DANMARKS NATIONALBANK

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Financial conditions are supporting the upswing

Increasing asset prices and low interest rates are contributing to GDP growth

In recent years, GDP growth has been buoyed up by expansionary financial conditions. Housing and equity prices increased significantly during the period, while interest rates are exceptionally low.

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GDP growth is less credit-driven than before

The current upswing is not buoyed up by credit expansion and, so far, has been balanced. Strong credit expansion stimulated the upswing in the mid-2000s and contributed to overheating the Danish economy prior to the financial crisis.

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Financial conditions are expected to continue to be expansionary

Even though interest rates are assumed to increase in the next few years, financial conditions will still make a positive contribution to GDP growth in the coming years.

Read more

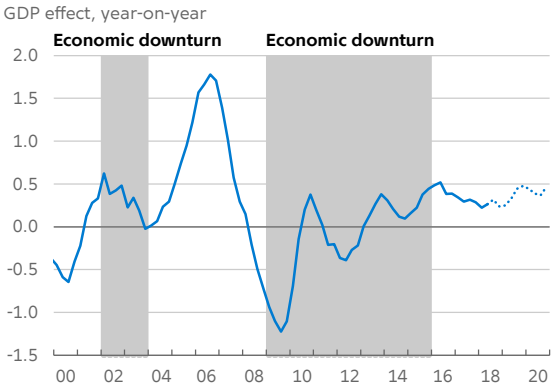
The Danish economy is booming. The output gap is positive and is expected to widen further in the coming years. This progress is supported by expansionary financial conditions. Housing and equity prices have increased significantly in recent years, while interest rates are exceptionally low. All of these factors contribute to private-sector demand.

The analysis assesses the impact of financial conditions based on an overall expression of the development in housing and equity prices, credit extension and interest rates.[1] In overall terms, they are estimated to have contributed 0.3-0.5 percentage points per year to year-on-year GDP growth since 2016, cf. Chart 1. This is equivalent to around one quarter of overall GDP growth. In recent years, the contribution from financial conditions has been at its highest level since prior to the financial crisis in 2008.

In itself, an economic upswing will drive up housing and equity prices. An upswing will also usually entail rising interest rates, in step with the central banks' wish to offset rising inflationary trends. Rising interest rates will also dampen housing price growth and investments in the economy. In the analysis these relationships are taken into account. The measure of financial conditions applied is thus an expression of the contribution to GDP growth *beyond* the effects of the cyclical development.[2] Rising housing prices might, for example, only be said to contribute positively to GDP growth if the increase lies beyond the "normal" cyclical trend, given e.g. incomes and interest rate levels. The analysis is based on a structural vector autoregressive model, cf. Box 1.[3]

The positive contribution to growth from financial conditions is expected to continue, in Danmarks Nationalbank's forecast period 2018-20. This reflects expectations of continued rising housing prices, just as interest rates based on market expectations are assumed to remain low. The contribution from financial conditions could thus be expected to lift GDP growth by around 0.25 percentage points in 2018, rising to around 0.4 percentage points in 2019 and 2020.

Contribution from financial conditions to GDP growth Chart 1



Note: The dotted line indicates financial conditions calculated on the basis of Danmarks Nationalbank's latest forecast. The contributions are calculated in a structural BVAR model, so that the impact of the cyclical development as such is eliminated. An economic downturn is characterised by GDP below the structural level, i.e. a negative output gap.
Source: Statistics Denmark, Danmarks Nationalbank and own calculations.

Financial conditions have often had a procyclical effect

The contribution from financial conditions to overall GDP growth varies considerably over time, cf. Chart 2.[4] The greatest contribution was seen when the Danish economy was overheated in the mid-2000s, where

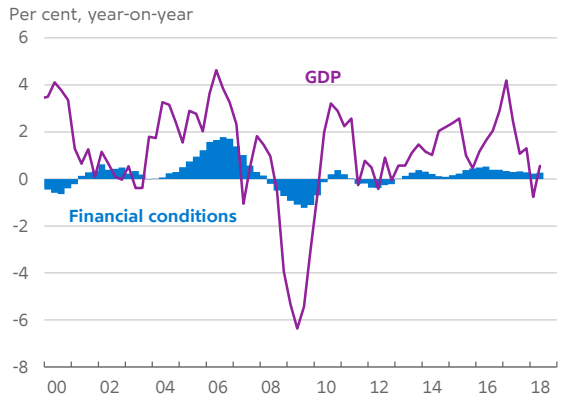
1 This means that it is not, for example, an isolated expression of financial regulation or credit standards.

2 This concerns the overall contribution to GDP growth due to changes in the financial variables that cannot be explained by changes in GDP, inflation or the other financial variables, including interest rates.

