

The growing prevalence of variable-rate mortgages with deferred amortisation contributes to the build-up of risk

27 September 2022

The Systemic Risk Council (the Council) observes that Danish homeowners are increasingly taking out variable-rate mortgages with deferred amortisation. These homeowners are taking on a risk of their loan payments rising significantly in the event of rising interest rates. This would result in substantially reduced disposable amounts and increased risk of loan default. The development contributes to build-up of risk and may add to losses in credit institutions from an economic downturn.

Danish homeowners have a substantial amount of assets but are also among the most indebted in the world in terms of gross debt relative to disposable income. Furthermore, loans with deferred amortisation are particularly prevalent, also among highly mortgaged homeowners. Recent developments in mortgage rates have contributed to the rapid increase in variable-rate loans, including loans with deferred amortisation. In the first half of 2022, households took out kr. 70 billion in variable-rate mortgage loans with deferred amortisation. Since February 2022, outstanding fixed-rate mortgage debt has fallen and variable-rate loans with deferred amortisation in particular have contributed positively to credit growth. This is partially driven by homeowners repaying their fixed-rate loans and replacing them with new, variable-rate loans with deferred amortisation. Interest rate hikes in which long-term interest rates increase more than short-term interest rates have contributed to the growing popularity of variable-rate loans with deferred amortisation.

The outlook for the Danish economy is characterised by high inflation, rising interest rates and weaker economic growth.¹ This outlook could hamper homeowners' repayment capacity. Rising interest rates are also expected to bring down nominal house prices, increasing the risk of technical insolvency. The loan payments on variable-rate loans with deferred amortisation are more sensitive to rising interest rates than the payments on other types of loans. At the end of 2020, the quarter of homeowners with variable-rate loans with deferred amortisation who are hit the hardest would see an increase in their loan payments corresponding to 10 per cent or more of income after tax in the event of a 3 percentage point interest rate hike.

¹ The pressure on the economy should be eased, Danmarks Nationalbank, September 2022.

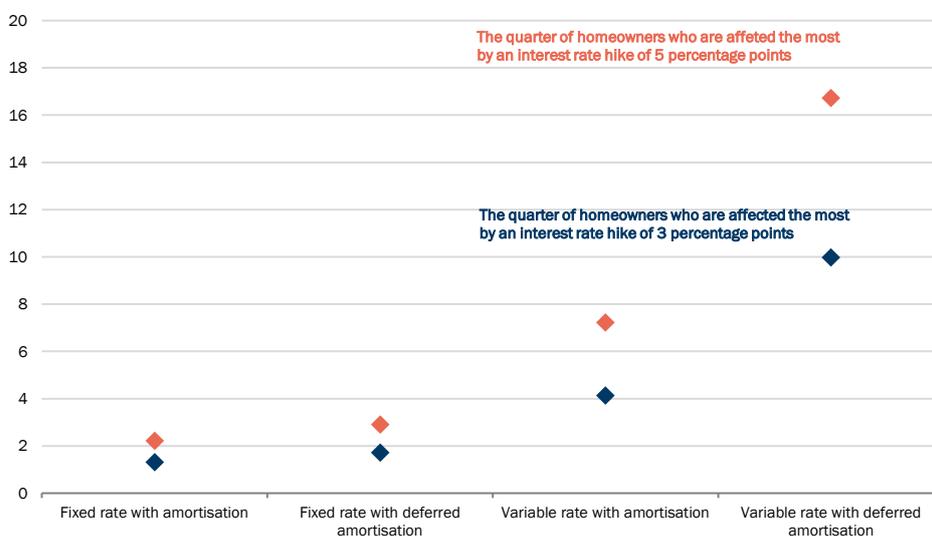
Mortgage rates have risen significantly since the end of 2020.² Considering an interest rate hike 5 percentage points from the level at the end of 2020, the quarter of homeowners with variable-rate loans with deferred amortisation who are hit the hardest would see an increase in their loan payments corresponding to 17 per cent or more of income after tax, see chart 1.³

The Systemic Risk Council finds that the current trend in the use of variable-rate loans with deferred amortisation is contributing to a build-up of unaddressed risks. It is important that homeowners taking out variable-rate loans with deferred amortisation have a buffer to enable them to manage large interest rate hikes. That is particularly important for those homeowners who increase their debt substantially in connection with loan refinancing. The Council will monitor the development closely.

