mainly on wholesale funding to finance their activities and to take into account risk factors, market reference rates are used as main determinants of banks' retail rate-setting behaviour. The results show that banks have not significantly changed their behaviour as regards setting lending rates by comparison with "normal times. Regarding the bank deposit rate, there has been downward stickiness given banks' reluctance to cross the lower band of zero. Consequently, the lending-deposit interest margin has been squeezed both in Sweden and, albeit to a lesser extent, in Denmark.

Finally, the paper analyses the evolution of lending and deposits, revealing that unintended consequences of negative monetary policy rates, such as a reduction in credit supply or a rush to cash, have not materialised. In Sweden, lending to both households and non-financial corporations (NFCs) has increased significantly over the last two years, fuelling economic activity. In Denmark, growth in lending to households and NFCs recovered steadily while the economy was emerging from a housing bust. However, according to Sveriges Riksbank and Danmarks Nationalbank, the prevailing low interest rates have aggravated financial stability risks associated with the banking sector's extensive exposure to the housing market in both economies, in a context of rapidly rising house prices and the associated rising indebtedness of the household sector.

1 Introduction

The recent introduction of negative monetary policy rates by some major central banks in Europe and Japan with the aim of providing additional monetary accommodation, and thus achieving their primary objective, has triggered concerns about the possible impact of this policy on banks' profitability. Introducing negative monetary policy rates could both hamper monetary policy transmission (which would be counterproductive in terms of the central banks' objective) and aggravate risks to financial stability. Arguably, by squeezing banks' profitability, negative monetary policy rates could both undermine banks' ability to support credit growth and erode their buffers over time, thereby weighing on economic recovery and inflation. Moreover, to compensate the adverse impact on their profitability, banks could invest in more risky assets, which would put their financial soundness at risk.

The overall effect of negative monetary policy rates on banks' profitability is not immediately obvious. Negative rates may erode banks' profitability, primarily by narrowing their net interest margin (the gap between bank lending and deposit rates), given their reluctance to introduce negative retail deposit rates. However, other channels include the development of wholesale funding costs, as well as lending volumes, credit losses or fee and commission income. Moreover, asset purchases and other measures contributing to lower interest rates increase the value of the securities held by banks, with a positive impact on profits.

The experience of Sweden and Denmark is particularly interesting in this context, as Sveriges Riksbank and Danmarks Nationalbank have brought some of their main policy rates deeper into negative territory than most other central banks (for instance, the repo rate in Sweden fell to -0.5% in February 2016, while the certificates of deposit rate in Denmark fell to -0.65% in January 2016). Negative monetary policy rates were introduced to lift inflation towards the target set in Sweden and to defend the ERM II peg in Denmark.

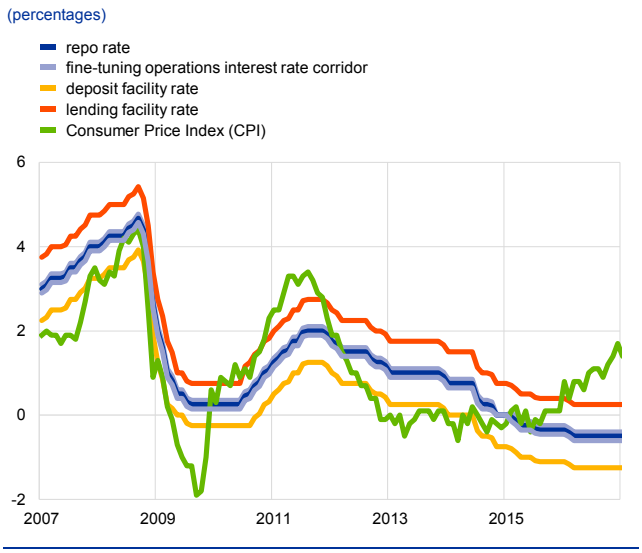
Against this background, this paper has three objectives: first, to examine how banks' profitability has evolved in the light of negative interest rates;[1] second, to assess if and to what extent monetary policy transmission has been hampered, looking more particularly at the banks' lending and deposit rates, but also at their funding structure; and third, to highlight lending developments and their potential impact on financial stability.

[1] The analysis uses unconsolidated bank data, as bank activities examined at the consolidated level may mask the impact of negative interest rates in domestic markets. It is worth noting that the Swedish banks' assets in foreign subsidiaries and branches abroad were roughly half their total assets over 2012-2015. In contrast, the ratio was only about 20% for Danish banks.

2 Banks' profitability

Chart 1

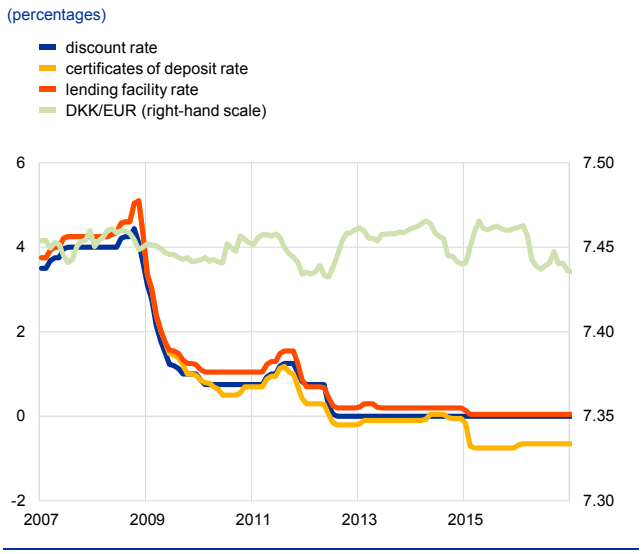
Key Swedish monetary policy rates and inflation



Source: Riksbank.
Note: In practical terms, the relevant operations are the weekly Riksbank Certificates transactions (at the repo rate) and the daily fine-tuning operations (at the repo rate plus/minus 10 basis points), so the deposit and lending facility rates have very little impact on the overnight rate.

Chart 2

Key Danish monetary policy rates and peg to the euro



Source: Danmarks Nationalbank.

Negative policy rates have been introduced in Sweden as part of a package of measures to lift up inflation to achieve its inflation target of 2.0%. In Denmark, whose currency is pegged to the euro, they were introduced to deter speculative pressures on the peg due to large capital inflows (see Charts 1 and 2). In February 2015, Sveriges Riksbank decided to cut its repo rate to -0.10% and to initiate government bond purchases to lift inflation and inflation expectations.[2] Three further rate cuts have since been decided.[3] Since February 2016 the repo rate in Sweden has been brought to -0.50%. In parallel, the Riksbank has extended its government bond purchases. For the first time in history, Danmarks Nationalbank lowered its certificates of deposit rate to -0.20% in July 2012. Denmark's monetary policy sought to keep the krone-euro exchange rate constant, this being the main objective of Danmarks Nationalbank.[4] In February 2015, the Danish central bank decided additional cuts in its certificates of deposit rate, bringing it to a record low of -0.75% to curb the appreciation of the Danish currency. The appreciation pressures

2 On 2 July 2009, when the Riksbank cut its repo rate to 0.25%, it was the first central bank in the world to implement a negative interest rate. This pushed its linked overnight deposit rate down to −0.25%. The aim was to counter the economic slowdown arising from the 2008 financial crisis.

3 On 18 March 2015, the Riksbank decided to cut its repo rate to -0.25%. On 2 July 2015, a further cut — to -0.35% — was followed by an extension of the Riksbank's bonds purchase programme by SEK 45 bn. Finally, on 11 February 2016, the Riksbank decided to cut its repo rate to -0.50%.