3 This challenge is known from the calculations of the impact of fiscal policy on economic activity. If tax revenue is high and transfers are low, this does not necessarily mean that fiscal policy is tight – it may also reflect the booming economy. In order to determine the fiscal policy's impact on activity, the fluctuations in public revenue and expenditure due to cyclical factors are eliminated from the general government balance.

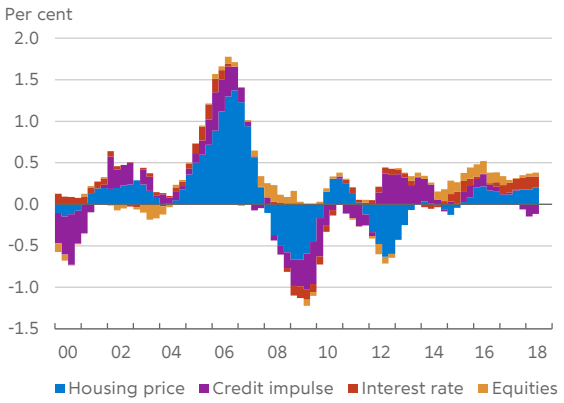
4 The long-term economic development is determined by the underlying structural conditions such as productivity, labour supply and capital apparatus. Both the monetary policy, via the official interest rates, and asset prices, including housing and equity prices, can affect demand, and thereby the real economy, but only in the short term.

Financial conditions stimulated GDP before the financial crisis and amplified the effects of the crisis Chart 2



Note: Year-on-year growth in GDP and contribution from financial conditions. In the applied model, the difference between the violet curve and the blue columns reflects the effect of the development in the oil price, growth in other countries, price development in other countries, and domestic inflation and real activity.
Source: Statistics Denmark, Danmarks Nationalbank and own calculations.

Interest rates, and housing and equity prices contribute particularly to growth Chart 3



Note: The overall contribution from financial conditions, broken down as contributions from housing prices, credit impulse, interest rates and equity prices, respectively. The curve in Chart 1 corresponds to the overall contribution from financial conditions.
Source: Own calculations.

financial conditions' overall contribution to the year-on-year growth in GDP reached 1.7 per cent, cf. Chart 2. During the subsequent downturn, the contribution was -1.2 per cent. This should be compared to a decline in year-on-year growth in GDP by more than 10 percentage points, from around 4 per cent in the 2nd quarter of 2006, to -6 per cent in the 2nd quarter of 2009.

During the most recent upswing, the contribution from financial conditions was moderate. This reflects how, to some extent, increases in housing and equity prices in recent years can be attributed to the cyclical situation.

Housing prices play a significant role

Fluctuations in housing prices have traditionally been a significant factor behind the fluctuations in GDP growth, cf. Chart 3. When the Danish economy overheated in the mid-2000s, sharply rising housing prices combined with expansionary credit extension played a significant role.[5] Prior to the financial crisis credit standards were eased and new types of loans were introduced, which contributed to the credit growth. The period was also characterised by an optimistic view of future housing prices.

The following decline in housing prices also contributed to the subsequent reversal. The importance of housing prices reflects that the housing stock is households' greatest asset. Rising housing prices increase the households' net worth and their opportunities to pledge collateral for loans. Fluctuations in housing prices are therefore of great significance to the households' financial conditions.

During the current upswing there is, once again, a positive contribution from the development in housing prices. It is, nonetheless, far less pronounced than during the overheating in the 2000s. Furthermore, the current upswing is only supported by the development in credit extension to a very limited extent,

5 See also Hviid (2017) for an analysis of the role of housing prices in the financial crisis.

and at the beginning of 2018, the impact of credit extension has been reversed to a dampening effect.

In recent years, interest rates have made a positive contribution. Among other things, this reflects the highly expansionary monetary policy in the euro area which, as a consequence of Denmark's fixed exchange rate policy, also results in an expansionary monetary policy in Denmark. Expectations in the financial markets are that monetary policy will continue to be expansionary in the coming years. This implies that longer-term interest rates are also very low, cf. Danmarks Nationalbank (2018c).

As a consequence of the low interest rates, households' and companies' credit costs are moderate. This gives households greater opportunities for consumption, and supports the housing market. Low interest rates also support business investments. It must be noted, however, that the current upswing is sounder and more broadly based than the upswing in the 2000s. This is inter alia reflected in the moderate contribution from the development in overall credit extension. The moderate credit growth does not exclude, however, that borrowing terms will be eased and that credit quality will deteriorate, cf. Danmarks Nationalbank (2018a).