Homeowners with variable-rate mortgages with deferred amortisation will experience the biggest increase in their debt servicing ratio from an interest rate hike

Chart 1

Change in debt servicing rate by a interest rate hike, per cent of income after tax



Note: Change in debt servicing ratio in the event of a 3 and 5 percentage point interest rate hike for homeowners. The starting point is the interest rate level at the end of 2020, and only homeowners whose next interest rate fixing of their mortgage debt is due in 2021 will receive a new interest rate. In addition, all bank debt is assumed to receive a new interest rate. Both interest rate hikes consider the quarter of homeowners who are hit the hardest (the 75 percentile). 25 per cent of homeowners within each loan type would then see their debt servicing ratio increase by the minimum stated. See Box B for further details.

Source: Statistics Denmark and Danmarks Nationalbank.

² From 30 December 2020 and 14 September 2022, interest rates on an F1 loan, an F3 loan and a fixed-rate mortgage loan have increased by 2.5, 3.3 and 3.2 percentage points, respectively.

³ The calculations are based on Danmarks Nationalbank's Working Paper 'Measuring household interest-rate sensitivity in Denmark' by Bech, Hviid and Mikkelsen (2021) with data through the end of 2020, which is the most recently available data. At that time, 19 per cent of Danish homeowners with debt had variable-rate loans with deferred amortisation. The group with the 25 per cent of homeowners with variable-rate loans with deferred amortisation that would be hardest hit by an interest rate hike, comprises 54,000 households.

Grounds

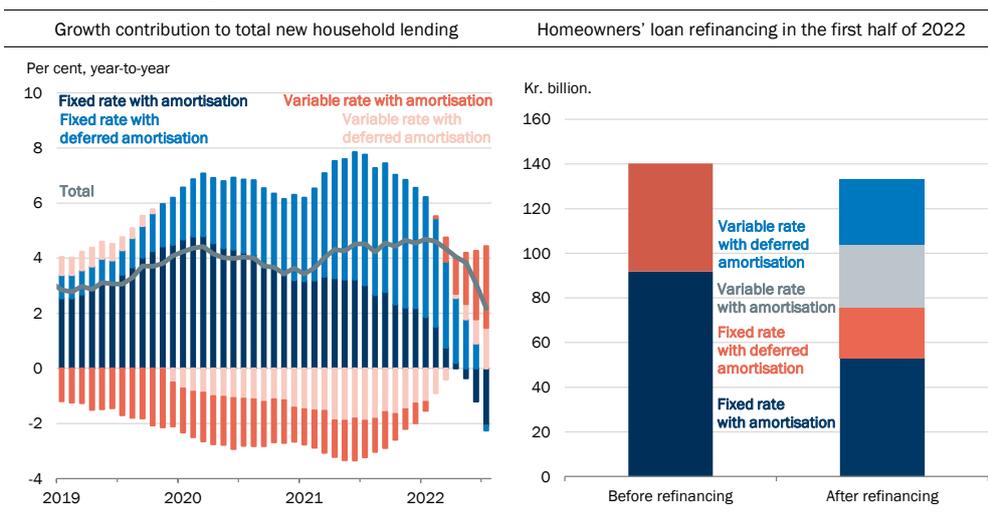
Homeowners increase their taking out of variable-rate loans with deferred amortisation

The development in Danish mortgage rates has led to homeowners and buyers increasingly taking out variable-rate mortgage loans with deferred amortisation, see chart 2 (left). This type of loan is particularly sensitive to rising interest rates, see Box A. 43 per cent of the new lending has been made in connection with loan refinancing. In the first half of 2022, homeowners refinanced kr. 133 billion worth of loans, roughly half of which was refinanced with variable-rate mortgages. Kr. 29 billion was refinanced with variable-rate loans with deferred amortisation, see chart 2 (right).