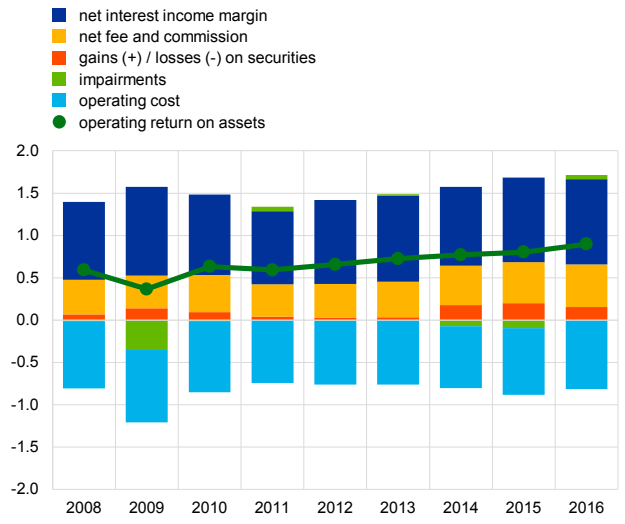
4 The Danish krone is linked to the euro through its participation in ERM II, with a central rate of 7.46038 kroner per euro and a ±2.25% fluctuation band around this central rate. This band is narrower than the standard fluctuation band of ±15% which was agreed in 1999.

stemmed from increased capital inflows during the first quarter of 2015, mainly due to the Schweizerische Nationalbank's announcement that it was going to abandon the Swiss franc's minimum exchange rate against the euro and the ECB's decision to expand its asset purchase programme.[5] Finally, from the second quarter of 2015, appreciation pressures on the Danish krone diminished, allowing Danmarks Nationalbank to gradually reduce its foreign exchange reserves to a level close to that prevailing at the beginning of the year, and, eventually, to raise its policy rate to -0.65% in January 2016.

Chart 3

Profitability of banks in Sweden

(percentage of total assets)

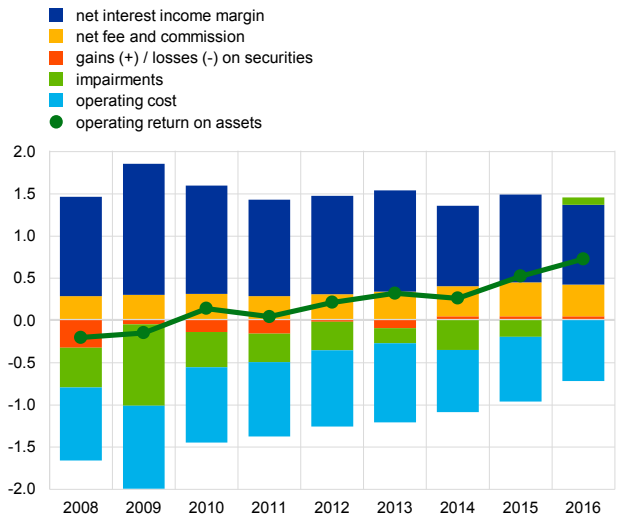


Source: ECB (Consolidated Banking Database CBD).
Note: Operating Return on Assets represents the profit before tax on continuing operations.

Chart 4

Profitability of banks in Denmark

(percentage of total assets)



Source: ECB (CBD).
Note: Operating Return on Assets represents the profit before tax on continuing operations.

The profitability of banks in Sweden and Denmark has continued to improve, even at a time of negative monetary policy rates (see Charts 3 and 4). The operating return on assets, defined as the profit before tax on continuing operations relative to total assets, rose on average from 0.6% in 2008 to 0.9% in 2016 in Sweden, and from -0.2% to 0.7% in Denmark over the same period. As Charts 3 and 4 show, however, the source of improvement differs between the two countries. The improvement in Swedish banks has been driven mainly by a rise in bank operating incomes, while in Danish banks it mainly reflects the fall in operating expenses.

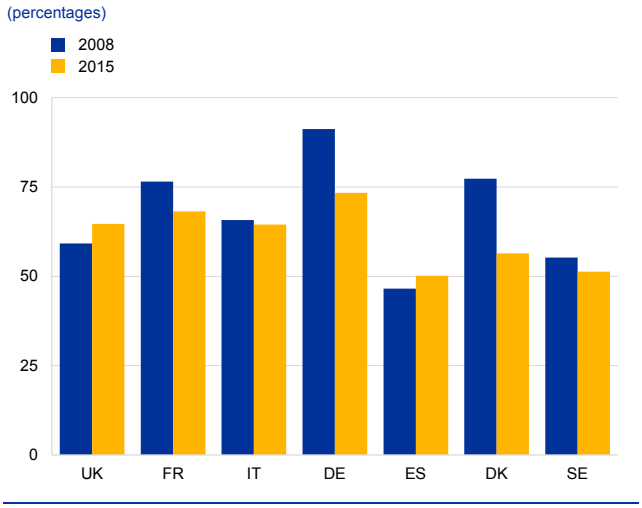
In Sweden, the resilience of the net interest income margin (net interest income relative to total assets) and improved "realised and unrealised gains on securities" have contributed to the rise in operating incomes. As debt

[5] On 24 January 2013, Danmarks Nationalbank decided to increase its certificates of deposit rate to -0.10%, before further increasing it on 24 April 2014 to 0.05%. Following several monetary policy decisions on 4 September 2014, 19 January 2015, 30 January 2015 and 5 February 2015, the Danish central bank lowered its certificates of deposit rate to -0.75%. However, it first intervened heavily in the FX market, building up its stock of foreign reserves, before cutting the certificates of deposit rate to -0.75%.

securities increase in value when interest rates fall, Swedish banks have benefited from gains on securities. In this context, the government bond purchase programmes pursued by Sveriges Riksbank have also contributed to increased earnings from securities.[6]

Chart 5

Banks' cost-to-income ratio



Source: ECB (CBD).

In Denmark, the fall in operating expenses was driven mainly by some improvement in impairments and a significant decline in operating costs. The improvement in impairments stems mainly from the recovery of the housing market and economic growth as of 2014. The comparatively large volume of impaired loans was largely the result of the bursting of a property bubble and a prolonged downturn in Denmark. This manifested itself particularly in high provisions stemming from the small and medium-sized enterprise (SME) and commercial real estate (CRE) segments. As regards the decline in operating costs, in its financial stability report on the second half of 2016, Danmarks Nationalbank noted that in recent years, banks have focused extensively on cutting costs and have constantly adjusted their business models.[7]

Finally, in both countries, fee income and commissions have also accounted for a growing proportion of bank incomes, especially in 2015. This may reflect increasing customer demand for services such as mortgage refinancing operations, given the low interest rate environment.

Swedish and Danish banks' cost efficiency as measured by the cost-to-income ratio has improved (see Chart 5) in the face of negative monetary policy rates. Another way of looking at banks' profitability is to examine the cost-to-income ratio. This ratio, which measures operating expenses as a percentage of operating incomes, is usually used to gauge banks' efficiency and productivity.[8] As shown by Chart 5, banks' cost efficiency improved in Sweden and Denmark between 2010 and 2015. Compared to other large European economies, apart from Spain, banks' cost efficiency was generally higher in Swedish and Danish banks over this period.

The net interest income margin[9] has remained broadly stable in Sweden and declined only slightly in Denmark, as the fall in interest incomes has been contained by positive growth in lending volume and partly compensated by

6 More generally, cutting interest rates and using quantitative easing (QE) to flood financial markets with newly-created money has tended to boost asset prices, including equities, bonds, property, commodities and currencies. These policies encourage investors to consider riskier assets in the hunt for higher returns on their cash.

7 For instance, customer services are increasingly provided by digital means, leading to a reduction in staff numbers.

8 Lower ratios generally indicate greater efficiency.

9 The net interest income margin is the difference between interest incomes on assets (such as loans granted and securities held) and interest expenses from interest paid on liabilities (e.g. customer deposits, bonds) relative to total assets.