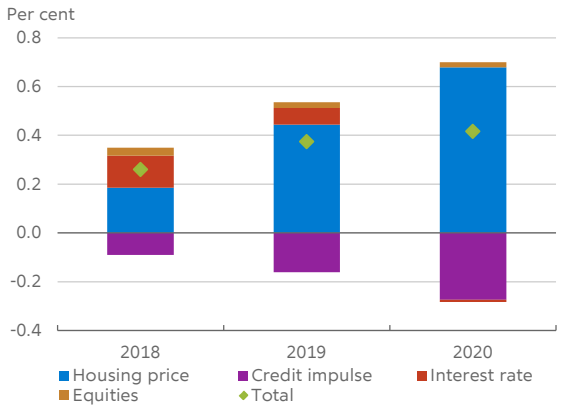
Expansionary financial conditions are expected to continue in the near future

Financial conditions are expected to continue to contribute positively to growth in the forecast period, cf. Chart 4. This partly reflects that financial conditions affect the economy with a time lag. It takes time, for example, before consumption and investments react fully to a change in interest rates, just as it can take time for households to release more equity to increase borrowing and consumption. The present contribution of approximately 0.25 percentage points thus includes the activity effect of financial conditions both today and in previous quarters.

However, the positive contribution during the forecast period also reflects that financial conditions are expected to continue to be eased. For example, Danmarks Nationalbank's forecast indicates that housing prices will continue to rise, cf. Danmarks Nationalbank (2018b). According to the model on which the analysis is based, the expected increases are stronger than the growth in GDP might immediately indicate. They thereby contribute positively to growth. The market expectations for the interest rates applied to Danmarks Nationalbank's forecast indicate a gradual increase in interest rates. This means that interest rates would have a moderately dampening effect in 2020.

The contribution from financial conditions will increase in the coming years

Chart 4



Note: The expected impact of financial conditions on the year-on-year rate of growth in GDP.
Source: Own calculations based on the VAR model applied.

Danmarks Nationalbank's macroeconomic DSGE model also indicates positive contributions from financial conditions

The analysis results are based on a VAR model. VAR models typically give a good description of data. To supplement this, the same analysis is performed with the help of Danmarks Nationalbank's DSGE model, cf. Pedersen (2016). This is a macroeconomic model with a stronger theoretical foundation.[6]

The DSGE model also indicates expansionary financial conditions. The model thus indicates that the overall contribution to GDP growth from financial conditions at the beginning of 2018 was approxi-

6 Even though the two models have a number of characteristics in common, there are also differences. In the DSGE model, it is not possible, for example, to consider the influence on the real economy from changes in equity prices. It is also not immediately possible to compare the effect from changes in interest rates between the two models. This is because the DSGE model considers the effect on the economy of a change in the official interest rates, while the VAR model applies the long-term mortgage rate. In the same way, credit in the DSGE model is not directly comparable. This is because credit in the VAR model concerns the amount of credit, while the DSGE model considers the price of credit in the form of a credit spread between the banks' deposit and lending rates.

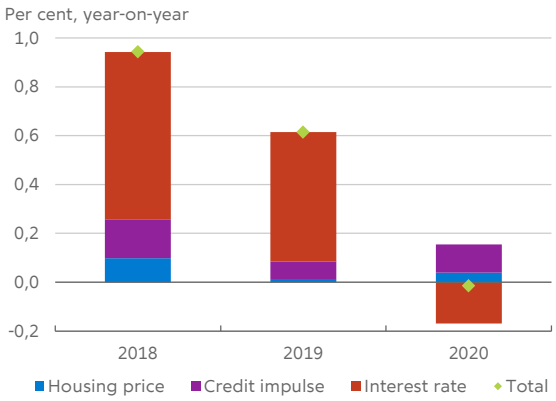
mately 0.25 percentage points. The results from the DSGE model furthermore support the conclusion that financial conditions will continue to support the upswing during the forecast period, cf. Chart 5.

In contrast to the VAR model, however, the DSGE model only assigns moderate significance to the development in housing prices. Instead, the low interest rates and credit development play a significant role. The impact of credit development must be viewed against the background that, in the forecast period, the DSGE model indicates a gradual tightening of the price of credit. This contributes to a decline in financial conditions' impact on GDP during the forecast period, in contrast to the VAR model. However, the credit spread is still expected to stimulate activity, going forward.

In overall terms, financial conditions are expected to lift GDP growth by approximately 0.9 percentage points in 2018, approximately 0.6 in 2019, and approximately 0 in 2020. The result is a strong indication that financial conditions are expected to stimulate growth in the Danish economy in the coming years.

The DSGE model also indicates continued stimulus from financial conditions

Chart 5



Note: The expected impact of financial conditions on the year-on-year growth rate in GDP is shown.
Source: Own calculations based on Danmarks Nationalbank's DSGE model.