The increased propensity to choose loan types that are more sensitive to interest rate increases comes in the wake of a prolonged period of increasing prevalence of fixed-rate mortgage loans. Consequently, the falling and very low long-term interest rates up to the start of 2022 contributed to homeowners taking out fixed-rate loans, reducing their sensitivity to rising interest rates. At the end of July 2022, variable-rate loans with deferred amortisation accounted for 30 per cent of total mortgage lending to households. More interest-sensitive types of loans mean that a greater proportion of homeowners become more exposed to economic fluctuations and rising payments on their loans.

Variable-rate loans contribute to lending growth and are especially taken out in connection with loan refinancing

Chart 2



Note: *Left-hand chart:* Year-on-year growth contribution to total mortgage lending to households by loan type. Nominal values from the MFI statistics. The most recent observations are from July 2022. *Right-hand chart:* Homeowners who refinanced a fixed-rate mortgage loan in the first half of 2022. The value of the outstanding debt is indicated as the nominal value, both before and after the refinancing. The pre-refinancing value was calculated in Q4 2021 and Q1 2022 for refinancing made in Q1 2022 and Q2 2022, respectively. Any bank debt repaid in connection with the loan refinancing is net of the outstanding debt following the refinancing. The loan type for homeowners with multiple loans is categorised by the largest single loan of the borrower.

Source: Statistics Denmark, Danmarks Nationalbank and the credit register.

Variable-rate loans with deferred amortisation are particularly sensitive to rising interest rates

Box A

The sensitivity of homeowners to rising interest rates depends on several conditions of which the loan type is an important factor. Danmarks Nationalbank has published a Working Paper analysing the change in homeowners' debt servicing ratio in the event of an interest rate shock.⁴ The analysis uses register data from Statistics Denmark for the period 2009-2020, and a new debt servicing ratio is only calculated for bank loans and variable-rate mort-

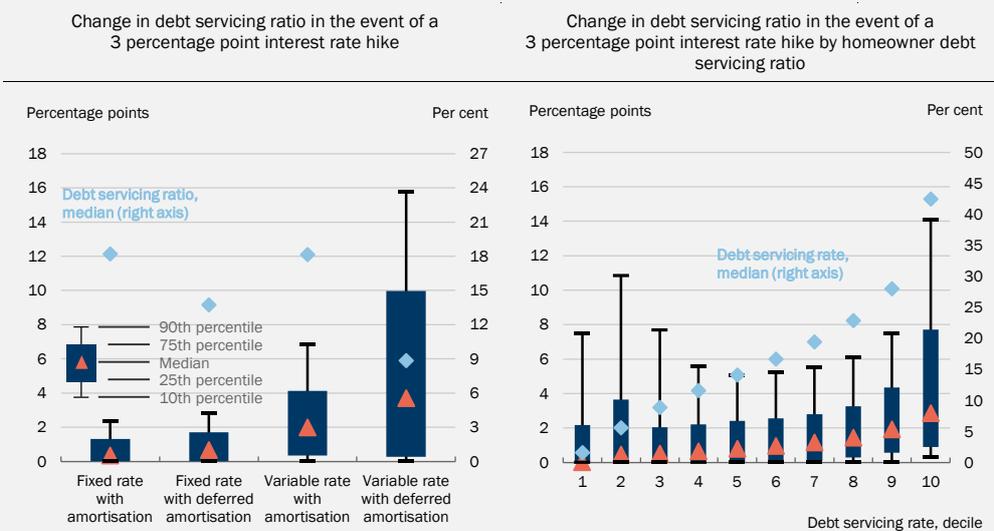
⁴ Stine Ludvig Bech, Simon Juul Hviid & Jakob Guldbæk Mikkelsen, Measuring household interest-rate sensitivity in Denmark, Danmarks Nationalbank Working Paper, no. 183, November 2021.