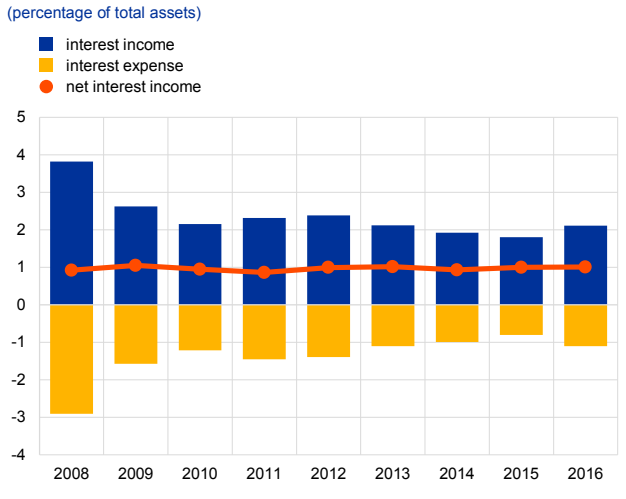
declining interest expenses (see Charts 6, 7, 8 and 9). Net interest income margin is a key source of income and profitability for banks. It accounted for almost 60% of banks' profit in Sweden and for over 70% in Denmark. In Sweden, the net interest income margin stood at 1.02% of total assets in 2013 and reached 1.01% in 2016. In Denmark, it declined only slightly from 1.2% of total assets in 2013 to 0.95% in 2016. The net interest income margin is normally expected to increase immediately after an interest cut, as the entire yield curve shifts downward and steepens at the same time. The difference in the fixation period of banks' assets and liabilities boosts the net interest income margin in the short term, as banks carry out maturity transformation by borrowing in the short term and lending in the long term.

However, some recent literature has argued that this inverse relationship may be weakened or break down when unconventional monetary policy is deployed (in a negative interest rate environment, for instance, banks might be reluctant to lower bank deposit rates into negative territory or when low interest rates are accompanied by effective forward guidance or asset purchases[10]). This has generated a vigorous debate about banks' profitability in the face of negative monetary policy rates.

To investigate this issue further, the next sections of this paper focus on how the monetary policy transmission mechanism affects the banks' lending and deposit rates, looking also in particular at the structure of the banks' funding and the lending activities in a context of negative monetary policy rates.

Chart 6

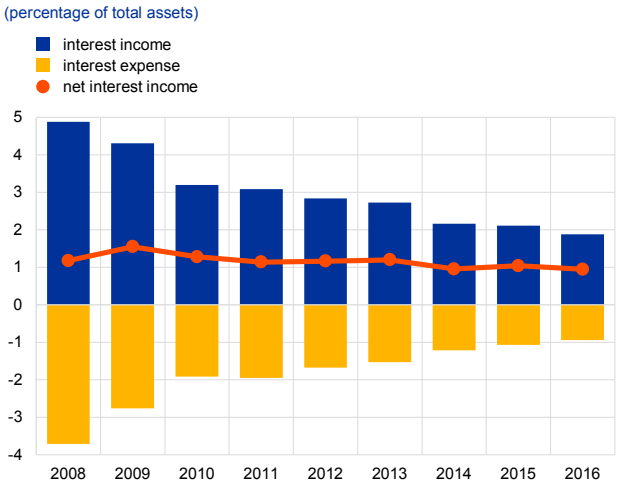
Banks' net interest income margin in Sweden



Source: ECB (CBD).

Chart 7

Banks' net interest income margin in Denmark



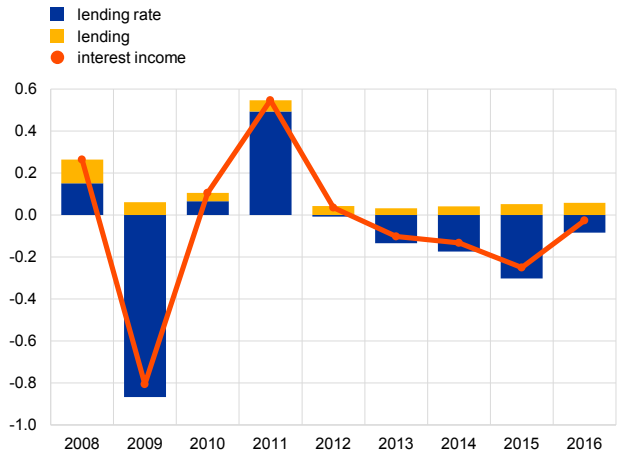
Source: ECB (CBD).

[10] If the decline in rates is accompanied by a flattening of the yield curve, the margin between lending and borrowing is eventually compressed, reducing the net interest income margin. Such a flattening may result from expectations of a prolonged period of low short-term rates (reflecting forward guidance), and it may be compounded by a compression of the term premium if the central bank also operates a large-scale asset purchase programme. See Cœuré (2016).

Chart 8

Contributions to interest income growth in Sweden

(differences of logarithms)

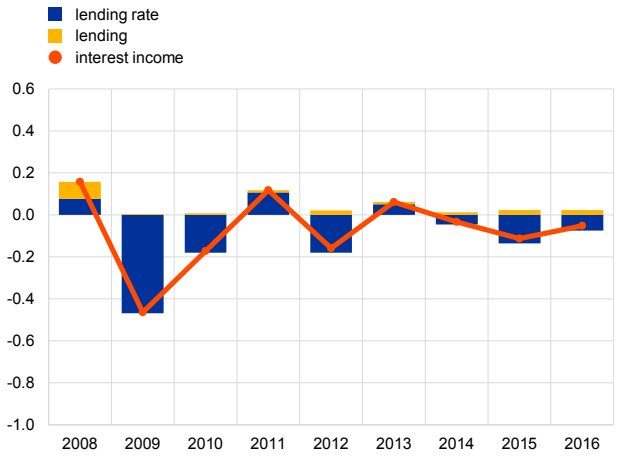


Source: ECB (CBD).
Notes: The contributions to interest income are based on new agreements.

Chart 9

Contributions to interest income growth in Denmark

(differences of logarithms)



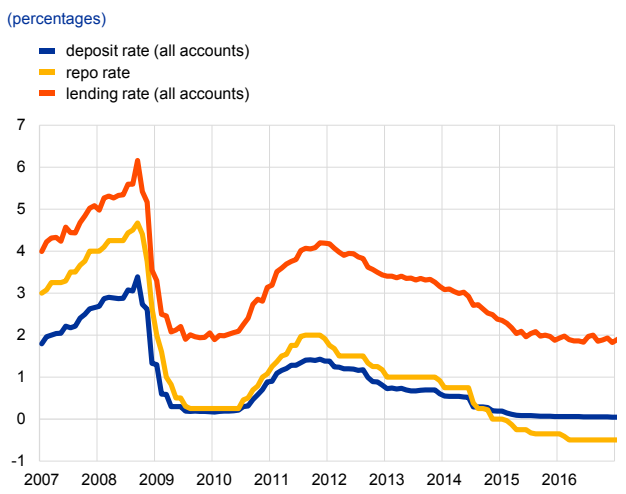
Source: ECB (CBD).
Notes: The contributions to interest income are based on new agreements.

3 Monetary policy transmission to bank lending and deposit rates: stylised facts

As Charts 10 and 11 show, bank lending rates have fallen in both countries, with a somewhat steeper fall in Sweden. Bank lending rates on new business in Sweden to households and non-financial corporations (NFCs) have declined broadly in parallel with the path of the monetary policy rate, even after the introduction of negative monetary policy rates in February 2015, showing a similarly close relationship to that which was evident prior to negative policy rates. The pass-through to the bank lending rate in Denmark seems to have been less pronounced. Bank lending rates, in particular, remained almost unchanged on average following the substantial cut in Danmarks Nationalbank's monetary policy rate to -0.75% during the same period.

