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DANMARKS NATIONALBANK

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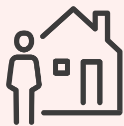
Refinancing has boosted the interest rate pass-through to fixed-rate mortgages



Refinancing attractive when interest rates decrease

Half of homeowners in Denmark finance their mortgages via fixed-rate mortgages. Danish fixed-rate mortgages are special in an international context, as they can be refinanced without the outstanding debt being significantly increased. This makes refinancing attractive when interest rates decrease.

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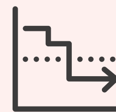

Refinancing has boosted the interest rate pass-through

Declining interest rates have given many homeowners an opportunity to refinance their fixed-rate mortgages, and changes in the market rate have hence passed-through more rapidly to homeowners' budgets.

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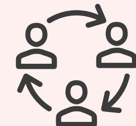

Inaction may have affected the interest rate pass-through

Some homeowners choose not to refinance their fixed-rate mortgages even though they have financial incentives to do so. This may have delayed the interest rate pass-through to homeowners having fixed-rate mortgages.

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Denmark was the first country to introduce negative monetary policy rates in 2012. Since then, Switzerland, Sweden, Japan and the euro area have followed suit.

Very low and in some cases negative interest rates have characterised the past decade across the advanced economies. There are several reasons why interest rates have fallen to the current low levels. Low interest rates reflect the fact that inflation has been subdued in many countries, but structural changes in household and corporate savings and investment behaviour are also part of the explanation.

These developments have brought monetary policy and the economy into uncharted waters, which is why Danmarks Nationalbank will be issuing a series of publications on the topic.

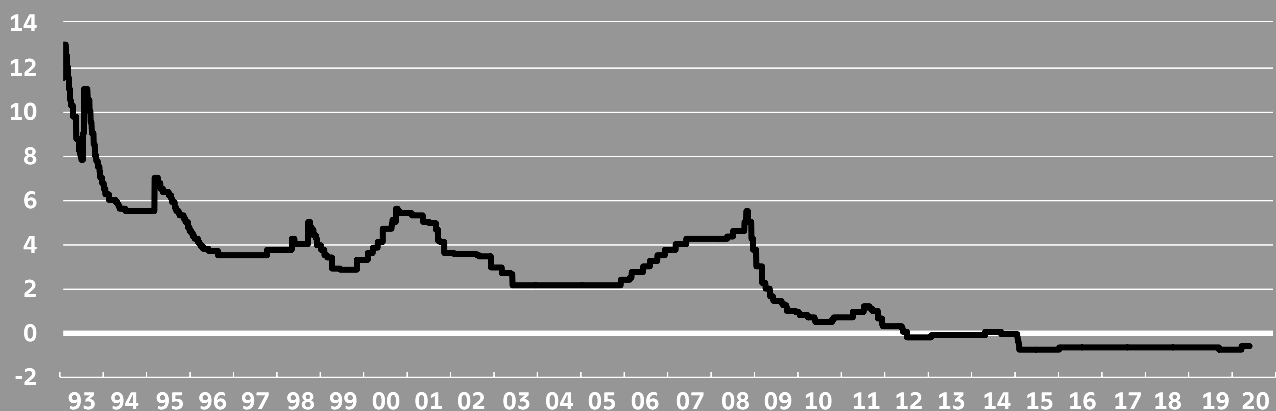
ABOUT THIS ANALYSIS

Danish fixed-rate mortgages are special in an international context, as they can be refinanced without the outstanding debt being significantly increased. This makes refinancing attractive when interest rates decrease.

Declining interest rates have given many homeowners an opportunity to refinance their fixed-rate mortgages, and changes in the market rate have hence passed-through more rapidly to homeowners' budgets.

Danmarks Nationalbank's interest rate

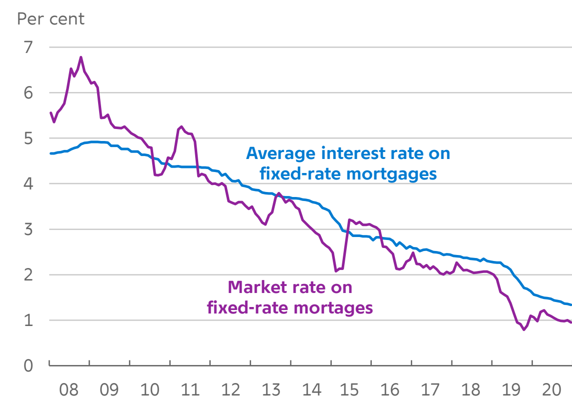
Danmarks Nationalbank's key interest rate has been negative since the summer of 2012, with the exception of a brief period in 2014.



