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# Economic implications of interest-only mortgages combined with high leverage

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Interest-only mortgages are common among Danish homeowners, which sets Denmark apart from most other countries. Danish households also have high levels of debt by international standards. While interest-only mortgages can be useful for some homeowners to smooth out consumption and savings over their lifetime, the combination of interest-only mortgages and high loan-to-value ratios can pose a systemic risk to the Danish economy, which could materialise during a severe recession with a large decline in house prices.

**Interest-only mortgages are common among homeowners with high leverage and the extent may grow further under current regulation**

Since the financial crisis, stricter regulation and lending policies have restricted access to interest-only mortgages for less robust home-owners. However, 29 per cent of total housing debt is currently interest-only, with a loan-to-value ratio above 60 per cent. The lending rules allow interest-only mortgages to become even more widespread in the future. Changes to the regulation could curtail the risk of the volume increasing and help simplify the rules.

**Amortisation among homeowners with high loan-to-value ratios will significantly reduce the most risky housing debt**

According to new calculations, if homeowners with high loan-to-value ratios had amortised their housing debt, it could have reduced the most risky housing debt. But it would not have significantly reduced the total housing debt of homeowners. If new housing loans with a high loan-to-value ratio are amortised going forward, it could structurally strengthen the Danish model for home financing.

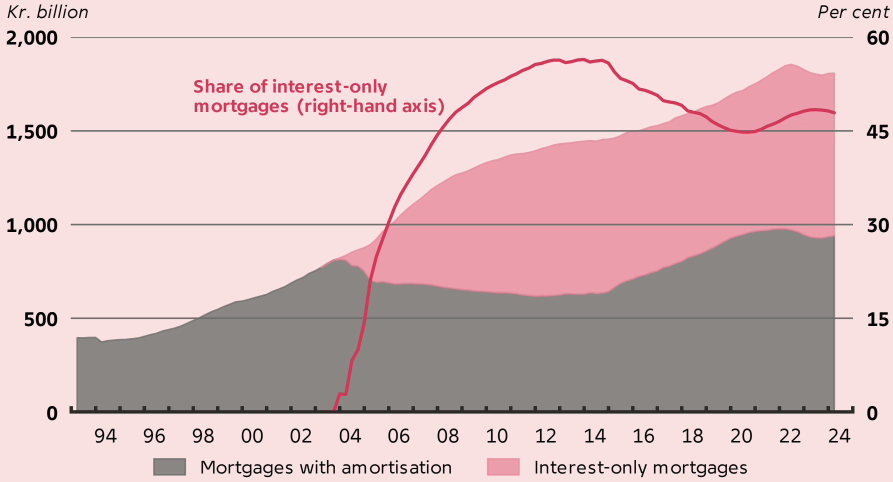
**Interest-only mortgages have a limited impact on consumption and liquid savings, but can increase house prices fluctuations**

Consumption and liquid savings can be funded by deferring amortisations on housing debt. New calculations indicate that interest-only mortgages for home-owners with a loan-to-value ratio above 60 per cent, annually, account for a modest increase in private consump-tion and liquid savings of approxi-mately kr. 3 and 2 billion, respectively. On the other hand, calculations also indicate that the prevalence of interest-only mortgages may contribute to greater house price fluctuations.

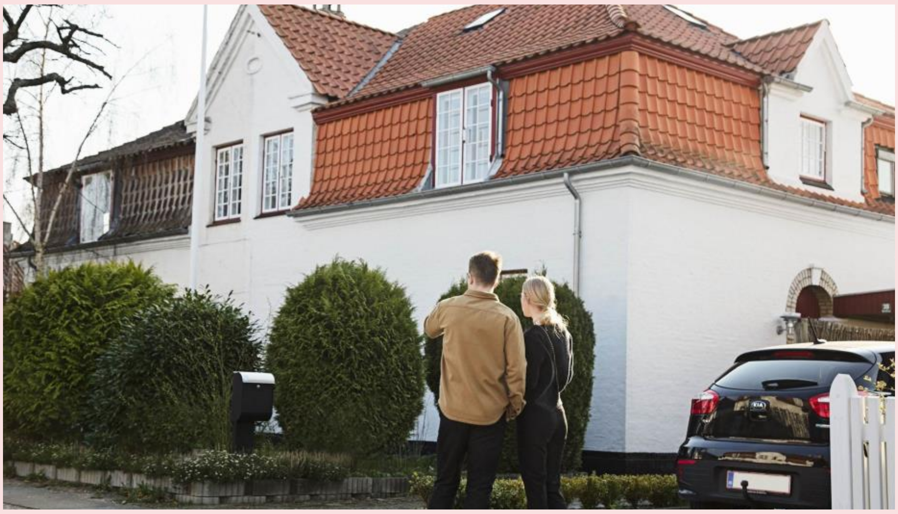
## Why is it important?

Danmarks Nationalbank works to ensure a robust economy in Denmark, including stability in the financial sector. Widespread use of interest-only mortgages affects the economy in several ways. Interest-only mortgages can stimulate economic activity through private consumption, but can also lead to increased household debt, which expose credit institutions to losses in the wake of severe economic downturns with falling house prices. Those losses can spread across the financial sector and to the economy as a whole, amplifying the depth and length of a recession.

## Main chart: Interest-only mortgages are still common in Denmark




Note: The chart shows household mortgages in Denmark, divided into mortgages with amortisation and interest-only mortgages.
Source: Danmarks Nationalbank.



## Key words

Banking and mortgage lending
Home financing
Housing market
Financial stability and financial risks
Financial regulation

# 01 Danmarks Nationalbank's assessment

The assessment of Danmarks Nationalbank is that the Danish housing finance model can be structurally strengthened if lending rules better curtail the risks associated with the prevalence of interest-only mortgages to homeowners with high loan-to-value (LTV) ratios. Structurally, financial and macroeconomic stability in Denmark would be strengthened if interest-only mortgage lending to homeowners with high loan-to-value ratios is reduced in the future. Homeowners with interest-only mortgages and an LTV above 60 per cent currently account for 29 per cent of total home lending. These homeowners may struggle to cope with large declines in house prices, causing losses for credit institutions. During a severe recession, when the financial sector may already be under pressure, reducing this risk to mortgage lenders and banks will benefit the economy.

It is a natural part of running a credit institution to manage the credit risk associated with issuing loans, including interest-only housing loans. However, risks become systemic when vulnerabilities can lead to problems in all or large parts of the financial sector, to the extent that the economy as a whole is affected negatively. Financial crises where systemic risks materialise can amplify and extend a recession.[1] Such risk goes beyond the direct credit risk of the individual credit institution and is borne by society.

Stricter regulation in the years following the financial crisis and more appropriate market practices have contributed to the fact that homeowners with interest-only mortgages are now more robust than they were previously. This has reduced credit institution risk related to this loan type. However, the current regulations only partially limit the possibility that interest-only mortgages for homeowners with high loan-to-value ratios could become even more widespread in the future. This was partly why the Systemic Risk Council concluded in 2021 that the lending rules do not sufficiently address systemic risks related to the large prevalence of interest-only mortgages. For example, an even greater propagation of interest-only mortgages may occur as the result of increased optimism among homeowners and increased competition in the housing finance market. The overall set of rules regulating access to interest-only mortgages is also complex, with individual and macroeconomic conditions determining which rules may limit the individual homeowner's borrowing. A limitation in the scope of new interest-only mortgages issued to homeowners with a high LTV could be designed in a way that would help simplify the lending rules.

The housing market and consumption decisions made by homeowners are also affected by interest-only mortgages. Price formation on the housing market is affected by the prevalence of interest-only mortgages. Restricting access to new interest-only mortgages is thus expected to dampen housing demand and may reduce house price fluctuations to the benefit of macroeconomic and financial stability. On the other hand, if access to deferred amortisation is restricted, private consumption and the accumulation of liquid savings will be constrained.

The overall assessment is that limiting access to interest-only mortgages will be beneficial to financial and macroeconomic stability in Denmark in the long run, while only slightly limiting homeowners' flexibility in planning their consumption and savings. This assessment is based on the following sub-analyses, which highlight the impact of deferred amortisation on the financial sector, private consumption, and the housing market.

[1] See The Systemic Risk Council, *Monitoring systemic risks*, report, 18 December 2014.

# 02
# Introduction

This analysis examines the prevalence of interest-only mortgages over time as well as across borrowers in Denmark. Focus is placed on homeowners with a high loan-to-value ratio (LTV), and the analysis presents new calculations of the impact of interest-only mortgages on the build-up of risks in the financial sector, aggregate household consumption and the housing market.

The risks associated with deferred amortisation can be tackled in several ways. One way is to limit access to interest-only mortgages for the most indebted homeowners, which the Systemic Risk Council recommended to the Minister for Industry, Business and Financial Affairs in 2021. This analysis is based on the proposal to limit deferred amortisation on new mortgages with an LTV above 60 per cent.[2] Other regulatory tools could also be used to counteract the risks of interest-only mortgages. However, the following sub-analyses are aimed at quantifying the impact of interest-only mortgages for homeowners with LTV ratios above 60 per cent.

**Existing lending rules do not limit even more widespread use of interest-only mortgages**

Almost half of mortgage lending to households is currently with deferred amortisation, and 29 per cent of housing debt in Denmark is with deferred amortisation and an LTV above 60 per cent. The first chapter of the analysis describes the prevalence of interest-only mortgages across different loan-to-value ratios and how the take-up of interest-only mortgages changed with the implementation of new lending rules since the financial crisis. Interest-only mortgage lending is currently targeted towards more resilient homeowners than it was before the financial crisis. However, current legislation does not prevent the proportion of interest-only housing debt from increasing to higher levels than today.

**The analysis presents three data-driven sub-analyses**

Chapters 4-6 present three sub-analyses. First, new calculations based on Danmarks Nationalbank's credit register are presented, which show that the most risky housing debt would have been reduced by about one-third with an amortisation requirement in place for homeowners with an LTV above 60 per cent. In this part of the analysis, the partial effects of a measure in line with the recommendation from the Systemic Risk Council in 2021 on the financial sector's potential losses on housing loans are simulated.[3] Specifically, we simulate a restriction on access to interest-only mortgages for homeowners with a loan-to-value ratio above 60 per cent, with interest-only mortgages still available at lower LTV ratios. With a loan-to-value ratio above 60 per cent, there are no stipulations in the simulations regarding which part of the housing debt should be repaid first. The homeowner can thus choose to repay any supplementary home financing before mortgage debt.

The next sub-analysis presents new estimates of the impacts on homeowner consumption and liquid savings, which are assessed to be a direct consequence

[2] The most indebted homeowners are defined as those who have a LTV ratio on their homes above 60 per cent. This definition follows the Systemic Risk Council's recommendation, 'the Supervisory Diamond' and the existing structure for the administration margins used by mortgage credit institutions, where, for example, the margins on mortgage loans for owner-occupied homes increase for LTV ratios above 60 per cent.
[3] See Recommendation from the Systemic Risk Council, *Limitation of access to interest-only loans for highly indebted borrowers*, 22 June 2021.

of interest-only mortgages. There is still little academic literature on the isolated effects of interest-only mortgages on consumption and savings behaviour. However, there are indications that deferred amortisation have an impact on homeowner behaviour. The estimates are based on a new working paper from Danmarks Nationalbank, which uses administrative data to show how Danish homeowners changed their consumption and savings behaviour when taking out interest-only mortgages in 2010–2019.[4] The results indicate that annual consumption of just under kr. 8 billion can be linked to interest-only mortgages, of which homeowners with loan-to-value ratios above 60 per cent accounted for approximately kr. 3 billion. This corresponded to 0.3 per cent of total private consumption in 2022. In addition, liquid savings are estimated to have increased by approximately kr. 2 billion annually for the same group of homeowners, as a consequence of taking out an interest-only mortgage. The chapter also illustrates that a significant part of the interest-only mortgage debt is associated with extraordinary amortisation of other debts, including e.g. supplementary housing debt with banks – but also other types of loans, such as car loans or consumer loans.

The final chapter illustrates that housing demand is affected by the prevalence of interest-only mortgages and that fluctuations in house prices could be reduced if access to interest-only mortgages is limited. The prevalence of interest-only mortgages is closely correlated with house price increases, which can have implications for the real economy via, for example, household consumption.[5] In addition, an examination of all owner-occupied housing transactions from 2011 to 2021 shows that homes financed with an interest-only mortgage have consistently been more expensive than homes financed with an amortising mortgage. Even when accounting for the fact that house prices have developed differently across municipalities and that buyers have varying levels of income and wealth, the usage of interest-only mortgages and house price increases are related.

### Widespread use of interest-only mortgages can lead to a build-up of systemic risks

The overall consequence of deferred amortisation is greater household indebtedness.[6] From a systemic risk perspective, the prevalence of interest-only mortgages among the most leveraged borrowers exposes mortgage lenders and banks to greater losses in the event of a decline in house prices, all else being equal. If these losses and any consequences are not only borne by the lender but also by other actors in the financial system, deferred amortisation will lead to a systemic risk. In this case, the combination of interest-only mortgages and high loan-to-value ratios can lead to a risk that society bears in addition to the direct credit risk for the lending institution.