Chart 10

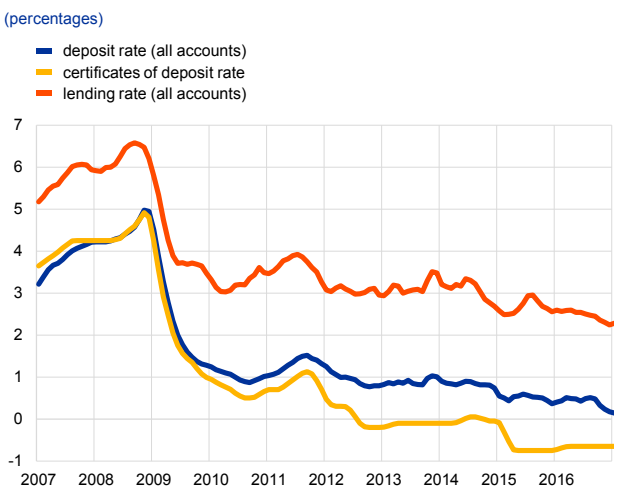
Swedish banks' lending and deposit rates for households and NFCs – new business



Source: Riksbank.

Chart 11

Danish banks' lending and deposit rates for households and NFCs – new business



Source: Statistics Denmark.
Note: Lending and deposit rates are shown as a three-month moving average, given the volatility of the data.

In contrast, data on bank retail deposits point to downward stickiness in the bank deposit rates in the face of negative policy rates (see Charts 10 and 11). While deposit rates have declined in both countries, they have remained at or above zero, even though monetary policy rates have descended into negative territory.[11] This may reflect the banks' intention to preserve their deposit and customer bases in

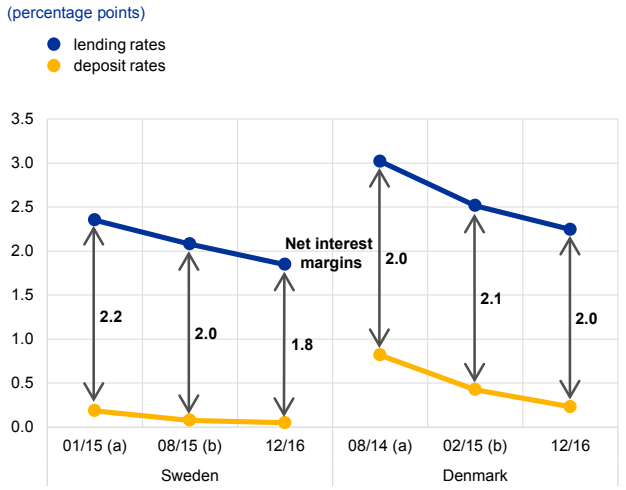
[11] However, according to a regular survey conducted by Danmarks Nationalbank, negative deposit rates were in widespread use for approximately 30% of the NFCs. Deposit rates thus seem to be sticky at zero for certain types of customer only (see Danmarks Nationalbank Financial Stability Report S2 2016). The same also seems to have applied to Sweden, where some NFCs have faced negative deposit rates. However, they have remained slightly positive at aggregate level.

a context of strong competition among banks, with a view to maintaining future profits from cross-selling activities.

Against this background, the lending-deposit margin on new agreements has been squeezed in both Sweden and Denmark (see Chart 12). While close to 2.2 percentage points in both countries before the introduction of negative interest rates, it fell by 40 basis points to 1.8 percentage points in Sweden, and by 20 basis points to 2.0 percentage points in Denmark.

Chart 12

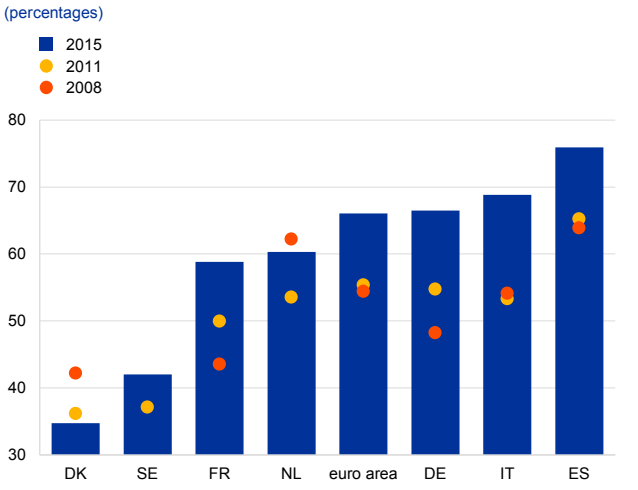
Banks' lending-deposit margins on new agreements



Sources: National statistical offices.
Notes: Lending and deposit rates for Denmark are shown as three-month moving averages, given the volatility of the data.
(a) Month before the introduction of negative monetary policy rates.
(b) Month after a relevant monetary policy decision.

Chart 13

Deposits to total liabilities



Source: ECB (CBD).
Note: including deposits from financial institutions. Euro area refers to the unweighted average of FR, NL DE, IT and ES. 2008 is missing for Sweden.

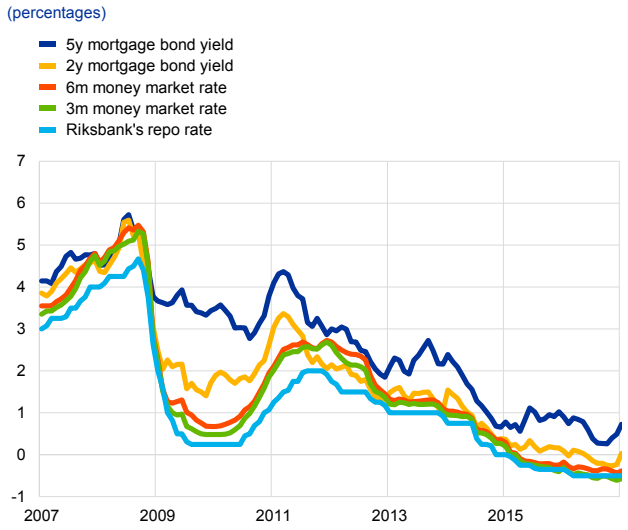
However, Swedish and Danish banks rely mainly on wholesale funding to finance their activities (see Chart 13). Banks can obtain funds from a variety of sources, which, in addition to retail deposits, include senior unsecured and covered bond markets and the interbank market. As Chart 13 shows, in 2015 deposits represented only 42% and 35% of the total liabilities of the Swedish and Danish banks respectively. This ratio is much lower than that observed in the largest euro area economies, which averaged slightly over 66% during the same period. The gap between the euro area and Swedish and Danish banks has actually widened significantly as a consequence of the paralysis of the bank funding market observed at the beginning of the financial crisis (from 2007-12). At this time, major banks experienced liquidity shortages and a period of increased turmoil in interbank funding markets, and interest rates on interbank lending rose sharply. Given the scale of wholesale funding in Swedish and Danish banks, a grasp of how wholesale market funding costs have changed is essential to understand banks' behaviour in setting lending rates and its potential impact on banks' profitability, especially in a context of negative monetary policy rates.

In both countries, issuing covered bonds is a major source of wholesale funding, especially for mortgages. Wholesale funding for banks comes in many forms and it is provided by a wide range of types of investors. A bank may receive

unsecured deposits from other banks, large corporates, pension funds, insurance companies and other financial market participants. Alternatively, unsecured funds may be sourced from financial markets: in this case, rather than the financial investor depositing money with a bank, the bank issues a bond or other type of debt instrument which the investor buys. Banks can also access secured wholesale funding. This is funding backed by collateral. In Sweden, wholesale funding comes primarily from issuing money-market instruments and covered bonds in both domestic and foreign currency, and liabilities in Swedish kronor are swapped to match lending in domestic currency.[12] In Denmark, as it is mainly mortgage banks that engage in mortgage activities, almost 80% of mortgages to households are financed by issuing mortgage bonds. This type of mortgage lending also plays an important role for lending to NFCs.