gage loans which were subject to interest rate fixing in 2021, see Box B. If we consider a 3 percentage point interest rate hike, the 25 per cent of homeowners with variable-rate loans with deferred amortisation that are hit the hardest would see an increase in the debt servicing ratio of at least 10 percentage points of their after-tax income, see chart 3 (left). For the typical homeowner in this group that results in an increase in the debt servicing ratio from 11 per cent to 26 per cent of their after-tax income. As a rule, however, homeowners with variable-rate mortgages with deferred amortisation have a lower debt servicing ratio than homeowners with other types of loans. The low debt servicing ratio of 11 per cent reflects the very low level of short-term mortgage rates at the end of 2020.

Homeowners' sensitivity to rising interest rates is determined not only by their choice of loan type, but also by how much of their income they are already spending on paying interest, administrative margin and instalment payments on their loans (the debt servicing ratio). Many homeowners with an already high debt servicing ratio will also see a significant increase in the payments on their debt in the event of an interest rate hike, see chart 3 (right). For example, the quarter of homeowners who are hit the hardest in the top decile of the debt servicing ratio will see their mortgage loan payments rise by just under 8 per cent in relation to their after-tax income if interest rates rise by 3 percentage points. This sensitivity is linked to the homeowners' loan-to-value ratio. If a homeowner has a bank loan in addition to a mortgage loan, the bank loan will typically be a variable-rate loan and hence sensitive to rising interest rates.

Loan type and debt servicing ratio are crucial to interest rate hike sensitivity

Chart 3



Note: Change in homeowner debt servicing ratio in the event of a 3 percentage point interest rate shock in 2020.
Source: Statistics Denmark and Danmarks Nationalbank.

Methodology and data basis for analysing homeowner resilience to interest rate hikes

Box B

Methodology and analysis assumptions

Homeowner interest rate sensitivity is calculated as the change in the debt servicing ratio in the event of a 3 percentage point increase in the interest rate on the individual loans. A 5 percentage point interest rate hike is also applied in chart 1. The calculations are roughly linear, however. Variable-rate mortgage loans and the time of the interest rate fixation can be identified in register data. In the calculation, a new debt servicing ratio is only computed for variable-rate mortgage loans with interest rate fixation in 2021. For bank loans, it is assumed that all bank loans will have a higher interest rate. See Danmarks Nationalbank's Working Paper written by Bech, Hviid and Mikkelsen (2021) for a complete description of the methodology.

Data basis and definition of debt servicing ratios

The analysis is made using register data from Statistics Denmark. Income and wealth data for the individual households is coupled with data on their mortgage and bank debt. The registers contain information on the loan type, outstanding debt, interest rate, maturity, repayment profile and interest rate fixation period of the individual loans, making it possible to calculate interest, instalment and administration margin payments on the debt of the individual household. The registers necessary for calculating the debt servicing ratios are available for the period 2009-2020.

The debt servicing ratio is calculated as interest, instalment and administration margin payments on bank and mortgage loans over the coming year. Interest rate sensitivity in relation to the debt servicing ratio is analysed in more detail in the above-mentioned Working Paper by Bech, Hviid and Mikkelsen (2021).