### House prices can decline significantly during an economic downturn

House prices have been on an upward trend for many years, but this trend has periodically been interrupted by downturns. The most significant decline in house prices was during and after the financial crisis from 2008 to 2012, when the price of single-family houses declines by an average of 19 per cent over the four-year period, see Chart 1. The decline in house prices should be seen in light

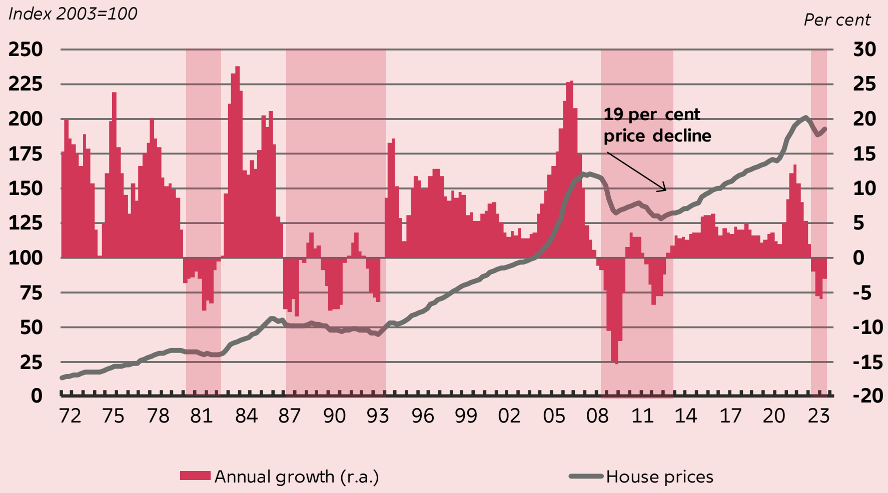
[4] See Henrik Yde Andersen and Stine Ludvig Bech, Describing Interest-Only Mortgage Borrowers' Savings and Spending using Danish Register Data, *Danmarks Nationalbank Working Paper*, no. 203, May 2024.
[5] See Alessia De Stefani and Simon Juul Hviid, Housing Collateral and Home-Equity Extraction, *Danmarks Nationalbank Working Paper*, no. 135, February 2018, and Henrik Yde Andersen and Søren Leth-Petersen, Housing Wealth or Collateral: How Home Value Shocks Drive Home Equity Extraction and Spending, *Journal of the European Economic Association*, vol. 19, issue 1, February 2021, pp. 403–440.
[6] In addition to the mechanical effect of deferred amortisation a behavioural effect can appear. Experiences from Sweden indicate that deferred amortisation causes increased indebtedness among homeowners. See Claes Bäckman and Peter van Santen, *The Amortization Elasticity of Mortgage Demand*, Department of Economics and Business Economics, Aarhus University, Working Paper no. 16, November 2020.

of the strong price growth in the preceding years. This was a period when adjustable-rate and interest-only mortgages were just being introduced and a tax freeze was introduced in the housing market.

**CHART 1**

### House prices fell 19 per cent after the financial crisis

Average house price development and annual growth rates for single-family houses in Denmark.




Note: The house price development is indexed to the 4th quarter of 2003, when interest-only mortgages were introduced. See Danmarks Nationalbank, *Danish Monetary History 2005–2020*, Chapter 2, for more information on guarantees provided by the Danish state to the Danish financial sector during the financial crisis.
Source: Danmarks Nationalbank and Statistics Denmark.

The financial crisis hit the financial sector hard in Denmark, and the government had to issue extensive state guarantees to ensure a well-functioning financial system. It is difficult to quantify, but it is likely that the crisis would have had an even greater impact on the Danish economy in the absence of the guarantees provided by the Danish government. Therefore, house prices could potentially have declined even more than they actually did. In that case the financial sector would have suffered larger losses due to customers having to sell their properties at a price lower than their mortgage. This would likely have further exacerbated the financial crisis in Denmark.

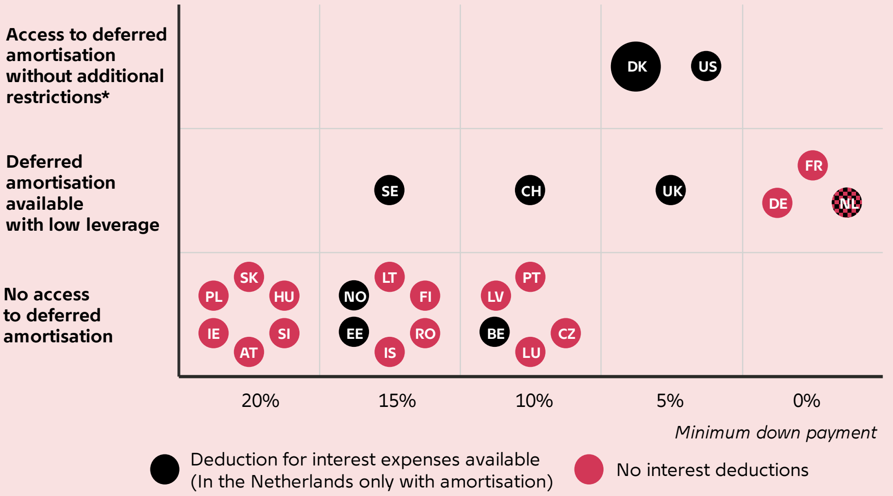
### Denmark's widespread use of interest-only mortgages stands out internationally

Deferred amortisation is the exception rather than the norm in other countries, see Chart 2. Denmark stands out from other European countries by having one of the lowest down-payment requirements of 5 per cent and by having tax deductions on interest expenses.

CHART 2

## Housing regulation in Denmark stands out in an international context

Applicable rules across countries on down payment requirements, interest deductions and access to interest-only mortgages



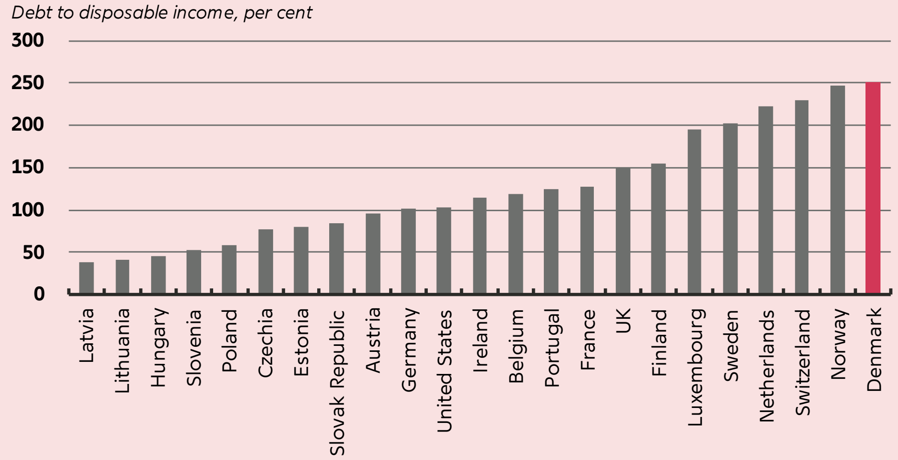

Note: The chart only includes countries where the authorities require a minimum down payment for home purchases, either as a legally binding down payment requirement or as guidelines monitored on an ongoing basis.
1.) In Sweden, it is possible to take out an unsecured loan when buying a home and bypass the down payment requirement. The Swedish FSA estimates that 4 per cent of new lending for home purchases in 2022 was in the form of unsecured loans.
2.) In the Netherlands, interest deductions can only be claimed if the loan is repaid at the same time. Finland is in the process of phasing out the interest deduction. In Finland, there is a 5 per cent down-payment requirement for first-time buyers.
3) In Switzerland, the authorities recommend a 10 per cent down payment, but market practice is 20 per cent.
*In Denmark, the combination of interest-only mortgages, high LTV and high DTI partially restricts interest-only mortgages in Good Practice. As a general rule, lenders may only grant loans with variable interest rates or interest-only mortgages to borrowers who can be approved to service a corresponding loan amount with fixed-rate interest and amortisation. The Growth Guidance also places certain restrictions on the availability of deferred amortisation.
Source: IMF, ESRB, OECD and Federal Reserve Bank of Chicago.

Danish households also stand out internationally in terms of household indebtedness, see Chart 3. There are several factors that influence household debt levels across countries. Relaxed regulation may have been a contributing factor over the long-term.[7] Structural factors, such as the structure of the pension system, also play a role, as large savings via occupational pension schemes and tax incentives for contributions to pension accounts can lead to increased borrowing.[8]

[7] See Danmarks Nationalbank, What is behind the rising debt of Danes? *Danmarks Nationalbank Analysis*, no. 13, June 2020.
[8] See Henrik Yde Andersen, Niels Lynggård Hansen and Andreas Kuchler, Mandatory pension contributions and long-run debt accumulation: Evidence from Danish Low-wage Earners, *Journal of Pension Economics and Finance*, 22(3), July 2023, pp. 371–399, and Henrik Yde Andersen, Do tax incentives for saving in pension accounts cause debt accumulation? Evidence from Danish register data, *European Economic Review*, vol. 106, July 2018, pp. 35–53.

CHART 3

### Danish households have high debt in an international comparison



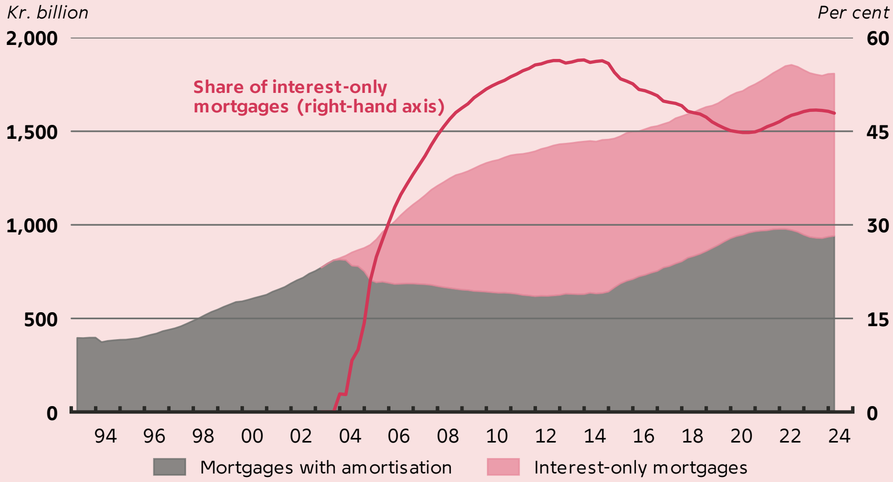

Note: The chart shows household debt relative to their disposable income, the so-called debt-to-income ratio, across OECD countries. Data is for 2021.
Source: OECD.

# 03
# The spread of deferred amortisation and current regulation

For more than 20 years, Danish homeowners have been able to defer amortisation on their mortgages. In 2008, five years after the introduction of interest-only mortgages in October 2003, deferred amortisation accounted for half of the lending from mortgage credit institutions to homeowners. The deferred amortisation share of mortgage debt then declined between 2013-2019, but in recent years, interest-only mortgages are once again becoming more widespread among homeowners, see Chart 4.

CHART 4

**Interest-only mortgages are still widespread in Denmark**



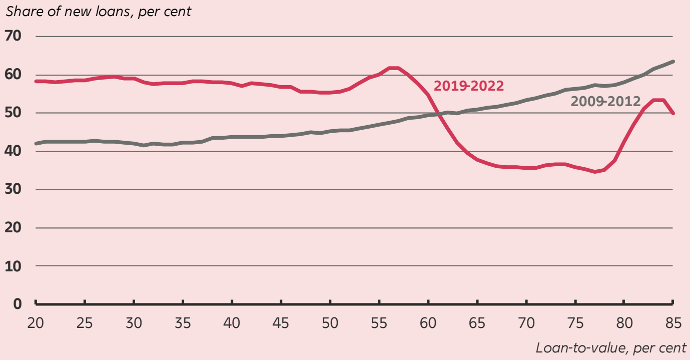

Note: The chart shows the portfolio of mortgage debt in Denmark, divided into mortgages with amortisation and interest-only mortgages.
Source: Danmarks Nationalbank.

**Deferred amortisation is common among homeowners with mortgage debt amounting to the upper limit of 80 per cent of the property value**
Deferred amortisation on new mortgages is common among homeowners with both high and low loan-to-value-rations (LTV), see Chart 5. In 2019–2022, deferred amortisation accounted for approximately half of new mortgages for homeowners with the maximum mortgage loan-to-value ratio of 80 per cent. In a situation with declining house prices, homeowners with high loan-to-value ratios can risk their debt exceeding the sale value – especially if they also have additional housing debt to banks.

In the aftermath of the financial crisis between 2009 and 2012, the share of interest-only mortgages with a loan-to-value ratio above 60 per cent was significantly larger compared to today. After the crisis, more strict regulation and lending practices in the financial sector have affected which homeowners have access to or demand interest-only mortgages.

**CHART 5**

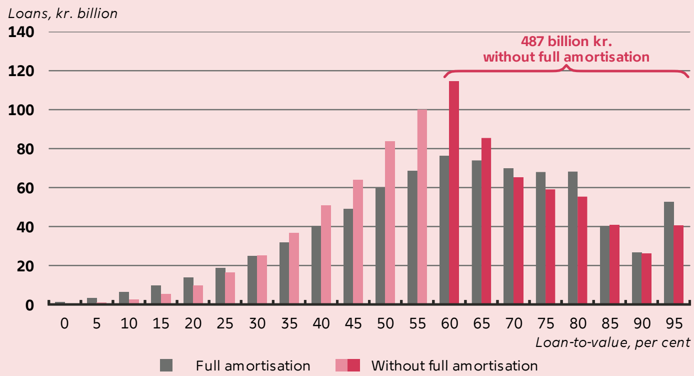
**Interest-only mortgages are granted to homeowners with both high and low loan-to-value ratios**




Note: Share of new mortgage debt (net) with deferred amortisation. Net new lending comprises newly created mortgage debt less amortisation of existing mortgage debt in the same period.
Source: Danmarks Nationalbank and Statistics Denmark.

**CHART 6**

**Deferred amortisation makes up a large share of total housing debt among high loan-to-value borrowers**




Note: Total lending for owner-occupied housing by loan-to-value ratio and whether total home financing is deferred amortisation. The loan-to-value ratio indicates the lower end of the range. Data for Q2 2023.
Source: Credit Register and Danmarks Nationalbank.

Homeowners with high loan-to-value ratios account for a significant part of the outstanding housing debt in Denmark. Among homeowners with a loan-to-value ratio above 60 per cent, interest-only loans totalled kr. 487 billion in Q2 2023, see Chart 6. This is slightly more than the group with only amortising loans and an LTV above 60 per cent, amounting to kr. 476 billion.