Chart 14

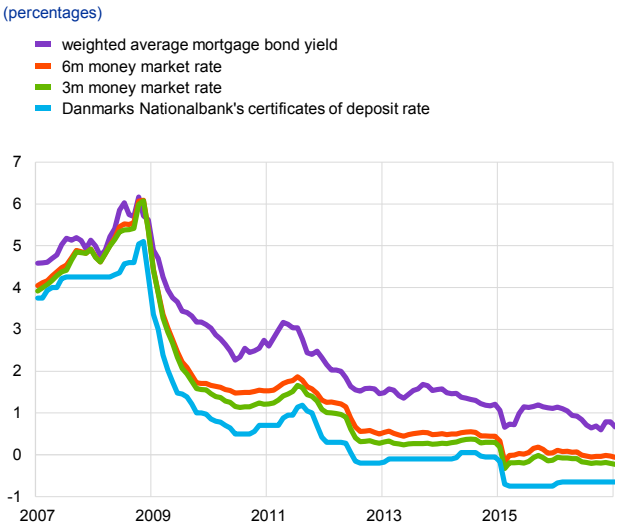
Indicative wholesale funding costs for Swedish banks



Source: Riksbank.

Chart 15

Indicative wholesale funding costs for Danish banks



Source: Statistics Denmark and Finans Danmark.

Although sizeable gaps can open up between the different measures of funding costs (depending in particular on the maturity), wholesale funding costs did not deviate substantially from monetary policy rates during the period under consideration, even in the face of negative policy rates in Swedish and Danish banks. Charts 14 and 15 cover a wide range of short and long-term wholesale funding cost indicators for Swedish and Danish banks. They reveal that where there have been negative policy rates, different indicators have significantly converged towards the monetary policy rate, especially in Sweden. For shorter maturities, these indicators even moved into negative territory. This might explain why introducing negative monetary policy rates hardly affected the banks' behaviour as regards setting lending interest rates. It also accounts in large measure for the fall in interest expenses observed in both countries and thus for the resilience of the net interest income margin, as shown by Charts 6 and 7 in Section 1.

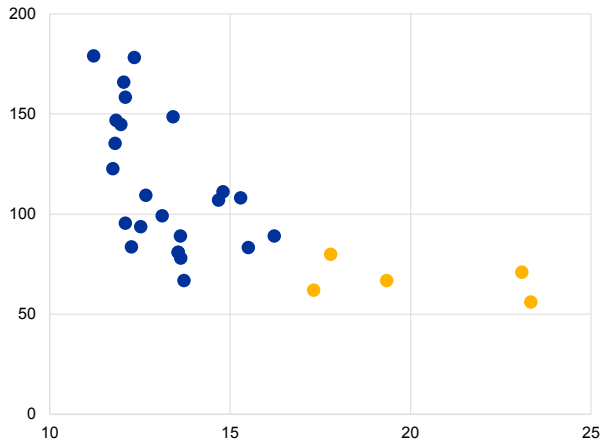
[12] See Turk (2016).

However, it is important to stress that the evolution of wholesale funding costs does not depend solely on the monetary policy stance. Wholesale funding providers are sensitive not only to the interest rate environment, but also to changes in the credit risk profile of the institutions to which they supply these funds.

Chart 16

Tier 1 capital ratio and funding cost

(x axis: Tier 1 capital ratio; y axis: 5-year CDS; average period 2013Q1-2016Q4 - percentages)



Source: Bloomberg.
Note: The chart includes the 30 largest European banks. The Swedish and Danish banks are shown in yellow.

The fact that Swedish and Danish banks have a high capital ratio compared with their global peers may also have helped keep funding costs down and facilitated monetary policy transmission, even in the face of negative monetary policy rates. Indeed, several papers (e.g. Bank of England, June 2012; Gambacorta & Shin 2016; Babihuga & Spaltro, 2014) have highlighted the link between capital ratios (as indicators of bank resilience) and funding costs. In particular, Babihuga & Spaltro (2014) revealed that increased capital buffers can lead to a decline in a bank's funding costs in the long run. If the increase in capital buffers is due to higher-quality Tier 1 capital, there is a short-run reduction in funding costs as well. This link is illustrated in Chart 16, which shows the Tier 1 capital ratios of the 30 largest European banks and their five-year Credit Default Swap (CDS) premia used as a proxy of the wholesale funding cost.

4 Model-based evidence of monetary policy pass-through to bank lending and deposit rates

To further investigate bank lending and deposit rates pass-through in Sweden and Denmark in an environment of negative policy rates, this section bases its analysis on a standard pass-through model relating to bank interest rates in an error correction framework. It first considers a traditional pass-through model, which considers the monetary policy rate to be a direct determinant of retail bank rates (lending and deposit), assuming that the risk level is low and stable and that financial institutions are well capitalised. Second, as Swedish and Danish banks rely mainly on wholesale funding to finance their activities and to take into account risk factors, it uses market reference rates as the main determinants of banks' retail rate-setting behaviour. This approach is similar to that taken by Darracq Pariès et al. (2014) in the context of the euro area. [13]

$$\Delta br_t = \alpha(br_{t-1} - \mu - \beta r_{t-1}) + \delta \Delta r_t + \sum_{j=0}^{J} \lambda_j \Delta br_{t-j} + \theta d_t^{neg} \Delta r_t + \varepsilon_t$$

Here, br_t denotes a bank retail rate – either a lending or a deposit rate – in a given economy at time t and r_t denotes either the monetary policy rate or the market reference rate. On the lending and deposit side, two categories are considered separately: households and NFCs. [14] Lending rates refer to loans of all maturities. For lending to households, the reference rate is the two-year mortgage bond yield in Sweden and the weighted average mortgage bond yield in Denmark. For lending to NFCs, the market reference rate is a composite indicator of money market rates for both countries. Deposit rates refer to overnight deposits for Sweden and Denmark, with overnight money market rates as the reference rates. All reference rates were selected from a broader set of rates so as to optimise the model fit. The coefficient δ captures the short-run pass-through from market reference rates into bank interest rates, while β refers to the long-run pass-through according to a co-integration relationship. The coefficients λ_j $(j = 0, \ldots, J)$ capture autoregressive effects. d_t^{neg} is a country-specific dummy that takes the value 1 for the period with negative policy rates. Since this dummy interacts with the policy rate or the market reference rate, a coefficient θ that differs significantly from zero would indicate that the short-run pass-through since the introduction of negative policy rates has been different from that applicable at normal times. The model is estimated separately for each country and category, based on monthly data for the period January 2005 to December 2016.

[13] Alternative approaches use panel data (Sørensen and Werner, 2006) or factor-augmented VARs (von Borstel et al., 2015).

[14] The analysis distinguishes between households and NFCs, as in both countries some NFCs experienced negative deposit rates.

Table 1

Pass-through to bank lending and deposit rates

A) Using monetary policy rate

	Lending rates				Deposit rates			
	Mortgages		Lending to NFCs		Households		NFCs	
	SE	DK	SE	DK	SE	DK	SE	DK
Long-run pass-through (β)	0.86***	0.77***	0.90***	0.73***	0.73***	0.73***	0.64***	0.73***
Short-run pass-through (δ)	0.72***	0.53***	0.45***	0.49***	0.49**	0.48***	0.96***	0.71***
Policy rate x negative policy rate dummy (θ)	-0.18	0.14	0.27	-0.08	-0.38**	-0.44***	-0.85**	-0.61***
Adjusted R-squared	0.79	0.45	0.84	0.61	0.93	0.84	0.86	0.90
Observations	134	134	134	134	134	134	134	134

B) Using market reference rates

	Lending rates				Deposit rates			
	Mortgages		Lending to NFCs		Households		NFCs	
	SE	DK	SE	DK	SE	DK	SE	DK
Long-run pass-through (β)	0.83***	0.92***	0.73***	1.04***	0.60***	0.75***	0.71***	0.79***
Short-run pass-through (δ)	0.35***	0.82***	0.76***	0.82***	0.42***	0.42***	0.64***	0.62***
Market rate x negative policy rate dummy (θ)	-0.2	-0.03	-0.14	-0.11	-0.38***	-0.40***	-0.57***	-0.58***
Adjusted R-squared	0.81	0.60	0.85	0.55	0.93	0.84	0.94	0.88
Observations	134	134	134	134	134	134	134	134

Source: ECB staff.
Note: ***, ** and * denote statistical significance at the 1%, 5% and 10% level. For brevity, the remaining coefficients are not reported. The regressions also include dummies for specific months to correct for outliers. The model is estimated separately for each category based on monthly data for the period November 2005-December 2016.