The structural VAR model used in the analysis

Box 1

In order to assess the impact of financial conditions on the economy, taking account of the cyclical situation, a structural vector autoregressive model, called a structural VAR, is set up.

The model estimates a system of relations between a series of variables. This means that all variables are determined by the development in all other variables, and the values of the variables in earlier periods. The model's reduced form can be written as:

$$(1) \qquad Y_t = A_1 Y_{t-1} \dots A_p Y_{t-p} + DZ_t + \varepsilon_t,$$

where Y_t is a vector of endogenous variables, Z_t is a vector of exogenous variables, and ε_t is a vector of error terms with an expected value of zero and the variance-covariance matrix Σ. A_i are matrices of parameters for the dynamic relation belonging to the endogenous variables, and D is a matrix of parameters belonging to the exogenous variables, see also Hamilton (1994) and Christiano et al. (1999).

The endogenous variables are real GDP, inflation, real housing prices, credit impulse[1], 30-year mortgage rate and real equity prices. The exogenous variables are the oil price, Danish export market growth and inflation in prices on Danish export markets.

For each of the six endogenous variables, the development in the variable is estimated as a function of lagged values of the variable itself, other endogenous variables, and the exogenous variables. Six relations are thus estimated – one for each of the endogenous variables. For example, the housing price is a function of GDP, interest rate, credit impulse, inflation, equity prices and housing prices in preceding periods. It can be considered that the VAR model estimates six relations – one for each of the endogenous variables. The model thereby takes account of both cyclical fluctuations (expressed by GDP and inflation) and financial conditions (expressed by interest rate, credit, equity prices and housing prices). On this basis, the development in the financial variables can be decomposed as an element explained by the cyclical development, and an element which lies beyond what can be explained by the business cycle.

In order to give the shocks to the model an economic interpretation, the model's structural form is identified with the help of a triangular identification. The identification assumption is based on the speed at which the variables included are assumed to react to shocks. On this basis, the order of the variables' in Y matrices is: GDP, inflation, credit impulse, housing prices, interest rate and equity prices. This identification means, for example, that GDP reacts more slowly to interest rate changes than interest rates react to changes in GDP. Grinderslev et al. (2017) find that housing prices are a leading indicator of credit extension. Credit impulse therefore precedes housing prices.

The model is estimated for data from the 1st quarter of 1994 – the 2nd quarter of 2018. One lag of each variable is included. With the exception of the 30-year mortgage rate, the credit impulse and the equity prices, the variables are formulated as year-on-year percentage growth rates. The 30-year mortgage rate is included as a quarter-on-quarter change, and the equity prices are the percentage quarter-on-quarter change. Data is obtained from Danmarks Nationalbank's forecast and Statistics Denmark. The model is estimated using Bayesian techniques, with independent Normal-Wishart priors.

1. The credit impulse is defined as $\frac{Credit_t - Credit_{t-1}}{Y_{t-1}} - \frac{Credit_{t-4} - Credit_{t-5}}{Y_{t-5}}$, where Credit indicates the overall credit to households and non-financial enterprises, and Y is nominal GDP. The credit impulse therefore indicates the acceleration in credit extension as a ratio of GDP.

Bibliography

Christiano, Lawrence J., Martin Eichenbaum and Charles L. Evans (1999), *Monetary policy shocks: What have we learned and to what end?*, in: J. B. Taylor and M. Woodford (ed.), *Handbook of Macroeconomics*, Elsevier, edition 1, Vol. 1, chapter 2, pp. 65-148.

Danmarks Nationalbank (2018a), Lengthy period of increasing risk appetite in parts of the banking sector, *Danmarks Nationalbank Analysis (Financial Stability)*, No. 6, May.

Danmarks Nationalbank (2018b), Boom with no signs of imbalances, *Danmarks Nationalbank Analysis (Outlook for the Danish Economy)*, No. 15, September.

Danmarks Nationalbank (2018c), Monetary and Financial Trends, *Danmarks Nationalbank Report*, No. 4, September.

Grinderslev, Oliver Juhler, Paul Lassenius Kramp, Anders Farver Kronborg and Jesper Pedersen (2017), Financial cycles: What are they and what do they look like in Denmark, *Danmarks Nationalbank Working Paper*, No. 115, June.

Hamilton, James Douglas (1994), *Time series analysis*, Princeton University Press.

Hviid, Simon Juul (2017), A leading indicator of house price bubbles, *Danmarks Nationalbank Working Paper*, No. 114, April.

Pedersen, Jesper (2016), An estimated DSGE model for Denmark with housing, banking and financial frictions, *Danmarks Nationalbank Working Paper*, No. 108, October.

Danish Ministry for Economic Affairs and the Interior (2018), *Economic Survey*, May.

ABOUT ANALYSIS

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

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

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