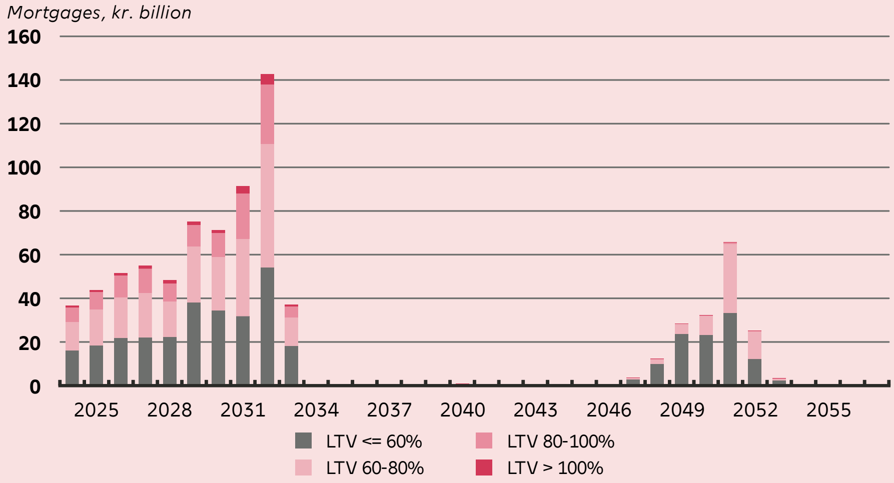
**The market standard for interest-only mortgages is a 30 year loan with a 10-year deferred amortisation period**

Interest-only mortgages are typically taken out as a 30-year mortgage with amortisation deferred during the first 10 years of the mortgage term. Therefore, when taking out an interest-only mortgage, amortisation will begin 10 years later and the loan will be fully repaid after 30 years. In 2024, the deferred amortisation period is expected to expire for kr. 37 billion of housing debt, see Chart 7. In comparison, in 2032 the deferred amortisation period expires for debt worth kr. 143 billion. This should be seen in light of the fact that many homeowners choose to repay their debt before their deferred amortisation period expires, for example due to moving to new homes or refinancing their loan.[9]

[9] Two out of three homeowners with interest-only mortgages have kept their mortgage for more than 10 years and have started amortisation. The remaining third have refinanced to a new mortgage with or without amortisation or have repaid the mortgage. Read more in Danmarks Nationalbank, Expiring interest-only mortgages have implications for household expenditure, *Danmarks Nationalbank Analysis*, no. 2, February 2020.

CHART 7

**The deferred amortisation period expire within the next 10 years for many mortgages, but 30 years of deferred amortisation is also common**

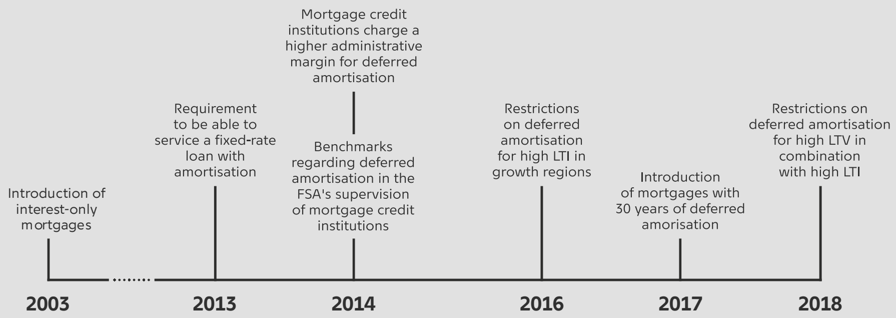



Note: The stock of interest-only mortgages in kr. billion over the year of deferred amortisation period expiration and loan-to-value ratio (LTV). Data from Q2 2023.
Source: The credit register and own calculations.

**New regulation since the financial crisis has contributed to interest-only mortgages being aimed at more resilient homeowners**

In the wake of the financial crisis, several measures were implemented to tighten financial regulation, including the so-called growth guidelines, the supervisory diamond for mortgage credit institutions and the executive order on good practice for housing credit (hereinafter good practice), see Box 1. These initiatives resulted in interest-only mortgages becoming increasingly aimed at homeowners with more robust finances who, in principle, could have amortised their mortgages. However, the regulation is complex in the sense that both borrower circumstances as well as macroeconomic conditions, including the interest rate, affect whether a customer can be granted an interest-only mortgage.

BOX 1



### Current regulation only partially curtail the risks of deferred amortisation combined with high leverage

The current regulation only partially restrict the possibility to defer amortisation for homeowners with a high LTV. It is possible to take out mortgages with fixed-rates and deferred amortisation even at the maximum 80 per cent LTV, except in Greater Copenhagen and Aarhus, where the growth guidelines apply, see Chart 8.

While the so-called supervisory diamond is a portfolio tool with indirect impact on the products offered by mortgage credit institutions, the rules in the order on good practice and the growth guidelines more directly impact the types of loans that banks and mortgage credit institutions may grant to certain customers. The ruleset has become complex, and the availability of specific combinations of deferred amortisation and interest rate fixation periods for the individual homeowner depends on factors such as geographical location, LTV and debt-to-income ratio[10] (see Box 2 for a description of selected elements of the current rules).

**BOX 2**

### Existing regulation of access to deferred amortisation

The lending rules implemented since the financial crisis are based on consumer protection legislation. The regulation regarding deferred amortisation has become relatively complex, and the possibility of deferring amortisation for the individual homeowner depends on location, LTV, wealth, debt-to-income ratio (DTI), choice of fixed interest period, etc. The complexity is also due to the fact that the rules are implemented in various executive orders and guidelines. Below are descriptions of key elements in the Danish legislation.

**2013: Requirement to be able to service a fixed-rate loan with amortisation to qualify for deferred amortisation (Good practice for housing credit)**
One of the key rules regarding deferred amortisation in the order on good practice states that homeowners must have robust finances and be able to service a fixed-rate mortgage (FRM) with amortisation to be approved for deferred amortisation or a variable-rate mortgage. There is no clear definition of when a borrower’s finances are robust enough to service an FRM. Among other things, the rule is intended to ensure a minimum standard for how institutions grant deferred amortisation , but the rules are flexible, and the institutions can deviate from them if it is deemed reasonable based on an assessment of the individual customer.

**2014: The supervisory diamond for mortgage credit institutions**
The Danish Financial Supervisory Authority’s (FSA) supervisory diamond for mortgage credit institutions sets out a number of benchmarks for what the Danish FSA considers mortgage lending with high risk.[1] The benchmark on deferred amortisation limits mortgage credit institutions lending with collateral in owner-occupied dwellings to homeowners with an LTV higher than 60 per cent (slightly less for holiday homes). Interest-only mortgages above LTV 60 may not exceed ten per cent of the institutions total mortgages.[2] The supervisory diamond was announced in 2014, but the benchmark for interest-only mortgages was not applicable until 2020. The benchmark is currently far from a binding limitation for any mortgage credit institution.

**2016: The growth guidelines**
The growth guidelines is a guide to how mortgage credit institutions should assess creditworthiness when lending against collateral in owner-occupied and cooperative housing in areas with large price increases (so-called growth areas – in practice, Greater Copenhagen and Aarhus). Point 4 of the guidelines states that customers with a high DTI should have robust net wealth that should remain positive even if the value of their home falls. Specifically, with a DTI between 4 and 5, net wealth should generally be positive even if the value of the home falls by 10 per cent. With a DTI above 5, wealth should generally be positive if the value of the home falls by 25 per cent. However, customers with high job security who have opted for a fixed interest rate and amortisation are exempt if their net worth is positive. In practice, this means that borrowers with high job security and a fixed interest rate and amortisation can borrow up to 90 per cent of the value of the home if their debt-to-income ratio is between 4 and 5, and up to 75 per cent of the value of the home if the debt-to-income ratio is greater than 5.

*Continues …*

[10] The debt-to-income ratio indicates the homeowner’s total debt in relation to annual gross income.

*... continued*

**2018: Restrictions on the riskiest loan types for borrowers with high DTI and LTV (good practice for housing credit)**
Additional limits on the choice of loan type for borrowers where the LTV exceeds 60 per cent and the debt-to-income ratio is greater than 4. These borrowers may generally only take out fixed-rate loans or loans with amortisation and an interest rate fixation period of at least five years. Deferred amortisation can be granted, but only on fixed-rate loans.

[1]The Danish FSA's *Supervisory Diamond for mortgage credit institutions* (link).
[2] The benchmark only includes the portion of the loan that is above 60 percent of the value.

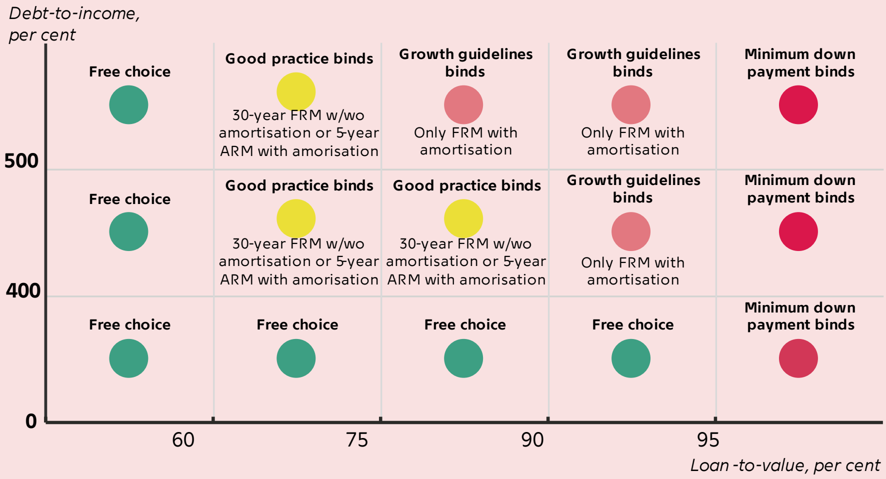
All borrowers are subject to the general rule, introduced in good practice in 2013, that they must be able to service a mortgage with a fixed-rate and amortisation at the time of taking out the mortgage in order to access an interest-only mortgage. However, there is some flexibility in the rules, and the credit institutions can deviate from them based on an assessment of the individual customer.[11] In addition, good practice does not clearly define what it means to be able to service a fixed-rate loan with amortisation.

Access to interest-only mortgages also depends on the borrower's debt-to-income ratio, see Chart 8. For borrowers with a debt-to-income ratio below 4, the only restriction on the period of deferred amortisation is that they must be able to service a fixed-rate loan with amortisation at the time the mortgage is taken out. Even with a debt-to-income ratio above 5, it is possible to take out interest-only, fixed-rate mortgages as long as the total loan-to-value ratio is lower than 75 per cent; cf. the growth guidelines.

[11] The current regulations give credit institutions flexibility in their application of these guidelines. That flexibility also contributed to approximately 8 per cent of new mortgage lending in Q2 2023 deviating from the guideline limits.

CHART 8

**Stylised product offering in mortgage credit institutions**




Note: Stylised example of product offerings for a creditworthy borrower with high job security and positive net worth at the time of borrowing. Generally, borrowers must be able to service a fixed-rate mortgage (FRM) with amortisation, regardless of debt-to-income and loan-to-value ratios. The growth guidelines apply only to homes located in the Greater Copenhagen as well as Aarhus municipality. The maximum loan-to-value ratio in mortgage credit institutions is 80 per cent. In Greater Copenhagen and Aarhus, mortgage qualification also depends on whether the customer has supplemental housing debt above the 80 per cent mortgage limit. To qualify for a variable interest rate (ARM), borrowers in Greater Copenhagen and Aarhus must be able to service a loan with an interest rate of 4 per cent and amortisation, regardless of loan-to-value ratio.

Source: Danmarks Nationalbank.

Government lending rules are minimum standards, and credit policies in some institutions are sometimes more restrictive than the lending rules. One example of this is that mortgage credit institutions have so far targeted loans with 30 years of deferred amortisation to borrowers with loan-to-value ratios below 60 per cent, regardless of whether or not they could service a fixed-rate loan with amortisation at a higher LTV. This is stricter than the current credit policy on mortgages with 10 years of deferred amortisation, while the regulation does not directly distinguish between the two different periods of deferred amortisation.

**Current legislation allows for greater uptake of deferred amortisation in the future**

The current regulation on interest-only mortgage lending allows for adaptation when the market changes. Changes in risk perception and competition can influence the design of deferred amortisation products and the lending practices of institutions in a direction that either increases or decreases risk relative to today.

With the implementation of the EU *Covered Bond* Directive into Danish law in 2007, there is no restriction on the maximum length of deferred amortisation, as long as the loan-to-value ratio of the mortgage is no more than 75 per cent at the time of origination. It is only an industry norm that deferred amortisation is still typically granted for 10 years at a time, after which a new loan must be taken out, along with a new credit rating of the customer, should a new period of deferred amortisation be desired. Similarly, it is also a market standard that mortgage credit institutions generally do not grant loans with 30-year deferred amortisation if the loan-to-value ratio exceeds 60 per cent. They also do not allow supplemental housing debt beyond a mortgage loan with 30-year deferred amortisation.

Overall, Danish regulation allows housing finance to become more risky in the future through the increased use of deferred amortisation in combination with high leverage. Despite several rounds of regulatory tightening since the financial crisis, credit institutions can, for example, grant mortgages with 30 years of deferred amortisation up to 75 per cent of the property value, and the homeowner can obtain supplementary financing from a bank so that the total loan-to-value ratio is 95 per cent.

**Interest-only mortgages are currently granted to homeowners who would be able to amortise**

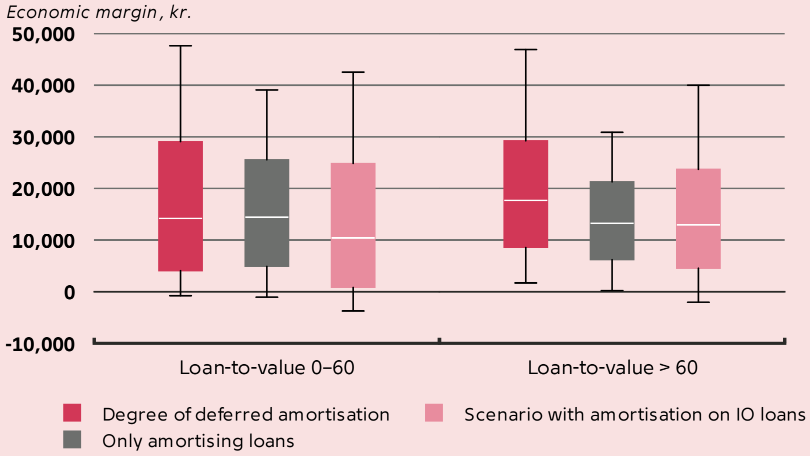
The current regulation and market practice means that access to interest-only mortgages is typically only granted if the homeowner's budget could accommodate amortisation. The economic margin can be used as a measure of whether or not there is room in the budget to make such payments. We define the economic margin as the amount of money homeowners have left after paying taxes on their income and all fixed consumption costs, including food and household expenses.[12] The economic margin can be used as a measure of whether or not a household has room in their budget to amortise.