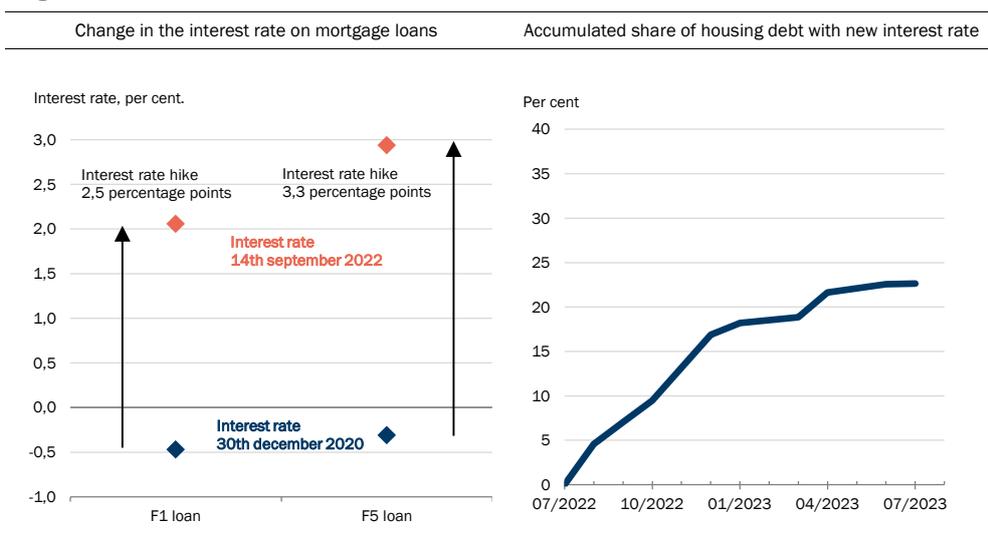
Increased sensitivity to rising interest rates could have an adverse impact on financial stability

The outlook for the Danish economy is characterised by high inflation, rising interest rates and lower economic growth.⁵ High inflation puts downward pressure on the real value of disposable income of Danish homeowners if their income does not keep up with the rising consumer prices.⁶ Especially the rising energy prices are significantly increasing the living costs for many households. Interest rate hikes will further reduce homeowners' income available for consumption after debt servicing payments. Increased sensitivity to interest rate hikes means that more homeowners may find it difficult to service their home finance obligations in the event of rising interest rates. Overall, increased sensitivity to interest rate hikes could add to the institutions' losses from an economic downturn.

The analysis in Box A is based on the interest rate level at the end of 2020. Since the end of 2020, the interest rate on an F1 loan has risen by 2.5 percentage points to 2.1 per cent, while the interest rate on an F5 loan has risen by 3.3 percentage points to 2.9 per cent, see chart 4 (left). This almost equates to a 3 percentage point shock to interest rates as presented in the model. However, short-term interest rates are expected to rise further going forward to combat the high level of inflation.⁷ When loans get a new interest rate, homeowner payments go up. From July 2022 and 12 months ahead, 23 per cent of homeowners' total debt will have a new interest rate, see chart 4 (right). This corresponds to total housing debt of kr. 447 billion.

Many homeowners are facing new and substantially higher interest rates on their housing debt

Chart 4



Note: *Right-hand chart:* Planned interest rate adjustments on existing bank and mortgage loans from July 2022. Shares indicate loans with new interest rates since July 2022. Loans that are given new interest rates several times only count once.

Source: The credit register, own calculations and Nordea Analytics.

Many homeowners with a variable-rate loan have high loan-to-value ratios

Homeowners with variable-rate loans without deferred amortisation typically have a lower loan-to-value ratio than homeowners with other types of loans. Given the risks associated with variable-rate mortgages with deferred amortization, this is a necessary characteristic. However, of the new lending in the first half of 2022, 37 per cent of homeowners' mortgage debt taken out at a variable interest rate with deferred amortisation has a high loan-to-value

⁵ The pressure on the economy should be eased, Danmarks Nationalbank, September 2022.

⁶ Conversely, high inflation is not necessarily a disadvantage for indebted homeowners. This is because, among other things, the nominal value of the homeowner's debt is diluted by high inflation and the real value of debt falls.