The stylised facts described in Section 3, related to monetary policy transmission to bank lending rates in a context of negative monetary policy rates, are confirmed by the model-based analysis. With bank lending rates, the regressions taking either the policy rate or the market reference rates – as main determinants – reveal that there is no clear evidence of a decline in pass-through following the introduction of negative policy rates in Sweden and Denmark (see Table 1). The estimated coefficient for the interaction term is statistically not significant from zero in any of the regressions. Thus, the pass-through into bank lending rates since the introduction of negative policy rates appears to have been similar to that in normal times.

The two models – the traditional pass-through model under the assumption of a low and stable level of risk and the second model, taking account of risk factors – give very similar results (although the adjusted R-squared tend to be higher in the model taking the market reference rate as the main determinant). This tends to confirm that risk perceptions by financial markets on Swedish and Danish banks have remained very low. This would also explain why – beyond the interest rate environment – wholesale funding indicators have declined significantly and why behaviour in terms of setting the bank lending rate has hardly changed, even against a background of negative interest rates. Finally, as illustrated by the differences in adjusted R-squared between Sweden and Denmark, the two models

tend to capture the lending rate-setting behaviour of Swedish banks better than that of Danish banks. This applies to the lending rates for both mortgages and NFCs.

By contrast, the model-based analysis also provides strong evidence of a decline in the pass-through to deposit rates (see Table). This is indicated by the coefficients for the interaction term, which are negative and highly significant for both households and NFCs in both economies. The regression results are thus consistent with the hypothesis that banks in Sweden and Denmark have been reluctant to introduce negative interest rates for depositors, preferring to squeeze the lending-deposit interest margin.

5 Lending and deposit developments

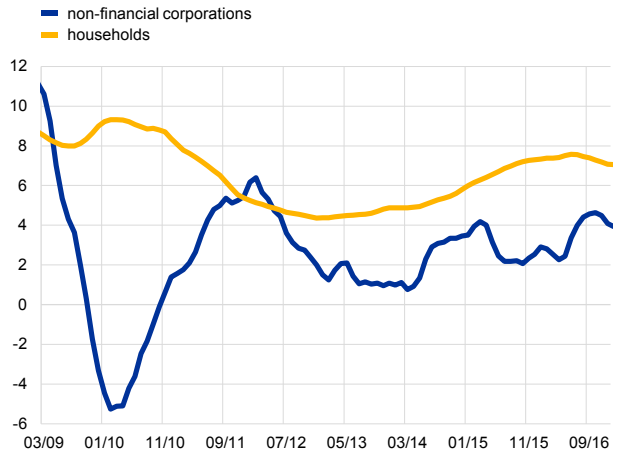
The introduction of negative monetary policy rates in both countries has been an effective monetary policy tool. Negative interest rates – in combination with other policy measures, such as quantitative easing and foreign exchange interventions – have been effective in lifting inflation and inflation expectations in Sweden and in stabilising the exchange rate in Denmark (see Charts 1 and 2). The Swedish economy has grown at a robust pace since 2013. Economic activity in Denmark has also picked up significantly since that year, albeit more slowly. The fact that the function of banks in the monetary policy transmission mechanism has been maintained in Sweden and Denmark, while banks have improved their profitability despite the introduction of negative policy rates, has continued to create the necessary conditions for positive developments in the credit supply.

Consequently, most fears about possible unintended consequences of negative monetary policy rates, such as a reduction in the credit supply, have not materialised so far (see Charts 17 and 18). In Sweden, lending to both households and NFCs has increased significantly over the last two years, fuelling economic activity. Total lending to Swedish households, for instance, rose by 5.2% in 2014, by 6.7% in 2015 and by 7.4% in 2016. Similarly, lending to NFCs rose from 2.2% in 2014 to 2.9% in 2015 and 3.6% in 2016. In Denmark, growth in lending to households, and specifically to NFCs, made a steady recovery as the economy was emerging from a housing bust, which amplified the effects of the global financial crisis on the economy.

Chart 17

Annual lending growth, Swedish banks

(percentage - 3-month moving average)

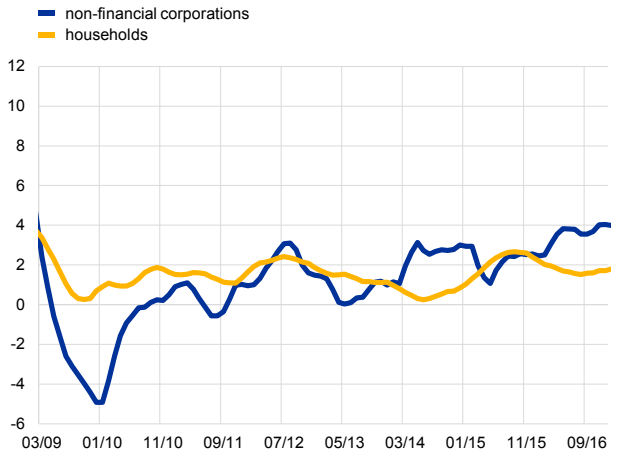


Source: Statistics Sweden.

Chart 18

Annual lending growth, Danish banks

(percentage - 3-month moving average)

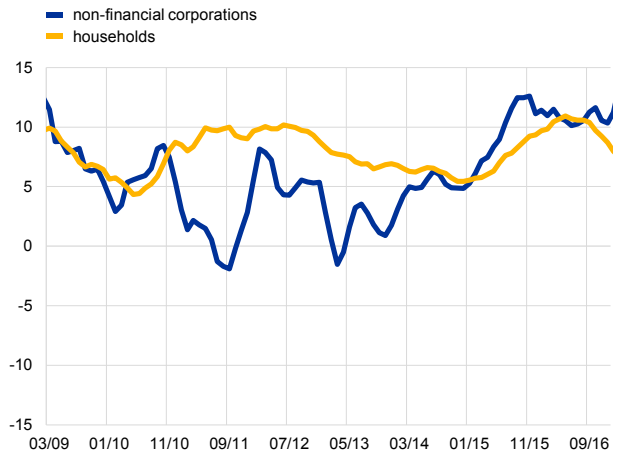


Source: Statistics Denmark.

Chart 19

Annual retail deposit growth, Swedish banks

(percentage - 3-month moving average)

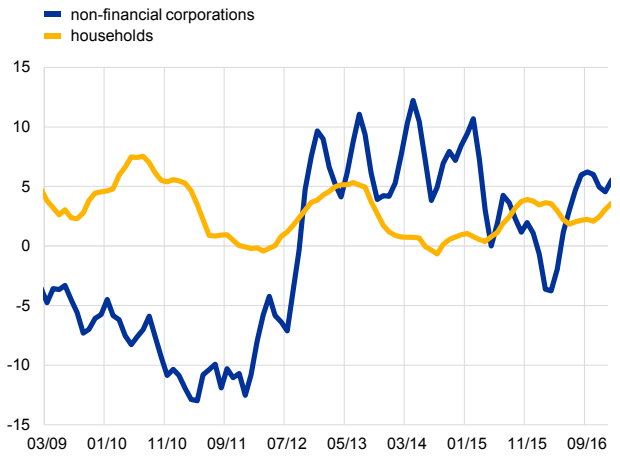


Source: Statistics Sweden.