Homeowners with a loan-to-value ratio above 60 per cent who have an interest-only mortgage have, on average, a higher economic margin than homeowners with the same LTV who are amortising, see Chart 9. If those deferring amortisation were to amortise, their economic margin would be equal to the amortising group. This indicates that deferred amortisation is typically granted to homeowners who would have been able to amortise and still live in the same home.

[12] The economic margin is defined as the difference between monthly disposable income and monthly minimum expenditure (credit and debt costs, other fixed costs and disposable income at a modest standard of living), see Meyer, Martinello and Nissen, Homeowners' budgets and projections of their debt servicing capacity, *Danmarks Nationalbank Economic Memo*, no. 4, June 2023. The fixed consumption costs reflect the minimum consumption that the Danish FSA sets as a guideline for bank credit ratings, debt service payments and fixed costs such as insurance.

CHART 9

**For homeowners with a loan-to-value ratio above 60 per cent, deferred amortisation is linked to a larger economic margin**




Note: The economic margin of homeowners (monthly disposable income less monthly minimum expenses, including borrowing costs), see Meyer, Martinello and Nissen, Homeowners' budgets and projections of their debt servicing capacity, *Danmarks Nationalbank Economic Memo*, No. 4, June 2023. The endpoints indicate the 10th and 90th percentile respectively. This is based on borrowing costs as of Q2 2023 and minimum monthly costs for the end of 2023.
Source: Danmarks Nationalbank, Statistics Denmark and own calculations.

**Homeowners with an interest-only mortgage have a higher debt-to-income ratio than borrowers who amortise**

Homeowners with and without deferred amortisation differ in a number of ways. Homeowners with deferred amortisation are more likely to live in more expensive areas than homeowners who amortise. This is consistent with the fact that debt is generally higher for homeowners with interest-only mortgages, see Table 1. Looking at borrowers with a loan-to-value ratio above 60 per cent, the median homeowner with an interest-only mortgage has kr. 2 million of housing debt, while homeowners who amortise have kr. 1.3 million of housing debt. The two groups are similar in terms of monthly disposable income, with a difference of about kr. 4,000 at the median in favour of the deferred amortisation group. The debt-to-income ratio is significantly higher for borrowers with deferred amortisation than the group that amortise, at 2.5 and 1.8 respectively.

**TABLE 1**

**Homeowners with a high loan-to-value ratio and interest-only mortgages have a high debt-to-income ratio, but they have room in their budgets to start amortisation**

| | Highly indebted homeowners *with* interest-only mortgages | Highly indebted homeowners *without* interest-only mortgages |
|---|---|---|
| LTV ratio | 74 per cent | 76 per cent |
| Housing debt | Kr. 2 million | Kr. 1.3 million |
| Disposable income | 49,900 Kr./month | +46,000 Kr./month |
| LTI ratio | 2.5 | 1.8 |
| Economic margin *(if amortisation is made*)* | 13,000 Kr./month | 13,200 Kr./month |
| Monthly expenses vs. disposable income *(if amortisation is made*)* | 73 per cent | 70 per cent |
| Age | 47 years old | 44 years old |

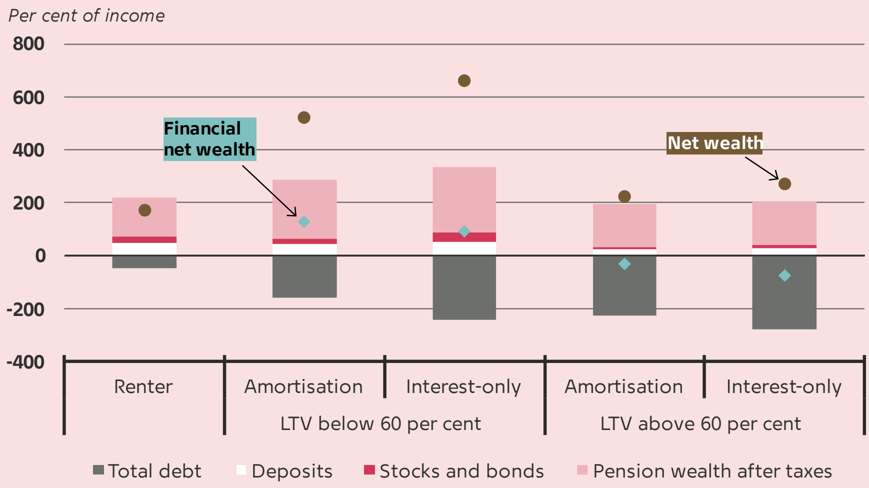
Note: Median values for homeowners with a loan-to-value ratio above 60 per cent in Q2 2023. Based on borrowing costs as of Q1 2023 and minimum monthly costs for the end of 2023. The economic margin is monthly disposable income minus monthly (minimum) expenses. Monthly expenses consist of fixed costs, including borrowing costs, and minimum variable expenses as recommended by the Danish FSA.
* For interest-only mortgages, the total payment with amortisation is calculated to compare costs with homeowners who amortise.
Source: Danmarks Nationalbank, Statistics Denmark and own calculations.

### Deferred amortisation homeowners have more assets but lower net financial wealth

Homeowners with interest-only mortgages have slightly more financial assets than homeowners who make amortisation. Among homeowners with a loan-to-value ratio above 60 per cent, the average value of financial assets was 194 and 205 per cent of disposable income for amortising and non-amortising borrowers respectively, see Chart 10. Based on a calculation of household financial balances at the end of 2021. The financial wealth of homeowners with a loan-to-value ratio above 60 per cent is generally lower than homeowners with a lower loan-to-value ratio. This should be seen in light of a number of other differences between the two groups, including age and income.

**CHART 10**

**Homeowners with interest-only mortgages have more liquid assets and lower financial net wealth than homeowners who amortise**




Note: The calculation includes all households in Denmark, and the values reflect the market value of wealth and debt at the end of 2021. The figures are calculated after tax, where pension wealth is assumed to be taxed at a fixed tax rate of 40 per cent. The difference between net wealth and financial net wealth is that housing wealth is included in net wealth.
Source: Own calculations based on register data from Statistics Denmark.

If we look at the financial *net wealth* instead, where financial assets is offset against debt, homeowners with interest-only mortgages are left with a smaller net wealth than amortising homeowners, see Chart 10. As mentioned above, this reflects the fact that homeowners with interest-only mortgages have significantly higher gross debt than homeowners who amortise. In other words, the slightly higher level of financial assets in the deferred amortisation group is not enough to compensate for the higher debt.

*Total* net wealth, which also includes housing wealth, was slightly higher for homeowners with interest-only mortgages than for amortising homeowners, at 271 and 223 per cent of annual income respectively. This should be considered in the context that deferring amortisation is more common in areas with high house prices, including urban areas where house prices have risen the most in recent years, as discussed in Chapter 6. . Homeowners with a loan-to-value ratio below 60 per cent have significantly higher net wealth than the high leverage group, largely reflecting greater housing equity.

# 04
# The riskiest housing loans can be reduced over time if deferred amortisation is restricted on new lending

A significant fall in house prices can lead to losses for mortgage credit institutions and banks, particularly if their customers are highly leveraged. All else equal, the option to defer amortisation contributes to maintaining high loan-to-value ratios. Reducing the riskiest part of interest-only mortgages can strengthen the foundations of housing finance and support financial stability in a situation where the economy is already under pressure, such as during a severe recession. This chapter simulates the impact of an amortisation requirement on homeowner debt and the financial sector's losses in a severe risk scenario with large falls in house prices. The simulation is based on an amortisation requirement for homeowners with a loan-to-value ratio above 60 per cent, in line with what the Systemic Risk Council recommended to the Minister for Industry, Business and Financial Affairs in 2021.

**Widespread use of deferred amortisation can contribute to the build-up of systemic risks**

During a severe recession, slowing housing demand will typically lead to a fall in house prices. Rising unemployment and falling real wages can lead to significant falls in house prices, which can also lead to some homeowners being forced to sell their property. A fall in house prices can lead to losses for the homeowner and, if the sale price is lower than the mortgage, losses for credit institutions. This type of credit risk is assessed by each credit institution when providing home financing to homeowners.

However, the risk becomes systemic if it affects the housing market as a whole or other parts of the financial sector and thus the real economy. This happens, for example, if house prices decline and credit institutions start to limit their lending to creditworthy customers or are unable to service their creditors due to the losses they are experiencing. Loan losses – or simply the risk of losses – can also cause trust in the financial system to erode during a recession. This is a systemic risk that society bears and that the widespread use of interest-only mortgages in combination with high leverage, all else being equal, helps to maintain.

Several regulatory measures could conceivably curtail potential losses in the financial sector in a situation with large declines in house prices. The introduction of an amortisation requirement for new loans to homeowners with a high loan-to-value ratio is one possible way to address the systemic risk associated with the widespread use of interest-only mortgages. The next section simulates the impact of an amortisation requirement for homeowners with a loan-to-value ratio above 60 per cent.

**Targeted amortisation requirements can reduce the riskiest home loans by 32 per cent.**

Based on microdata from Danmarks Nationalbank's credit register, it is possible to illustrate what the debt composition of homeowners would have looked like today if an amortisation requirement for homeowners with an LTV above 60 per cent had been in place. The main result of this exercise is a counterfactual housing debt, which can be interpreted as a measure of the homeowner's housing debt in a scenario where they would have been subject to an amortisation requirement while housing debt exceeds 60 per cent of the value of the property. We make no assumptions about the order in which homeowners choose to amortise their debt if, for example, they have supplementary bank financing. The counterfactual housing debt is a measure of the debt level had the borrowers amortised according to a reference home financing.[13] Other factors, such as other forms of concurrent savings, are kept fixed for the simulation exercise. We allow for local housing price trends to affect the loan-to-value ratio, but it is assumed that the amortisation requirement does not affect house prices.

The median loan-to-value ratio among Danish homeowners was 62 per cent in Q2 2023. Under the counterfactual amortisation requirement, the typical loan-to-value ratio would have been 59 per cent, assuming homeowners with an LTV above 60 per cent were required to amortise starting from the time the loan was taken out. In monetary terms, this corresponds to a reduction in outstanding housing debt of kr. 66 billion. This corresponds to 4 per cent of the total housing debt, which amounted to kr. 1,688 billion in Q2 2023. The amortisation requirement only reduces the total housing debt slightly, as the debt simply shifts to lower loan-to-value ratios over time.

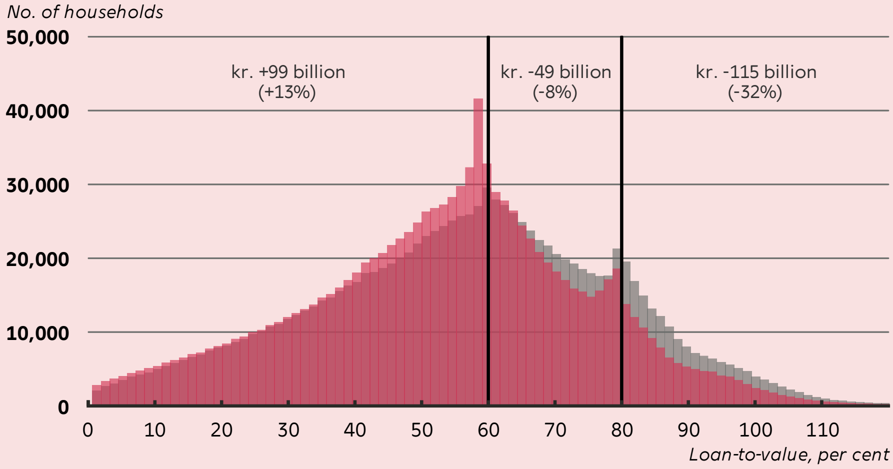
An amortisation requirement could reduce the part of lending that is most risky for the financial sector in a situation with a significant decline in house prices. Underlying this assessment is reduction housing debt for homes with loan-to-value ratios above 60 per cent. For debt with an LTV above 60 per cent, the counterfactual housing debt is kr. 164 billion lower than the actual level, corresponding to a reduction of 16 per cent, see Chart 11. For the debt with a loan-to-value ratio above 80 per cent, the counterfactual debt is kr. 115 billion lower. This corresponds to a debt reduction of 32 per cent in the riskiest debt in case a of declining house prices. An amortisation requirement will thus cause the riskiest housing debt to be reduced while debt with an LTV below 60 will increase and make up a larger part of total housing debt.

The distribution of loan-to-value ratios varies over time, and the calculation in Chart 11 reflects a snapshot in Q2 2023. Three years earlier – in Q2 2020 – the counterfactual housing debt with a loan-to-value ratio above 80 per cent would have been kr. 179 billion lower than the actual housing debt. This is a decrease of 43 per cent compared to the aforementioned 32 per cent. The difference should be seen in light of house price increases and loan restructuring in recent years, both of which have contributed to lower loan-to-value ratios.

[13]Reference financing is defined as a 30-year mortgage loan for debt with a loan-to-value ratio of less than 80 per cent and a 10-year bank loan for any other debt. Both loans are based on the average interest rates on new mortgage and bank loans for housing purposes in the year in question. If a borrower still has a loan-to-value ratio above 60 per cent in the following year, the reference financing is 'retained', i.e. the interest rate is maintained while the term is reduced.

CHART 11

**The housing debt for highly indebted homeowners would be reduced by kr. 165 billion if all homeowners with a loan-to-value ratio above 60 per cent had amortised.**




Note: Breakdown of loan-to-value ratios for owner-occupied housing. 'Counterfactual loan-to-value ratio' indicates the estimated loan-to-value ratio with an amortisation requirement for mortgages above 60 per cent of the value of the home (see Box 3). The values indicate the change in housing debt within each loan-to-value interval. Calculations are based on the loan mix in Q2 2023.
Source: The credit register and own calculations.

BOX 3

## How counterfactual housing debt is calculated

In a simulation based on the composition of outstanding loans in Q2 2023, a *counterfactual housing debt* is calculated for each interest-only mortgage with an LTV above 60 per cent. The counterfactual housing debt is an estimate of would-be debt levels had homeowners with interest-only mortgages amortised since loan origination.