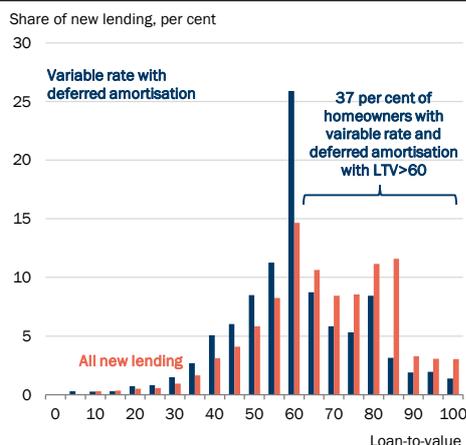
⁷ Monetary policy decisions, ECB press release, 8 September 2022.

ratio above 60 per cent, see chart 5 (left). The share of new variable-rate loans with deferred amortisation that have high loan-to-value ratios has remained relatively constant at around 39 per cent since the end of 2019. Since June 2021, however, the number of new variable-rate loans with deferred amortisation has increased significantly, which is why more homeowners currently have a high loan-to-value ratio and variable-rate loans with deferred amortisation, see chart 5 (right). The Danish Executive Order on Good Practice for Housing Credit (*Bekendtgørelsen for god skik for boligkredit*) restricts the availability to take out variable-rate loans with deferred amortisation if the borrower has a high loan-to-value ratio and a high debt-to-income ratio.⁸ Homeowners with a low loan-to-value ratio and debt-to-income ratio, however, are free to choose their preferred loan.

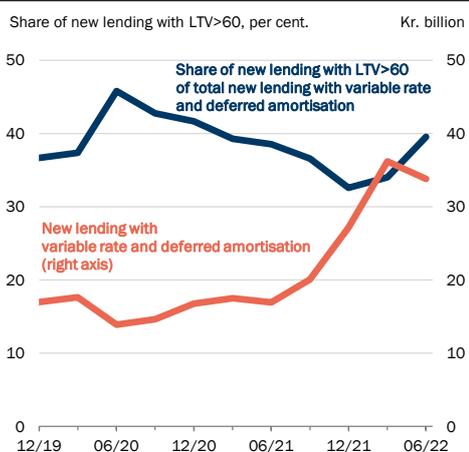
A large proportion of the new variable-rate loans with deferred amortisation has a high loan-to-value ratio

Chart 5

Breakdown of LTV for new loans taken out at variable-rates and with deferred amortisation in the first half of 2022



Development in new variable-rate loans with deferred amortisation



Note: Left-hand chart: Breakdown of LTV at individual level for homeowners who have taken out a mortgage loan. Calculated according to outstanding debt for new loans and broken down by all homeowners who have taken out a new mortgage loan and homeowners who took out a variable-rate loan with deferred amortisation in the first half of 2022. Right-hand chart: LTV > 60 is identified by LTV at individual level.

Source: Own calculations based on the credit register.

Fluctuating house prices require resilient homeowners

Homeowners should build up enough resilience to weather the decline in house prices that will occur at regular intervals. Danish house prices fluctuate over time, putting homeowners with high debt relative to the value of their home at risk of becoming technically insolvent. Since 1980, the Danish housing market has experienced two prolonged periods where nominal house prices fell by approximately 20 per cent.

Homeowners with fixed-rate loans will have some home equity protection in the event of interest rate increases as the market value of the debt decreases when interest rates rise. Such protection is not afforded to homeowners with variable-rate loans with deferred amortisation. At a time when the risk of sizeable drops in house prices is growing,⁹ the resurgence of the riskiest loan type is worrying.

⁸ The 2018 Executive Order on Good Practice for Housing Credit states that, as a general rule, a mortgage lender may not enter into risky agreements on mortgage loans or mortgage-like loans with a high loan-to-value ratio with consumers if this results in a high loan-to-value ratio for the consumer. Among other things, this means that homeowners with a high loan-to-value ratio (LTV > 60) and a high debt-to-income ratio (DTI > 4) are not allowed to take out variable-rate loans with deferred amortisation.

⁹ The pressure on the economy should be eased, Danmarks Nationalbank, September 2022.