Chart 20

Annual retail deposit growth, Danish banks

(percentage - 3-month moving average)



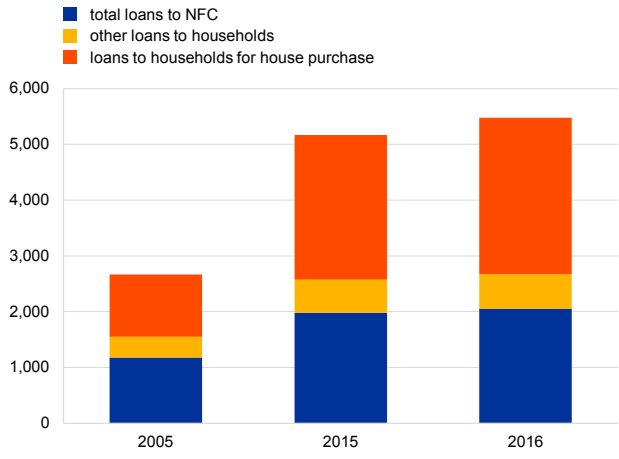
Source: Statistics Denmark.

There have so far been no signs of a "rush to cash" with the introduction of negative monetary policy rates (Charts 19 and 20). On average, there have been positive annual growth rates in deposits from households and NFCs in both countries. The fact that banks' retail deposit rates have remained in positive territory, while the use of cash has declined significantly over the last few years, could explain why these two countries have not experienced a rush to cash.[15]

Chart 21

Distribution of bank lending in Sweden

(SEK Billion)

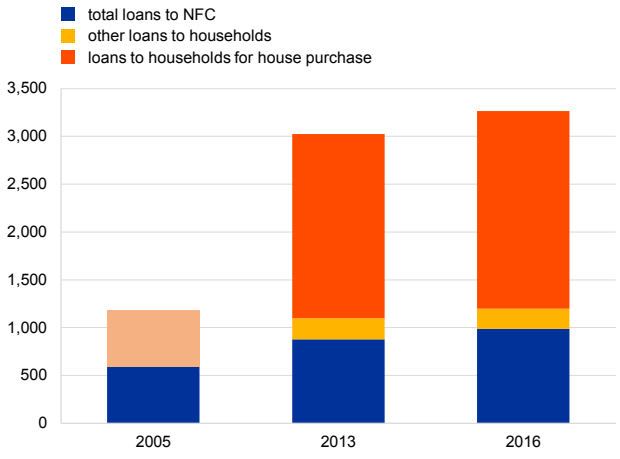


Source: Statistics Sweden.

Chart 22

Distribution of bank lending in Denmark

(DKK Billion)



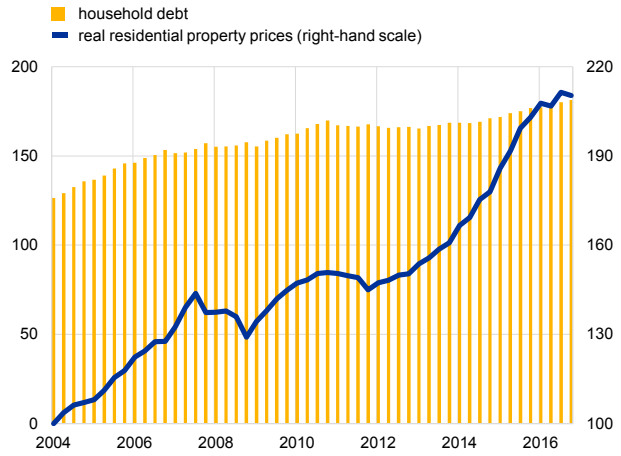
Source: Statistics Denmark.
Note: the loan-to-household breakdown is not available for 2005, indicated in light orange.

[15] See Sveriges Riksbank (2016c), Danmarks Nationalbank (2015) and Danmarks Nationalbank (2016b).

Chart 23

House prices and household debt in Sweden

(left-hand scale: household debt as a percentage of disposable income; right-hand scale: real residential property prices, index 100 = 04Q1)

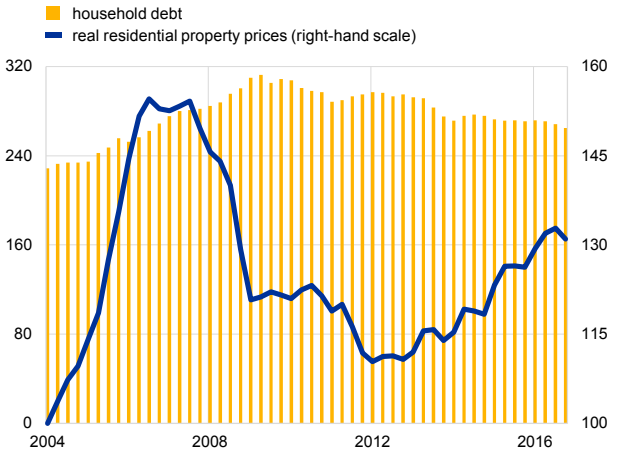


Source: Statistics Sweden and BIS.

Chart 24

House prices and household debt in Denmark

(left-hand scale: household debt as a percentage of disposable income; right-hand scale: real residential property prices, index 100 = 04Q1)



Source: Statistics Denmark and BIS.

However, the large exposure of the banking sector to the housing market, in a context of high house prices and high household debt, has increased financial stability risks in both countries. As noted by the Riksbank in its financial stability report for the first half of 2016, the introduction of negative monetary policy rates fuelled the already buoyant housing market, contributed to a growing and large exposure of households and the banking sector to the housing market (see Charts 21 and 23, also Box 1). Household debt stood at around 180% of disposable income as of mid-2016 and is expected to increase further. This has exacerbated macro-financial risks which could, in the long term, adversely affect the economy and banks' profitability. [16] The Danish banking sector is also very highly exposed to the domestic housing market (see Chart 22, 24 and Box 1). While the Danish economy experienced a housing bust at the beginning of the financial crisis (2008/09), during which average national house prices plummeted by around 28%, the housing market has now recovered (see Chart 24). Although credit growth remains subdued, negative monetary policy rates also seem to have contributed to the risk of creating a new bubble in the housing market. In particular, in its financial stability report for the second half of 2016 Danmarks Nationalbank observed that there was a substantial risk of a continuation of the last few years' house price increases being followed by equal price decreases. [17]

[16] The Riksbank also noted that the banks were also exposed to liquidity risks. There were short-term liquidity risks in the banking system that could pose risks to financial stability in the long run. It was possible for vulnerability to a liquidity crisis to arise in Denmark because some mortgages (typically with a 30-year maturity) are financed with bonds that have a relatively short maturity (1, 3 or 5 years) and could therefore be exposed to refinancing risk.

[17] The report also stressed that credit institutions in Denmark should carefully consider whether their current targeted returns are fully consistent with a prudent level of risk.

Box 1
Policy measures to strengthen financial stability

This box summarises the main challenges to financial stability and the measures taken over the last few years in Sweden and Denmark.

In Sweden, while the major banks have good profitability and low credit losses and are cost-efficient, they also have several structural vulnerabilities that make the financial system and Sweden's economy sensitive to shocks. The banking system is large, concentrated, interconnected, exposed to liquidity risks and increasingly exposed to the housing market.

Against this background, the authorities have been responding to developments by tightening up the policy and regulatory framework along with supervision. The banking sector has thus become more resilient in recent years, as banks have built up liquidity buffers and increased their capital ratios. The average Common Equity Tier 1 ratio was 19.2% at the end of September 2016, one of the highest rates in the EU. Sweden's financial supervisory authority decided, for instance, to raise the countercyclical buffer rate to 1.5% in June 2016 and further to 2.0% as of March 2017, thereby making its banks more resilient to adverse cyclical developments.

It has also introduced new supervisory methods for banks' risk weights. Banks using the Internal Risk-Based approach should now assume a downturn at least once every five years in their probability-of-default calculations. This measure should limit the variation in risk weights across banks and business cycles and lead to an increase in capital requirements. As regards risks stemming from housing market developments, a new macroprudential measure to do with the compulsory amortisation of new mortgage loans designed to curb household indebtedness was also adopted in March 2016. As a result, the 2016 European Banking Authority (EBA) stress tests revealed that the four main Swedish banks were resilient to a severely adverse scenario.