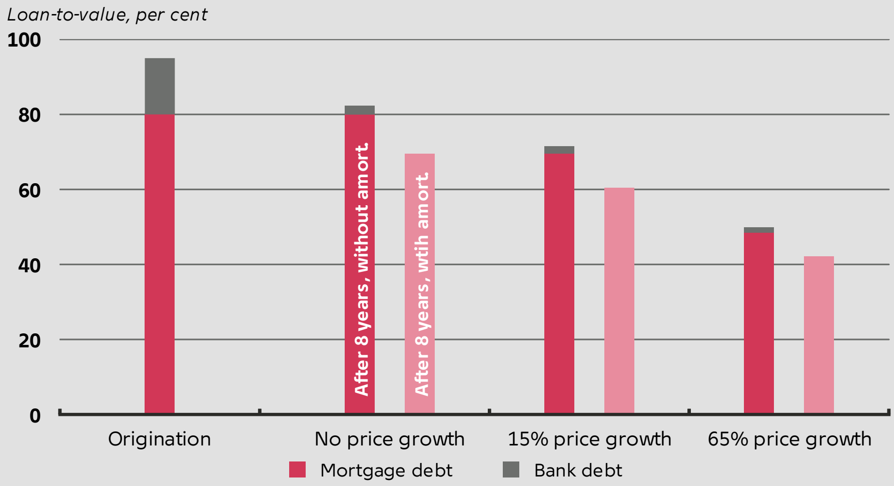
**Property values**
Properties are continuously revalued using Danmarks Nationalbank's model-based municipal house price index.[1]

**Loans included in the simulation**
The simulation covers all outstanding loans as of Q2 2023. We do not account for prior loans that have been repaid or refinanced. Around 20 per cent of all household mortgages loans have been refinanced since the beginning of 2022 due to higher interest rates allowing homeowners with fixed-rate mortgages to realise capital gains stemming from lower mortgage bond prices. Refinancing from a low fixed-rate mortgages typically reduced housing debt, pushing some homeowners below an LTV of 60 percent and exempting them from the hypothetical amortisation requirement.

**Counterfactual amortisation**
In the simulation, we update the LTV of each property with an interest-only loan annually. If the LTV exceeds 60 per cent, a *counterfactual amortisation* is calculated based on the annuity on a reference financing. Our reference financing consists of a 30-year mortgage of up to 80 per cent of the value, while a supplementary 10-year bank loan makes up any remaining debt[2]. Both loans are based on the respective average interest rate on new lending in that year. The calculation takes interest rate developments, adjustable-rate loans and amortisation on debt where amortisation is not deferred.

The chart below is an example of the development of housing debt over an eight-year period with a property LTV of 95 per cent upon origination, of which an interest-only mortgage accounts for the first 80 per cent, while the remainder is a bank loan. In a scenario with *unchanged house prices* over an eight-year period, the loan-to-value ratio would have been reduced from 95 per cent to 82 per cent if only the bank loan had been amortised, while the counterfactual loan-to-value ratio would have been reduced to 70 per cent if the debt had been amortised according to a reference financing. With a *house price increase of 15 per cent* over eight years, the LTV of the property would be 72 and 60 per cent without/with full amortisation, respectively. With a *house price increase of 65 per cent* over eight years, the homeowner would only be affected by an amortisation requirement for a limited period of time. This means that the difference between actual and counterfactual housing debt, shown in the two columns on the right, is lower.

**Example of the development of housing debt 8 years after origination with and without an amortisation requirement**




*Continues ...*

*... continued*

Note: Example of loan-to-value ratios without house price development and with a house price increase of 15 per cent and 65 per cent respectively over 8 years. Without an amortisation requirement, only the bank debt is repaid. With an amortisation requirement, both the mortgage and bank debt are reduced while the loan-to-value ratio exceeds 60 per cent.
Source: Own calculations.

[1] House prices affect whether the amortisation requirement is binding in the simulation, as some homes may drop below an LTV of 60 per cent due to price increases.
[2] We have also run the simulation with a 20-year bank loan as reference financing. The longer loan term does not significantly change the results.

**A reduction in the riskiest part of home loans reduces impairment charges**

Danmarks Nationalbank's 2023 stress test shows that credit institution impairment charges for homeowners would amount to about kr. 29 billion in a severe recession scenario, where house prices are assumed to decline by 27 per cent. Using kr. 29 billion as a benchmark, we recompute losses under a counterfactual amortisation requirement. With the lower loan-to-value ratio, based on the simulated counterfactual housing debt, credit institution impairment charges for homeowners would be reduced to about kr. 22 billion, corresponding to a decrease of 22 per cent. However, this does not take into account any indirect effects on credit institution losses or any indirect effects of lower losses on the economy.

Lower housing debt in the counterfactual scenario will also reduce the requirement for mortgage credit institutions' supplementary collateral by kr. 48 billion in the recession scenario. In the event of a major decline in house prices, mortgage credit institutions are obliged to provide collateral corresponding to the part of their lending that exceeds an LTV of 80 per cent. All such institutions have the liquidity and other assets to be able to handle a 20 per cent fall in property prices while still meeting the other liquidity requirements (data for the end of 2022). However, the financing requirement for supplementary collateral may increase sharply and challenge institutions in the event of a 27 per cent house price decline, which corresponds to the severe recession scenario in Danmarks Nationalbank's stress test. Especially during periods of economic downturn, institutions may have limited market access and therefore the credit institutions may not be able to issue these debt instruments. In other words, an amortisation requirement would reduce a liquidity risk that mortgage credit institutions face through their lending to homeowners with high loan-to-value ratios.

**Deferred amortisation is rarely used as a buffer when the borrowers' income decline.**

When amortisation is deferred the homeowner's disposable income increases and conversely the disposable income is reduced later when the homeowner starts to amortise. Once the homeowner has already deferred amortisation on their home financing, deferring amortisation is not an option later on, for example to mitigate the consequences of a decline in income. This means that consumers who choose interest-only mortgages in order to increase their consumption, including housing consumption, will have limited opportunities use deferred amortisation to withstand the consequences of a recession. A study based on Danish register data indicates that mortgages are only used to a very limited extent to smooth out short-term income losses due to unemployment.[14] This may reflect limited demand for or availability of interest-only mortgages in such a situation. On the other hand, interest-only mortgages can be used to build up liquid savings, which can be used during a period of unemployment, see next chapter.

**BOX 4**

### How the effect of an amortisation requirement on the expected losses of credit institutions in a recession scenario is calculated

The impact of the amortisation requirement on the expected losses of credit institutions is based on Danmarks Nationalbank's stress test from the first half of 2023. The expected losses of institutions on homeowners arise because some homeowners are expected to default on their debt and have to sell their house in foreclosure. An amortisation requirement targeted at highly indebted homeowners will reduce their loan-to-value ratio and thereby reduce the total expected losses of the credit institutions.

*The stress test's severe recession scenario*
In the severe recession scenario in Danmarks Nationalbank's stress test, house prices are assumed to decline by 26.5 per cent over a 3-year period, and the credit institutions have total impairment charges on homeowners of kr. 28.5 billion caused by homeowners defaulting on their housing debt and their homes being put up for foreclosure auction. See assumptions in the calculation below.

*Amortisation requirements in the severe recession scenario*
The effect of the amortisation requirement is based on a counterfactual scenario in which a similar number of homeowners default on their debt and have to sell their home in foreclosure. In this scenario, the highly indebted homeowners have regularly amortised, which reduces the credit institutions' exposures and thus their losses.

**Assumptions in the calculation**

- Homeowners amortise as described in Box 3.
- Homeowners are randomly selected with the same probability of default.[1] The default probability across borrowers with and without deferred amortisation is therefore also implicitly assumed to be the same.[2]
- In the event of default, it is assumed that the house is sold at a foreclosure auction at a 20 per cent price cut.[3]
- The loss from the individual homeowner defaulting on their debt is calculated as the market value of the outstanding debt is lower than sales price of the mortgaged property. In reality, the borrower is personally liable for the debt, which can reduce losses for credit institutions.[3]
- The impact of the amortisation requirement on the liquid savings of homeowners or on house prices is not taken into account (see Chapters 5 and 6).
- Risk weights and other parameters included in the stress test calculations are unaffected.

[1] As a robustness test, the simulated losses are recalculated based on 1,000 different samples of homeowners. The reduction in the losses of credit institutions on amortisation requirements is on average 22.42 per cent.
[2] Historically, homeowners with interest-only mortgages have had higher defaults, but according to the regulations in good practice from 2013 homeowners with interest-only mortgages to be credit rated to be able to service the same loan mix with amortisation. This has significantly reduced the difference in non-performing debt across loan types, so the probability of default is assumed to be the same for the two types of borrowers.
[3] See Danmarks Nationalbank, *Financial Stability Report 2012*, May 2012 (*link*). It finds that the price discount on the majority of homes sold at foreclosure auctions in the years after the financial crisis was over 20 per cent (*link*).

[14] See Asger Lau Andersen, Anders Møller Christensen, Charlotte Duus and Ri Kaarup, Families' financial resilience, variable interest rates and deferred amortisation, *Danmarks Nationalbank Monetary Review*, Q4 2012, part 2 (*link*).

# 05

# Interest-only mortgages boost private consumption only to a limited extent

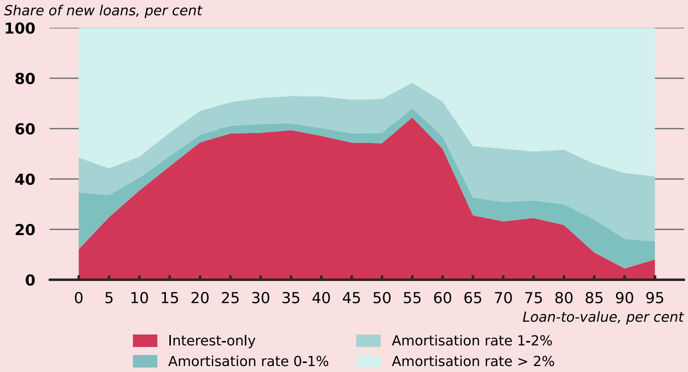
Home financing using interest-only mortgages basically ensures greater flexibility in homeowners' planning of consumption and savings over their lifetime. Consumption can be increased by deferring amortisation on housing debt and interest-only mortgages can therefore be used to maintain a certain consumption level – for example after retirement. Any limits on the access to interest-only mortgages must be seen in the context of potential consequences for the individual household – and the overall economy – via a fall in consumption.

**About a third of new loans to homeowners with an LTV above 60 per cent are amortised at a rate of less than 1 per cent annually**

Looking at new housing debt where the LTV is above 60 per cent, the amortisation rate is less than 1 per cent on about a third of new loans, see Chart 12. This should be seen in light of the fact that for an annuity type mortgage, the amortisation rate will be relatively low at the beginning of the loan term, depending on the interest rate level. But this also reflects the fact that deferred mortgage amortisation is not fully compensated by higher amortisation rates on supplementary housing debt in banks.

CHART 12

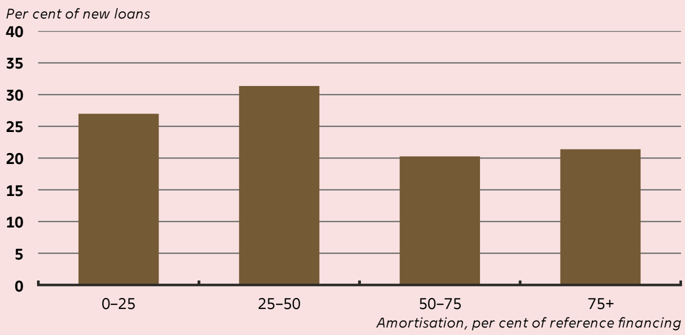
**The amortisation rate is below one percent on about a third of the new lending for homes with loan-to-value ratios above 60 per cent.**




Note: New loans for owner-occupied dwellings by loan-to-value ratio and amortisation instalment size. The loan-to-value ratio indicates the lower end of the range. Data is from Q1 2020 to Q2 2023. The amortisation rate should therefore be seen in light of the varying interest rate level during the period.
Source: Danmarks Nationalbank.

CHART 13

**Homeowners with interest-only mortgages repay supplementary bank debt to varying degrees compared to a reference financing**




Note: New lending to homeowners with interest-only mortgages, a loan-to-value ratio above 80 per cent and supplementary bank loans. Data is from Q1 2020 to Q2 2023. 75+ reflects, for example, that amortisation is made on bank debt during the deferred amortisation period corresponding to an amortisation rate of 75 per cent of a reference financing, defined as amortisation on mortgage loans over 30 years and supplementary housing financing in banks over 10 years (see box 3).
Source: Danmarks Nationalbank.

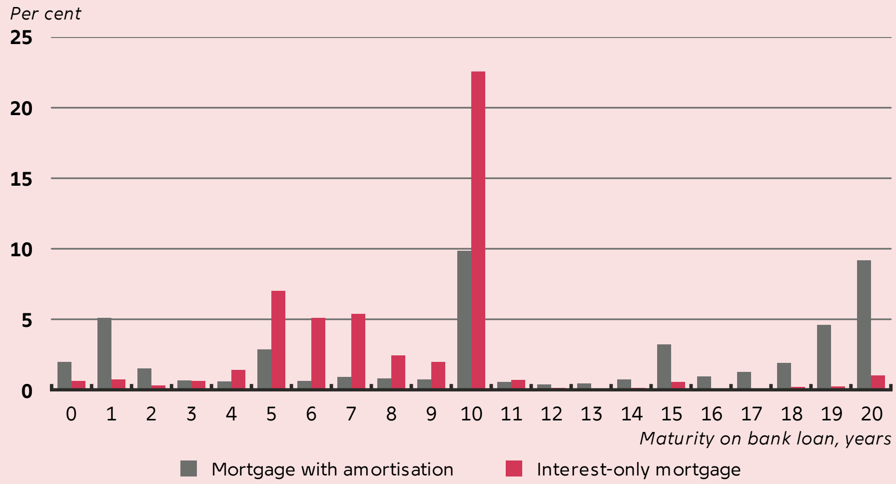
If we zoom in on homeowners with interest-only mortgages and supplementary housing debt with banks, the total amortisation is equivalent to more than 75 per cent of a reference financing (see Box 3) for 22 per cent of the debt, see Chart 13. This reflects the fact that approximately every fifth krone of deferred mortgage debt amortisation is used for extraordinary amortisation of supplementary housing debt in banks. Conversely, 27 per cent of this group of borrowers makes amortisation payments equivalent of 0–25 per cent of a reference financing. For the rest, amortisation falls somewhere in between the two extremes. The figures reflect a varied use of deferred amortisation. The funds that are not saved as home equity via amortisation can finance higher consumption, additional liquid savings, or be used to pay off other debt.