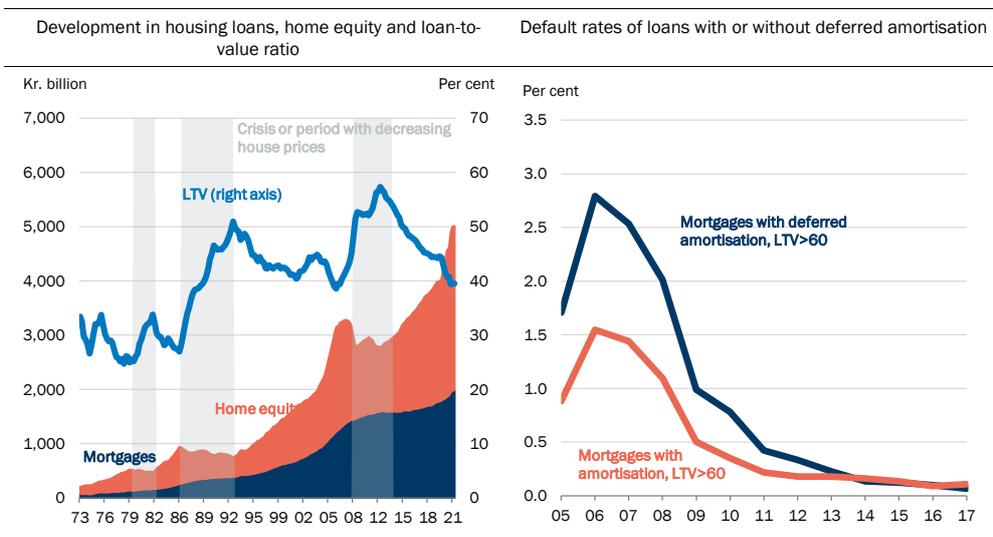
Instalment payments boost resilience and reduce the risk of loan default

Prior to the crises of falling house prices, average loan-to-value ratios declined as a result of rising house prices, see chart 6 (left). However, low average loan-to-value ratios did not prevent Danish mortgage institutions from incurring substantial losses and impairment charges on their loans secured by mortgages on owner-occupied homes in for example 1990-91.¹⁰

If homeowners do not pay instalments on their loan, they are, all else being equal, at greater risk of becoming technically insolvent as they are not steadily reducing their debt. Deferred amortisation thus makes homeowners vulnerable to falling house prices. During the financial crisis, loans with deferred amortisation also had higher default rates than loans without deferred amortisation, see chart 6 (right).

A low LTV has not provided adequate protection against past crises, and during the financial crisis default rates were higher among homeowners with deferred amortisation

Chart 6



Note: *Left-hand chart:* Housing loans are the total nominal debt secured by a mortgage on the home. The loan-to-value ratio does not take into account that in the 1980s many mortgage loans were granted on the basis of bonds issued with low coupon rates relative to the risk-free interest rate with the same maturity. This meant that the refinancing option was effectively almost worthless, which is why the market value of the debt rose sharply as interest rates fell. Consequently, the effective loan rates were significantly higher during the crises of the 1980s and 1990s than shown on the chart. *Right-hand chart:* Data for loans with a loan-to-value ratio above 60 per cent. The chart shows the proportion of loans granted a given year that were in default at any given time after that. Data for loans with a loan-to-value ratio of 60 per cent or more at the time of borrowing. Default is defined as a loan which is past due for 105 days or more. The only data available for 2005-08 is for loans that remained active in 2009. The numerator in the loan-to-value ratio is the market value of the mortgage debt and not the nominal outstanding debt because no data is available prior to 2009. The chart stops in 2017 because there were too few defaulted loans in subsequent years.

Source: Danmarks Nationalbank and own calculations based on register data from Statistics Denmark.

The Systemic Risk Council is monitoring the development closely

The Systemic Risk Council finds that the current trend in the use of variable-rate loans with deferred amortisation is leading to a build-up of unaddressed risks. It is important that homeowners taking out variable-rate loans with deferred amortisation have a buffer to enable them to absorb large interest rate hikes. Homeowners with a high loan-to-value ratio are relatively more vulnerable to future economic developments. By repaying their debt, they help to reduce this risk.

¹⁰ The Association of Danish Mortgage Banks' reports for 1990 and 1991.