In Denmark, although the systemically important credit institutions are well capitalised, comply with solvency requirements and reported sound earnings in 2016, the high level of interconnection with the housing market calls for vigilance. In its Financial Stability report for the second half of 2016, Danmarks Nationalbank thus points out that a "housing loan market providing attractive terms for customers is desirable, but should not go hand in hand with more lenient credit standards".

For this reason, several policy measures have been introduced to reduce risks associated with rising house prices and improve the resilience of the banking sector. In 2015, the Danish Financial Supervisory Authority (DFSA) introduced the "Supervisory Diamond" for banks and mortgage credit institutions. This set of measures, due to enter into force in 2018, includes five benchmarks designed to:

- limit annual lending growth,
- limit reliance on short-term funding,
- limit large exposures to real estate,
- limit large exposures to borrowers' interest rate risk,
- promote loan amortisation and excess liquidity coverage.

More recently, the DFSA introduced new guidelines, effective from February 2016, and has carried out on-site inspections of banks and mortgage credit institutions, to ensure caution in lending for residential real estate in geographical areas with high price levels and high price increases compared with the rest of the country. The guidelines are meant to protect credit institutions and borrowers from risks stemming from an increase in interest rates and a fall in house prices. They are currently being applied to lending for residential real estate in the greater Copenhagen area and the city of Aarhus.

6 Conclusion

The introduction of negative monetary policy rates in Sweden and Denmark has proven to be an effective monetary policy tool. Negative interest rates – in combination with other policy measures, such as quantitative easing and foreign exchange interventions – have been effective in lifting inflation and inflation expectations in Sweden and in stabilising the exchange rate in Denmark. The fact that banks' profitability has continued to improve and that their function in the monetary policy transmission mechanism has been maintained – creating the prerequisites for positive developments in the credit supply – has contributed to the effectiveness of monetary policy in both countries.

However, the current situation presents a number of challenges that need to be closely monitored. In particular, macro-financial risks seem to have increased owing to the large exposure of the banking sector to the housing market, in a context of rapidly increasing house prices and the high level of household indebtedness associated with that.

References

Babihuga R. and Spaltro M. (2014), "Bank Funding Costs for International Banks", IMF Working Papers, No 14/71, April.

Bank of England (2012), *Financial Stability Report*, June.

Beau E., Hill J., Hussain T. and Nixon D. (2014), "Bank funding costs: what are they, what determines them and why do they matter?", Bank of England, *Quarterly Bulletin*, 2014 Q4.

Bech M. and Malkhozov A. (2016), "How have central banks implemented negative policy rates?", *BIS Quarterly Review*, March, pp. 31-44.

Button R., Pezzini S. and Rossiter N. (2010), "Understanding the price of new lending to households", Bank of England, *Quarterly Bulletin*, 2010 Q3.

Claessens S., Coleman N. and Donnelly M. (2016), "'Low-for-long' interest rates and net interest margins of banks in Advanced Foreign Economies", Federal Reserve Board, IFDP Notes, April.

Cœuré B. (2016), "Assessing the implications of negative interest rates", Speech at the Yale Financial Crisis Forum in New Haven, 28 July.

Covas F.B., Rezende M. and Vojtech C.M. (2015), "Why are net interest margins of large banks so compressed?", Federal Reserve Board, FEDS Notes, October.

Danmarks Nationalbank (2015), *Financial Stability*, first half of 2015.

Danmarks Nationalbank (2016a), *Financial Stability*, second half of 2016.

Danmarks Nationalbank (2016b), *The role of cash in society*.

Darracq Pariès, M., Moccero, D., Krylova, E. and Marchini C. (2014), "The retail bank interest rate pass-through: The case of the euro area during the financial and sovereign debt crisis", ECB Occasional Paper Series, No 155.

European Central Bank (2016), "Euro area financial institutions", *Financial Stability Review*, May, pp. 57-109.

European Central Bank (2016b), "Recent developments in the composition and cost of bank funding in the euro area", *Economic Bulletin*, Issue 1/2016.

Gambacorta L. and Shin H.G. (2016), "Why bank capital matters for monetary policy?", BIS Working Papers, No 558, April. Forthcoming in *Journal of Financial Intermediation*.

Genay H. and Podjasek R. (2014), "What is the impact of a low interest rate environment on bank profitability?", *Chicago Fed Letter*, 324, July.

Gibas N., Juks R. and Söderberg J. (2015), “Swedish financial institutions and low interest rates”, Sveriges Riksbank, *Economic Commentaries*, No 16.

Illes A.,Lombardi M. and Mizen H. (2015), “Why did bank lending rates diverge from policy rates after the financial crisis?”, BIS Working Papers, No 486, February.

International Monetary Fund (2014), “Denmark: Financial System Stability Assessment”, IMF Country Report, No 14/336, December.

International Monetary Fund (2016a), “Financial Stability Challenges in a Low-Growth, Low-Rate Era”, *IMF Global Financial Stability Report*, October, pp. 1-48.

International Monetary Fund (2016b), “Sweden: Financial System Stability Assessment”, IMF Country Report, No 16/355, November.

Jobst A. and Lin H. (2016), “Negative Interest Rate Policy (NIRP): Implications for Monetary Transmission and Bank Profitability in the Euro Area”, IMF Working Papers, No 16/172, August.

Kinmonth T. (2016), “Banking in Sweden’s sub-zero world”, ABN AMRO, Financials Watch, October.

Moselund J. C. and Spange M. (2015), “Interest rate pass-through and the demand for cash at negative interest rates”, Danmarks Nationalbank, *Monetary Review*, 2nd quarter of 2015.

Scheiber T., Silgoner M.A. and Stern C. (2016), “The development of bank profitability in Denmark, Sweden and Switzerland during a period of ultra-low and negative interest rates”, Oesterreichische Nationalbank, *Focus on European Economic Integration*, Q3/16, pp. 8-28.

Shin, H.S. (2014), “Bank capital and monetary policy transmission”, ECB Forum on Central Banking, Monetary policy in a changing financial landscape, 25-27 May, Sintra.

Sørensen, C. and T. Werner (2006), “Bank interest rate pass-through in the euro area: A cross-country comparison”, ECB Working Paper Series, No 580.

Sveriges Riksbank (2016a), “How do low and negative interest rates affect banks’ profitability? ”, *Monetary Policy Report*, April, pp.20-23.

Sveriges Riksbank (2016b), *Financial Stability Report*, 2016:2.

Sveriges Riksbank (2016c), *The Swedish Financial Market 2016*.

Turk, R.A. (2016), “Negative interest rates: How big a challenge for large Danish and Swedish banks?”, IMF Working Papers, No 16/198, October.

von Borstel, J., Eickmeier, S. and L. Krippner (2015), “The interest rate pass-through in the euro area during the sovereign debt crisis”, Deutsche Bundesbank, Discussion Paper, No 10/2015.

Wilkins K., Gardner G. and Chapman B. (2016), “Developments in Banks’ Funding Cost and Lending Rates”, Reserve Bank of Australia, *Bulletin*, March, pp. 21-30.

Wong J. (2012), “Bank funding – the change in composition and pricing”, Reserve Bank of New Zealand, *Bulletin*, Vol. 75, No 2, June.

World Bank (2015), “Negative interest rates in Europe: A Glance at Their Causes and Implications”, *Global Economic Prospects: The Global Economy in Transition*, Box 1.1, June, pp. 13-19.

Acknowledgements

We would like to thank Pavlos Karadeloglou, Nico Zorell, Thomas Vlassopoulos and Tomáš Adam, all from the ECB as well as Björn Jönsson (Sveriges Riksbank) and Morten Spange (Danmarks Nationalbank) for their useful comments.

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ISSN	1725-6534 (pdf)	DOI	10.2866/907727 (pdf)
ISBN	978-92-899-2857-1 (pdf)	EU catalogue No	QB-AQ-17-015-EN-N (pdf)