### Deferred amortisation is partially associated with shorter maturities on supplementary housing debt

Looking at the maturity of bank loans with the same property as collateral for borrowers with an LTV above 80 per cent, homeowners with interest-only mortgages have shorter maturities on their bank debt on average, see Chart 14. If the interest-only mortgage is fully used for extraordinary amortisation of bank debt, the maturity would necessarily be lower. If a homeowner repays with the same amortisation as reference financing and if the bank debt is 15 per cent of the total home value, this bank debt can be paid off in 5–7 years to reach the same amortisation level as reference financing, depending on interest rates. Figures 14 and 15 thus indicate that homeowners with a high loan-to-value ratio pay off less overall than they would have done with standard home financing with amortisation. However, it should be emphasised that the actual maturities may be lower than the agreed maturities. For the corresponding group of homeowners with an amortising mortgage, the agreed maturities are often also 10 years, but they are also higher: 15–20 years in many cases.

**CHART 14**

**Interest-only mortgages are used by some homeowners to shorten the maturities of supplementary housing loans in banks**




Note: Agreed maturity for bank loans, for homeowners with mortgage loans and a loan-to-value ratio above 80 per cent at the time of taking out the loan. Based on data for home purchases from Q4 2019 to Q2 2023.
Source: Danmarks Nationalbank.

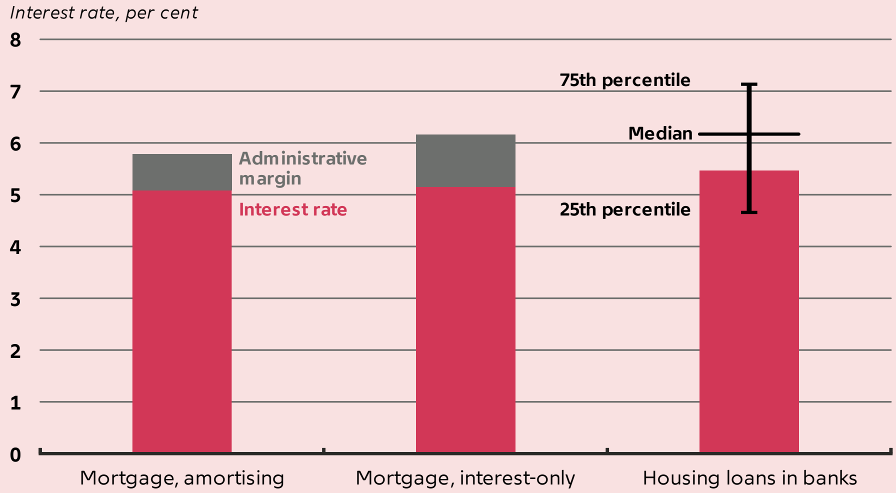
### No clear savings on interest payments from accelerating repayment on supplementary debt, while deferring mortgage amortisation

A fixed-rate, interest-only mortgage taken out during 2023 with a loan-to-value ratio of the maximum 80 per cent had an average interest rate, including administrative margins, of 6.2 per cent in 2023, see Chart 15. This is 0.4 percentage points higher than a similar loan with amortisation, which partly reflects the fact that the yield on the underlying bonds is marginally higher when amortisation is deferred, but it also reflects a surcharge in the administration margin.

The mean interest rate on supplementary housing loans from banks was 5.5 per cent in the same period. With a median interest of 6.2 per cent, half of this supplementary debt was cheaper than an average interest-only fixed-rate mortgage. On a quarter of the supplementary housing loans in banks, the interest rate was 4.7 per cent and thus 1.5 percentage points lower than the interest rate (including administration margins) on mortgage debt.

CHART 15

**The interest rate (incl. administrative margins) on interest-only mortgages can be identical to the interest rate on supplementary housing loans in banks**




Note: All red bars show value weighted rates, before tax deductions, for new lending in 2023. The interest rates on all new mortgage loans for owner-occupied housing are weighted averages. Interest rates on supplementary housing loans from banks are for new loans secured on real estate with a loan-to-value ratio of at least 70 per cent and where the outstanding debt was at least Kr. 50,000. The contribution rates are simple averages based on current price sheets from all mortgage credit institutions in Denmark for a maximum loan-to-value ratio of 80 per cent.
Source: Danmarks Nationalbank.

Conversely, a quarter of the supplementary housing loans had an interest rate of 7.2 per cent, which is 1 percentage point higher than the mortgage debt. However, the overall figures indicate that there were no clear interest savings in 2023 for homeowners opting for an interest-only mortgage in order to amortise faster on supplementary bank loans. While there are differences in the interest rates on the two types of debt, the difference may turn out to be marginal.

However, when comparing interest expenses on mortgage debt and bank debt, there are several important factors to consider. First, the rates may be different between loans with different interest rate fixation periods. For fixed-rate mortgages, you pay for the right to buy back the loan at par or market value. Second, loan terms, including interest rates and fees, at banks can be more negotiable than loans from mortgage credit institutions. This further emphasises that whether it is worthwhile to pay off supplementary housing debt before the mortgage can vary between households. Finally, the interest margin may have varied over time.

**Deferred amortisation can be used to repay non-housing debt**

The previous assessment focused on housing debt. Homeowners may have other debt in addition to their housing debt, such as loans secured on their car or boat, or construction and consumer loans. If savings are made through amortisation of debt other than housing debt, the estimates above underestimate the homeowner's total amortisation payments. This means that a larger share of deferred mortgage payments may go towards repaying other debt if all types of debt are included. The following sections examine the financial balances of homeowners in a broader sense than just their home financing to understand the impact of deferred amortisation on their total debt, financial assets and consumption.

**There is limited knowledge about the impact of interest-only mortgages on consumption and savings behaviour**

More knowledge is needed about how interest-only mortgages affect homeowners' decision making. The academic literature is still new and offers limited empirical insights that can quantify the effects of interest-only mortgages on consumption and savings.[15] Evidence from the Netherlands indicate that homeowners simply reduce spending and even increase the number of hours worked to pay off their housing debt when forced to do so by new regulation.[16] There may be several reasons why a targeted amortisation requirement in Denmark would affect behaviour differently. For example, the Dutch experiences are based solely on first-time buyers. However, studies based on Danish register data also indicate that Danish homeowners change their behaviour as a result of increased availability of interest-only mortgages. For example, there are indications of increased consumption when interest-only mortgages are made available,[17] and indications that consumption is reduced when the deferred amortisation period on interest-only mortgage loans expires.[18]

**A new study explains how Danish homeowners use deferred amortisation**

A new study from Danmarks Nationalbank, explains how Danish homeowners use the flexibility in their budget provided by deferred amortisation.[19] The study is based on register data and includes all Danish homeowners who opted for deferred amortisation between 2010–2019. The results indicate that consumption increased significantly for homeowners over the age of 50 in connection with the deferral of amortisation. Conversely, the results indicate that homeowners under the age of 50 predominantly used deferred mortgage amortisation to pay down other debt, or for savings in liquid assets.

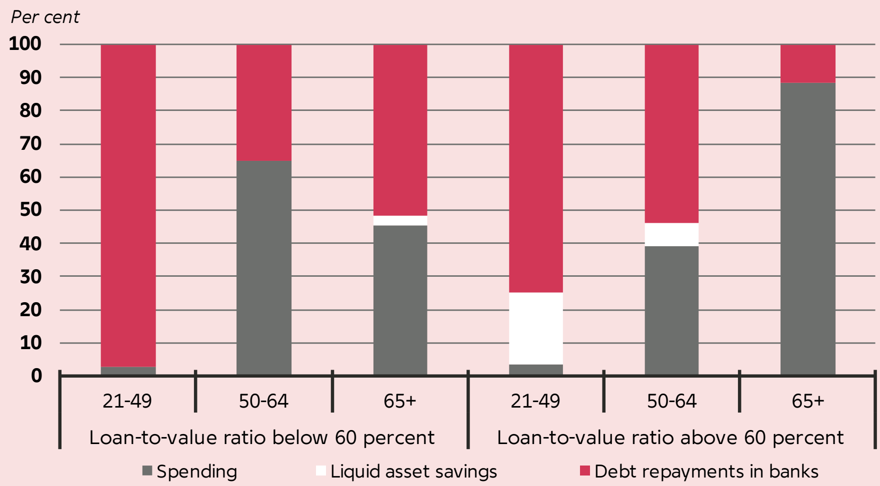
If we zoom in on homeowners with a loan-to-value ratio above 60 per cent, it is largely only homeowners above the age of 50 who have increased their

[15] For a literature review, see Danish Economic Council, *Mortgage regulation in the housing market, Chapter III*, Spring 2022.
[16] See Asaf Bernstein and Peter Koudijs, The Mortgage Piggybank: Building Wealth through Amortization, pending, *Quarterly Journal of Economics*.
[17] Linda Sandris Larsen, Claus Munk, Rikke Sejer Nielsen, Jesper Rangvid, How Do Interest-Only Mortgages Affect Consumption and Saving over the Life Cycle?, *Management Science*, pending.
[18] See Henrik Yde Andersen, Stine Ludvig Bech and Alessia De Stefani, Spending Response to a Predictable Increase in Mortgage Repayments: Evidence from Expiring Interest-Only Loans, *Review of Economics and Statistics*, vol. 106, issue 1, January 2024, pp. 1–9
[19] See Henrik Yde Andersen and Stine Ludvig Bech, Describing Interest-Only Mortgage Borrowers' Savings and Spending using Danish Register Data, *Danmarks Nationalbank Working Paper*, no. 203, May 2024.

consumption in connection with taking out an interest-only mortgage loan. See Chart 16. Homeowners aged 50–64 increased their consumption by an amount corresponding to 39 per cent of the deferred amortisation, while the propensity to consume out of the deferred amortisation for homeowners aged over 65 was significantly higher, at 88 per cent. On the other hand, young homeowners with the same high loan-to-value ratio, used the interest-only mortgage to save up liquid assets. On average, an amount corresponding to 22 per cent of the deferred mortgage amortisation was saved as liquid savings for this age group, either as deposits in banks or to increase holdings of shares and bonds, see Chart 16. The study could not determine whether deferred amortisation was linked to increased pension contributions in any of the age groups.

CHART 16

**Homeowners above age 50 increased their consumption the most when they defer amortisation**




Note: The figures reflect the percentage use of deferred amortisation on mortgage debt measured as an average of loans taken out between 2010-2019.
Source: Henrik Yde Andersen and Stine Ludvig Bech, Describing Interest-Only Mortgage Borrowers' Savings and Spending using Danish Register Data, *Danmarks Nationalbank Working Paper*, no. 203, May 2024.

Considering the same group – homeowners under 50 years of age with a loan-to-value ratio above 60 per cent –amortisation of bank debt increased by 75 per cent of the deferred repayment amount, see Chart 16. In other words, the estimates indicate that the youngest homeowners with high loan-to-value ratios have historically spent kr. 75 on repaying other debt for every kr. 100 in deferred mortgage amortisation. Here, amortisation on other debt also includes non-housing debt, e.g., car loans and consumer loans. In addition, the estimates are based on the years after the financial crisis, when Danish households reduced their debt significantly.

Estimates based on historical data do not necessarily reflect the behaviour of homeowners today or in the future. The new study estimates statistical correlations and not necessarily causal relationships. It is therefore important that the results are used with some caution when estimating the expected effects of an amortisation requirement. In other words, homeowners can use the deferred amortisation option differently now from how they have done historically. Nevertheless, these statistical correlations provide an important insight into an otherwise sparse empirical literature.

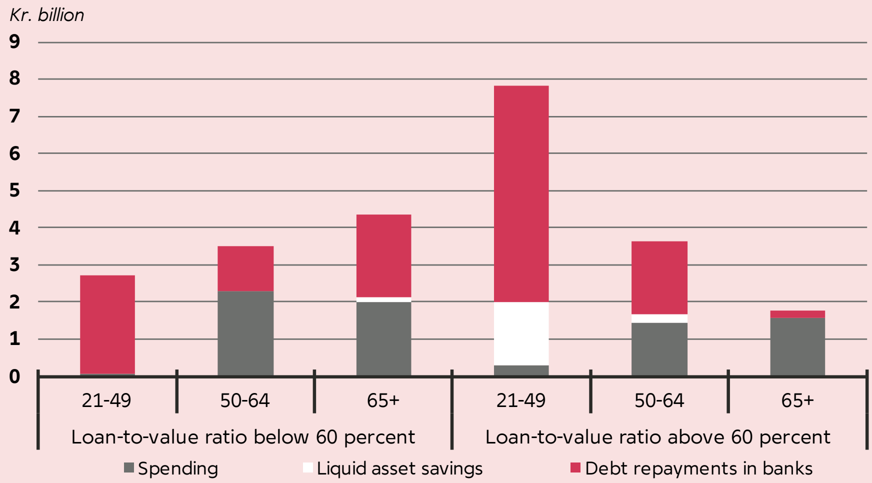
**Interest-only mortgages boost private consumption only to a limited extent**

The importance of interest-only mortgages for private consumption in Denmark can be quantified by multiplying the estimated consumption propensities by the extent of deferred amortisation. The latter can be measured across age groups and loan-to-value ratios using Danmarks Nationalbank's credit register, consistent with the simulation exercise in the previous chapter.

The result indicates that an annual consumption increase of kr. 7.6 billion can be linked to interest-only mortgages, of which homeowners with a loan-to-value ratio above 60 per cent accounted for kr. 3.3 billion, see Chart 17. This corresponded to 0.3 per cent of total private consumption in 2022.

CHART 17

**Historically, deferred amortisation has financed kr. 3 billion in consumption per year for homeowners with an LTV above 60 per cent, primarily driven by people above age 50.**




Note: The calculations are based on estimated consumption propensities (see Chart 16), which are multiplied by a calculation of the total deferred amortisation in each age group and loan-to-value ratio.
Source: Own calculations based on register data from Statistics Denmark.

In the group of borrowers with an LTV above 60 per cent, the age groups 50 to 64 and 65+ each accounted for a similar consumption increase at kr. 1.4 and 1.6 billion, respectively (see Chart 17). This means that a significant part of the consumption effect comes from homeowners of working age, who are able to partially adjust consumption and savings for several years before retirement. In addition, some borrowers will be able to accommodate an amortisation requirement by drawing on their savings.

**Deferred amortisation was used to build up liquid savings for homeowners below age 50**

Homeowners younger than 50 with a loan-to-value ratio above 60 per cent are a relatively large borrower segment. When their estimated propensities are expressed in monetary terms, deferred amortisation can be linked to additional annual liquid savings of kr. 1.7 billion in this group, see Chart 17. This corresponds to approximately 4 per cent of the increase in total bank account deposits in 2022. These are savings that are made in financial assets rather than in housing because of interest-only mortgages. Determining the optimal degree of liquidity in savings is beyond the scope of this analysis, but must be considered in light of a number of other factors, particularly the organisation of the pension and unemployment benefit system.

There are two direct motives for increasing liquid savings through deferred amortisation on mortgage debt. One is that the homeowner wants a higher degree of liquidity in their savings. This may be due to the desire to be able to handle unforeseen expenses or to mitigate the effects of a possible decrease in income due to future unemployment. However, the liquidity motive has a cost that corresponds to the interest rate spread between deposits and mortgages.

The second motive is financial investments, for example equity investments. This means that homeowners use their leverage to hold more financial assets. In practice, this means that the homeowner's interest expenses will increase, but they can also expect a higher return on capital. Higher leverage is associated with increased risk and differences in taxation of returns and interest expenses.

**Non-mortgage debt amortisation is accelerated when mortgage amortisation is deferred**

Deferred amortisation currently amounts to kr. 13 billion annually among homeowners with loan-to-value ratios above 60 per cent. The estimated behavioural effects indicate that the funds are used for increased amortisation of other debts of Kr. 8 billion, increased liquid savings of Kr. 1.7 billion and increased consumption of Kr. 3.3 billion. On this basis, it can be expected that this group can increase their home equity by kr. 5 billion annually if access to interest-only mortgages is limited. These are funds that would otherwise have been gone into liquid savings or increased consumption.

The study does not estimate how much of the kr. 8 billion in amortisation on bank debt comprises supplementary housing loans and how much comprises loans without collateral in the home. This makes it difficult to fully compare the results in Chart 17 with the numbers in Chart 13.

In other words, there is some uncertainty in measuring the behavioural responses, partly due to differences in data sources and calculation methods, partly due to statistical uncertainty, but also since the behaviour of homeowners can change over time. In the years following the financial crisis, there may have been greater focus on reducing debt as it became clear that house prices fell significantly during the same period. This is reflected in Chart 17, which indicates that interest-only mortgages were largely used to repay other debts. Today and in the future, homeowners may have a different focus, for example on bringing forward consumption, including housing consumption. As Chart 13 shows, the majority of the most indebted homeowners with deferred amortisation repay less than reference financing.

# 06

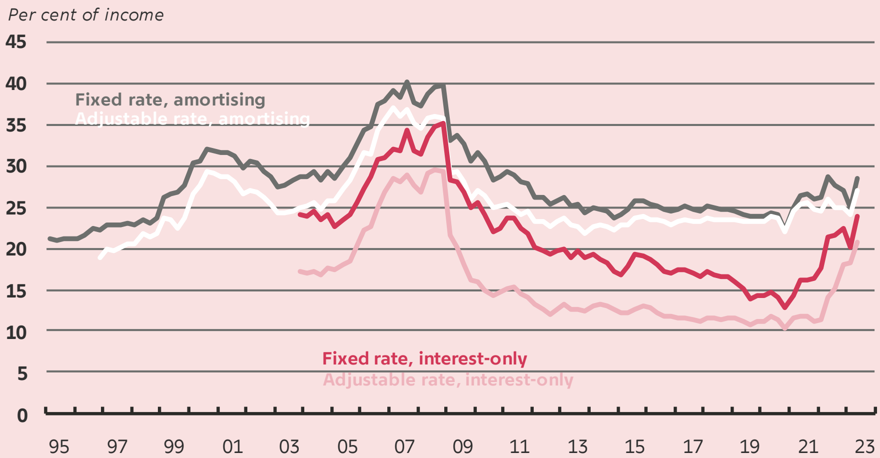
# Pricing in the housing market is affected by interest-only mortgages

House prices are determined by supply and demand, but demand alone determines the short-term development of house prices. This is because supply usually adjusts with a significant delay, as it takes time to build homes. Demand is determined by a wide range of factors, including the cost of servicing housing debt.

Over the past three decades, new loan types have emerged that directly affect financing costs, which typically affects housing demand. This includes the introduction of variable rate mortgages in 1996 and interest-only mortgages in 2003, both of which allowed homeowners to significantly reduce their housing expenditures, see Chart 18. The so-called housing burden is a measure of the debt service expenses and taxes for an average home as a proportion of average disposable income. With interest-only mortgage debt, the housing burden was 10–15 per cent in 2019, while the housing burden was 24 per cent for similar mortgages with amortisation in the same period. On the other hand, the housing burden across loan types became more uniform during 2022, when interest rates rose significantly. This is a consequence of the annuity principle in the Danish mortgage credit system, as amortisation becomes relatively smaller when interest rates rise, so that the total debt service payment is fixed for the duration of the loan.

**CHART 18**

**Housing expenditures was significantly reduced by interest-only mortgages**



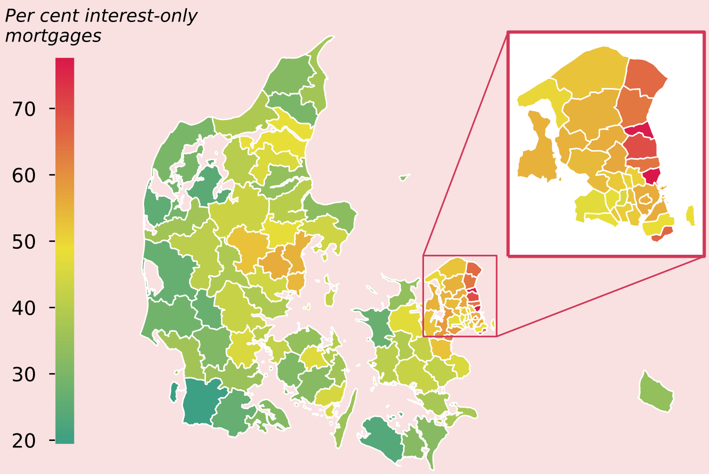

Note: The chart shows a stylised calculation of debt service expenditure, including property taxes, of buying a single-family home, as a share of average disposable income. Debt service is calculated based on a 30-year mortgage loan including administration margins and brokerage fees, plus a bank loan for the part not financed by mortgage loans.
Source: Statistics Denmark, Finance Denmark and own calculations.

The lower debt service that comes with an interest-only mortgage, can be used to cushion the impact on a household's budget when buying a home. All things equal, this can put upward pressure on house prices, especially in the most expensive segments of the housing market. As Chart 19 shows, there is significant geographical variation in the prevalence of interest-only mortgages for homeowners with an LTV above 60 per cent. In the areas around Aarhus and Copenhagen, as well as in the municipalities north of Copenhagen, there is a particularly high utilisation of interest-only mortgages among the most leveraged homeowners. These are areas where house prices are significantly higher than in the rest of the country and where prices have risen considerably since the financial crisis. There can be many causes behind this correlation, just as there may be interdependencies between the prevalence of deferred amortisation and house prices.

This section will focus on the correlation between interest-only mortgages and house prices in general, not just among the most leveraged home buyers.

**CHART 19**

**Homeowners with high loan-to-value ratios choose to defer amortisation more often in the Capital Region and East Jutland**




Note: The share of interest-only mortgages among the group of homeowners with a loan-to-value ratio above 60 per cent in the second quarter of 2023.
Source: The credit register.

**Homeowners may perceive amortisation as a cost**

Repaying housing debt is a form of saving for homeowners. Housing costs are therefore not affected by deferring amortisation.[20] However, it can be rationalised that interest-only mortgages could affect housing demand. This is the case if homebuyers are liquidity constrained and deferred amortisation, in isolation, eases this constraint, leaving room in the budget to buy a more expensive home. In other words, buyers can smooth their housing consumption over their lifetime, for example by allowing younger households with the prospect of rising incomes to buy a relatively larger home, or by allowing older

[20] However, interest-only mortgages increase financing costs, as the yield to maturity on interest-only mortgages is slightly higher than similar loans with amortisation. In addition, there are differences in administration margins.

homeowners with a declining income profile to stay in their home for longer. Interest-only mortgages can also affect housing demand if homebuyers exhibit *myopic* behaviour. That is, the buyer wants to maximise housing consumption today with little consideration for consequences further down the line.[21]

**House price levels and fluctuations can increase with interest-only mortgages**

Given that access to interest-only mortgages affects housing demand, house prices will also adjust, and this can have two consequences for house prices. First, house price levels will be higher until the housing stock has adjusted to the higher demand.[22] The level of house prices will rise as demand for housing increases, but in the long term, prices will be moderated by new home construction. Second, house price fluctuations can be greater with interest-only mortgages. This will be the case if, for example, an increase in income translates into more expensive home purchases with an interest-only mortgage available than in the absence of interest-only mortgages. The theoretical rationale for a higher income elasticity of housing with deferred amortisation is described in more detail in Box 5. What this means is that if amortisation is partly perceived as a cost, then for every extra krone of income, relatively more housing can be purchased if no amortisation is required. This means that house price fluctuations increase when interest-only mortgages are available.

**BOX 5**

### Modelling interest-only mortgages and house prices

House prices are determined by supply and demand. In the short run, the supply of housing, i.e. the amount of housing, is fixed as it takes time to build new homes. It is therefore the demand for housing that determines short-run house prices given the current supply. The demand for housing (in quantity), $K^D$, is determined by, among other things, the price of housing, $p^h$, the cost of owning a home, $omk$, and income, $Y$.

$$K^D = F(Y, p^h, omk)$$

Given that some homebuyers are, for example, liquidity-constrained or myopic, it can be rationalised that the minimum first-year payment can have a significant impact on housing demand.[1] In these cases, the cost can be expressed as a weighted sum of the minimum first-year payment and the conventional user cost, first defined by Poterba (1984)[2].

$$omk = \alpha \cdot user\ cost + (1 - \alpha) \cdot minimum\ first\ payment$$

It is through the minimum first-year payment that the interest-only option on the mortgage debt affects house prices. With the introduction of interest-only mortgages, the minimum first-year payment was significantly reduced and thus contributed to an increase in house prices.

In semi-structural models such as MONA, ADAM and SMEC, variations of this demand function are linearised, implicitly assuming that, for example, the effect of income on house prices does not depend on costs. This means that the level of the amortisation rate will have no impact on the percentage fluctuations in house price, i.e. volatility. However, it should be noted that a higher cost level, e.g. in the form of amortisation, will reduce the level of house prices. And since the percentage fluctuations are unchanged, this will result in smaller nominal fluctuations in house prices. In this linearised model, the reduction/increase in nominal fluctuations will be directly proportional to the reduction/increase in house prices.

*Continues …*

[21] Similar behaviour is found in other household consumption. The importance of liquidity constraints and myopic behaviour can be found in the literature on hand-to-mouth consumers, starting with Campbell and Mankiw, Consumption, Income, and Interest Rates: Reinterpreting the Time Series Evidence, *NBER Macroeconomics Annual 1989*, vol. 4, 1989.
[22] In the long term, however, house prices could be permanently lifted if higher demand is reflected in land prices.

*... continued*

A simple and explicit way to soften the assumption of linearity in housing demand is to let the demand function be determined by income measured in monetary units, $Y$ as before, and also the cost measured in monetary units. $p^h \cdot omk$[3] This means the price of the home multiplied by the cost, which is defined as a rate.

$$K^D = F(Y, p^h \cdot omk)$$

That means housing demand is determined by the numerator and denominator in the calculation of the housing expenditures. Linearising this model achieves the property that the percentage fluctuations in the house price due to an income shock will be greater when costs are low than when costs are high. Amortisation is included in the costs through the minimum first-year payment. This means that, all things being equal, the option of deferred amortisation makes the fluctuations in house prices greater than if there was no option for deferred amortisation. Deferred amortisation then theoretically has an effect on volatility that is greater than the proportional effect in the former model.[4]

There are other modelling tools that can be used to assess the impact of deferred amortisation on house prices. Most New Keynesian (often called DSGE) models produce relatively small effects, as they typically contain a credit constraint rather than a liquidity constraint for households.[5] However, within real business cycle models (often called RBC models), there is a class of so-called ‘spender-savers’ models where liquidity constraints are prominent. For example, Sørensen (2016) shows that interest-only mortgages will contribute to increasing fluctuations in house prices.[6]

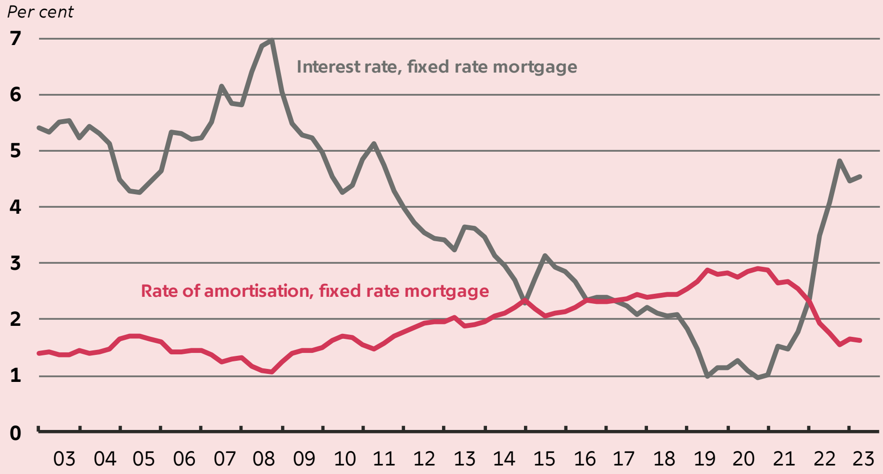
[1] See Niels Arne Dam, Tina Saaby Hvolbøl, Erik Haller Pedersen, Peter Birch Sørensen and Susanne Hougaard Thamsborg, Developments in the owner-occupied housing market in recent years – Can house prices be explained? *Danmarks Nationalbank Monetary Review*, Q1, Part 2, 2011.
[2] Se James M. Poterba, Tax Subsidies to Owner-Occupied Housing: An Asset-Market Approach, *The Quarterly Journal of Economics*, vol. 99, no. 4, 1984, pp. 729-52.
[3] See Niels Arne Dam, Tina Saaby Hvolbøl and Peter Birch Sørensen, Can fluctuations in house prices be dampened, *Danmarks Nationalbank Monetary Review*, Q1, Part 2, 2011.
[4] See Box 4 in *Danmarks Nationalbank Monetary Review*, Q2, Part 1, 2011.
[5] See e.g. Jesper Pedersen, What are the effects of changes in taxation and new types of mortgages on the real economy? The case of Denmark during the 00’s, *Danmarks Nationalbank Working Paper*, no. 113, March 2017. However, there are some models that could be used to analyse interest-only mortgages, see e.g. Daniel Greenwald, The Mortgage Credit Channel of Macroeconomic Transmission, *MIT Sloan Research Paper,* no. 5184-16, January 2018.
[6] See Palle Sørensen, chap. 1, Does financial innovation create more volatile housing prices? In *Financial Frictions, Price Rigidities and the Business Cycle*, Aarhus University, March 2016.

### Interest rate sensitivity of housing demand increases with interest-only mortgages

Housing demand is more interest-rate sensitive with widespread use of interest-only mortgages. This is due to the annuity principle in the Danish mortgage credit system, where the amortisation rate depends on the interest rate. When interest rates rise, amortisation rates fall, see Chart 20. Total payments on an interest-only mortgage increase more than those on an amortising mortgage for a given interest rate increase. Specifically, the total payment on a mortgage with deferred amortisation will follow the interest rate development one-to-one, while the payment on an amortising mortgage will react less. As a result, the demand for housing increases more strongly with interest-only mortgages than with traditional financing when interest rates fall. At the same time, the annuity principle means that the liquidity gain from deferred amortisation is greatest when interest rates are low. In other words, in relation to consumption smoothing, interest-only mortgages provide the borrower with the most liquidity, relative to traditional mortgages, when the borrower needs it the least, i.e. when interest rates are low. If home buyers use the entire liquidity gain to buy more property, this will similarly increase house price fluctuations. This is because lower interest rates are typically associated with higher house prices, and since the liquidity gain is greatest at low interest rates, house prices will be even higher when interest rates are low and there is access to interest-only mortgages than without access to interest-only mortgages.

CHART 20

**The annuity principle means that amortisation falls when interest rates rise, mitigating the interest rate pass-through to housing expenditures**




Note: The amortisation percentage is the first-year instalment calculated by annualising a 30-year fixed-rate mortgage loan at the current interest rate.
Source: Finance Denmark and own calculations.

**The number of interest-only home purchases has decreased**

Home purchases financed with interest-only mortgages accounted for 26 per cent of home purchases in Q2 2023. The proportion of interest-only home purchases has reduced significantly during 2022 and 2023, while interest rates have increased, see Chart 21. But before the interest rate hikes started, the share of home purchases with interest-only mortgages increased between 2018 and 2021.

In the years 2011–2013, the share of interest-only home purchases was more than twice as high as it is today. Several factors may have contributed to this decline. First and foremost, bank lending policies and existing regulations in this area have been tightened. Stricter credit policies in banks and mortgage credit institutions – including rising administration margins for interest-only mortgages – and the Danish Financial Supervisory Authority's stricter guidelines for issuing interest-only mortgages have probably played a role in the fact that fewer home purchases today are financed with interest-only mortgages.

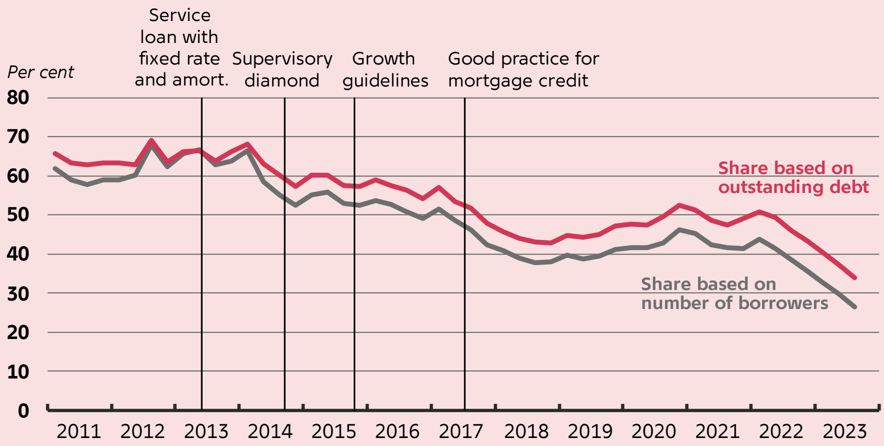
Another factor is that interest rates fell significantly up to and including the pandemic, which may have increased the financial robustness of Danish households. For example, some homeowners may have taken advantage of low interest rates to consolidate after the financial crisis.[23] The fall in interest rates may also potentially have contributed to fewer households facing liquidity constraints and seeing the need for an interest-only mortgage. Finally, the recent

[23] See e.g. Simon Juul Hviid and Andreas Kuchler, Consumption and savings in a low interest-rate environment, *Danmarks Nationalbank Working Paper*, no. 116, June 2016.

fall in the proportion of interest-only purchases coincides with sharply rising interest rates over the past two years.

CHART 21

**The proportion of homes purchased with deferred amortisation has decreased over the past decade**



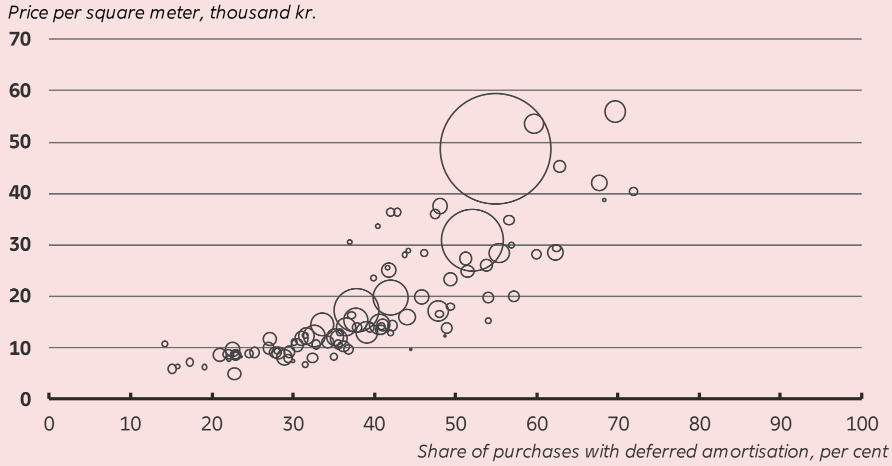

Note: The proportion of homes purchased with an interest-only mortgage is calculated within the group of home buyers who take out a loan in connection with the home purchase. The data in this and the following charts was constructed by combining the following registers: EJSA, EJER, BEF, IND and REAL.
Source: Own calculations based on register data from Statistics Denmark.

### Interest-only mortgages are used more when house prices are high

Even though interest-only mortgages are used less today than in the past, there is still a question as to which types of homes interest-only mortgages finance. Based on all home purchases in 2021, there is a close correlation between house prices and the use of interest-only mortgages across municipalities, see Chart 22. In the most expensive municipalities, up to 70 per cent of home purchases are financed with interest-only mortgages, while only about 10 per cent of home purchases are financed with interest-only mortgages in municipalities with the lowest house prices.

CHART 22

**Municipalities with high house prices have a higher prevalence of deferred amortisation**




Note: The chart shows the geographical breakdown of house prices and the use of interest-only mortgages in 2021. The diameter of the circles indicates the number of property transactions in the municipality.
Source: Own calculations based on register data from Statistics Denmark.

There may be several reasons for the correlation between the proportion of interest-only mortgages and house prices across municipalities. However, two potential explanations are particularly interesting.[24] First, high house prices, which could push buyers to defer amortisation. This happens, as mentioned above, if households have limited wealth and liquidity and are unable to finance the purchase without deferred amortisation and still have sufficient disposable income. The other potential explanation is that the option of interest-only mortgages in itself contributes to higher house prices. Whether there is a causal relationship, and whether it might run from house prices to the usage of interest-only mortgages or vice versa, cannot be concluded based on this geographical correlation alone.

**Signs of major house price fluctuations with widespread use of interest-only mortgages**

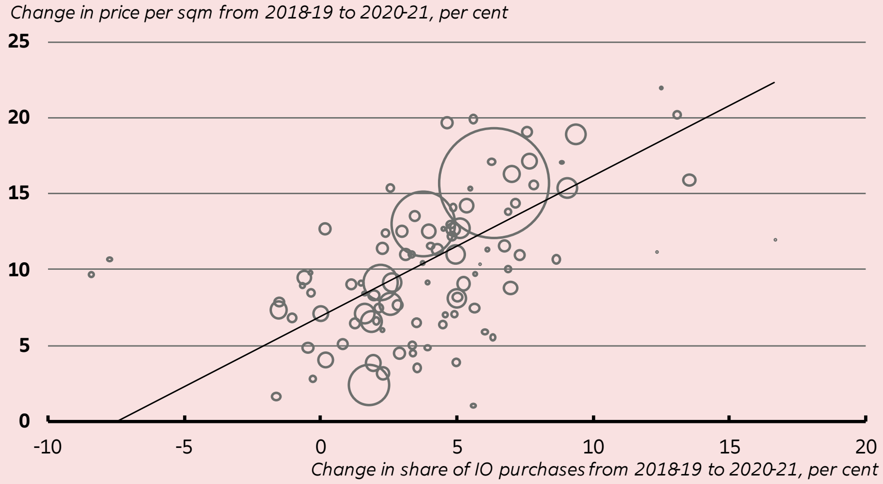
The close correlation between house prices and the proportion of interest-only mortgages across municipalities is also found when taking into account that homes and buyers fundamentally differ across municipalities. This can be done by looking at changes in house prices and changes in the proportion of home purchases financed with interest-only mortgages, rather than looking at the levels for each municipality. In other words, looking at changes in the two variables removes the municipality-specific element of the correlation. As Chart 23 shows, house price growth and the growth in the share of interest-only mortgages from before the pandemic (2018–19) to during and after the pandemic unfolded (2020–21) are closely linked.[25]

[24] Other explanations may be related to population composition, such as differences in income or wealth across the country, or it may be due to differences in norms that cannot be observed in the available data.
[25] This correlation is not specific to the pandemic, but is also seen in previous years, just as the correlation cannot be explained by developments in income, wealth and age among buyers in the municipalities.

The fact that house price growth and the growth in the prevalence of interest-only mortgages are correlated is an indication that not only house price levels, but also fluctuations in house prices, are affected by interest-only mortgages.

CHART 23

**During the pandemic, house prices increased the most in municipalities where the share of interest-only home purchases increased the most**




Note: The chart shows the geographical distribution of the development in house prices and the use of interest-only mortgages measured from 2018–19 to 2020–21. The diameter of the circles is proportional to the number of property transactions in the municipality in 2020–21.
Source: Own calculations based on register data from Statistics Denmark.

**Homes financed with an interest-only mortgage have become more expensive in recent years**

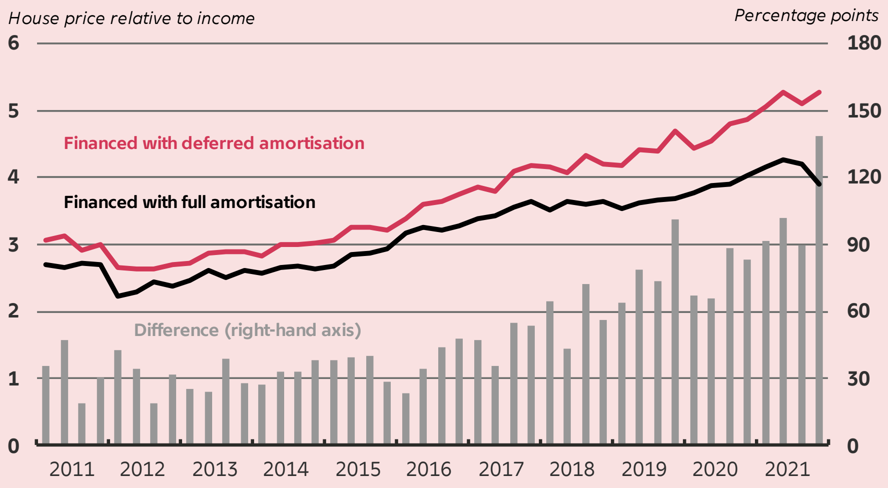
Looking at all home purchases from 2011 to 2021, the average purchase price has increased from about 3 times the buyer's annual income to between 4 and 5 times the annual income, see Chart 24. This should be seen in light of falling interest rates during the period. The purchase price in relation to income has consistently been higher for homes financed with interest-only mortgages than homes financed with amortising mortgages. This gap has widened in recent years. Homes financed with an interest-only mortgage carried a price premium of about a third of annual income at the start of the period, rising to about a full year's income in 2021.

The purchase price relative to income is calculated as an average of all individual property transactions and adjusted for a number of buyer background factors. This means that neither wealth, income, age nor municipality of residence can explain the higher purchase price with an interest-only mortgage. Furthermore, during the period when the difference in purchase price increased, there was no significant change in the proportion of home purchases with deferred amortisation, see Chart 24. Overall, this indicates that a composition effect cannot explain this trend.

The fact that homes financed with interest-only mortgages have gradually become more expensive compared to other home purchases during a period when house prices have risen indicates that access to interest-only mortgages can amplify house price fluctuations.

CHART 24

**Interest-only buyers buy more expensive homes than buyers who choose to amortise**




Note: The chart is a 'margin plot' based on a regression on home buyer house price-to-income ratio. The regression includes municipality and age fixed effects, log gross income and net wealth relative to income the year before the purchase. Lastly, quarterly constants are interacted with whether the home was purchased by a buyer who financed the purchase with at least one interest-only mortgage. It is the interaction between quarter and deferred amortisation that is plotted in a margin plot.

Source: Own calculations based on register data from Statistics Denmark.

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The analysis consists of a Danish and an English version. In case of doubt as to the correctness of the translation, the Danish version will prevail.

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