Interest rate decreases may, among other effects, stimulate the real economy by reducing the debt service on their total home financing. This can increase on homeowners' total financing, for example, consumption. However, an interest rate decrease will only result in lower current financing costs for homeowners with fixed-rate mortgages if they prepay their existing loans and raise new loans with lower rates. Homeowners' decisions to refinance are therefore of importance to their interest costs and thus their financial scope for, for example, consumption.

The purpose of the analysis is to highlight how mortgage refinancing has affected homeowners' average interest rates on fixed-rate mortgages. To this end, the so-called interest rate pass-through is calculated, which indicates how many percentage points the average homeowner's interest rate on a fixed-rate mortgage change as a result of a one percentage point change to the market rate. The interest rate pass-through is of great importance in assessing the real economic development in Denmark, as fixed-rate mortgages constitute a large proportion of the Danes' debt.

Homeowners' average interest rate has followed market rate Chart 1



Note: Both the market rate and average interest rate on homeowners' fixed-rate mortgages are defined in Box 1.
Source: Danmarks Nationalbank, Refinitiv Eikon and own calculations.

The interest rate on 30-year fixed-rate mortgage bonds (the so-called market rate) has decreased significantly since the financial crisis, see Chart 1. In 2009, the interest rate was 6-7 per cent, while it is around 1 per cent today. The falling mortgage rates have allowed many Danish homeowners to refinance their fixed-rate mortgages to new loans with a lower interest rate. This has contributed to reducing the Danes' average interest rates on fixed-rate mortgages, see Chart 1.

The analysis documents that it has taken around 5-6 years on average for a one percentage point change in the market rate to result in a change of approximately one percentage point in the homeowners' average interest rate on fixed-rate mortgages.[1] Refinancing to lower interest rates has boosted the impact on how quickly a change in interest rates has passed to homeowners' mortgage rates. This has been particularly evident during waves of refinancing, which typically occur during periods after major market rate decreases. Refinancing of fixed-rate mortgages has thus supported the transmission of monetary policy rates to homeowners' budgets.

Fixed-rate mortgages are common in Denmark

The Danish mortgage market differs from other comparable countries in that a large proportion – approximately 30-35 per cent of the debt of Danish households – consists of callable fixed-rate mortgages, see Chart 2. This is in contrast with the euro area, where housing debt is more tied to variable-rate mortgages and fixed-rate mortgages that are non-callable and usually have a shorter maturity.

Danish fixed-rate mortgages are special because borrowers can always redeem the loan at price

1 Approximately means that it takes five years for an interest rate change to have a pass-through of 90 per cent, while it takes 6.2 years for an interest rate change to have a pass-through of 95 per cent. For more details, see Hensch (2021).

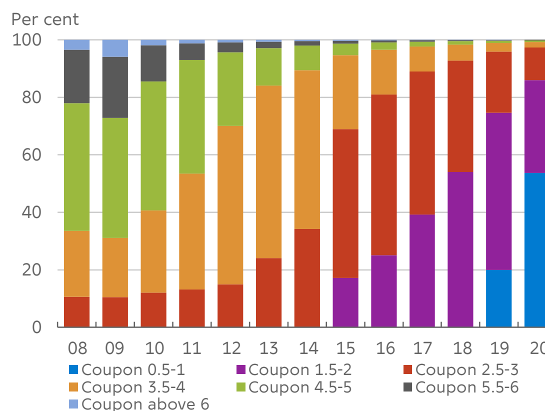
Measures of market rate and homeowners' interest rates on fixed-rate mortgages

Box 1

Market rate on fixed-rate mortgages
The market rate is based on a series of benchmark bonds on 30-year fixed-rate mortgage bonds. A benchmark bond is defined as a newly issued bond with a price below 100. When the bond price exceeds 100 (or drops below 95-96), it can no longer be characterised as a benchmark bond. As a consequence, the benchmark series will be replaced by a new benchmark bond. The market rate is therefore a composite series.

Average rate on fixed rate mortgages
The measure of homeowners' average interest rate is based on 30-year fixed-rate mortgages, which constitutes around 80 per cent of the total outstanding debt on fixed-rate mortgages. The measure is defined as a weighted average of homeowners' interest rate on these loans. Each home-owner's interest rate is defined as follows: If a homeowner raises a 30-year loan with a coupon rate of one per cent at price 97.5, the homeowner's interest rate over the entire financing period (i.e. until the mortgage matures) is equal to the yield to maturity, which is approximately 1.15 per cent per year. The development in composition of coupon rates on 30-year fixed rate mortgages is illustrated in Chart A. The measure of homeowners' average interest rate does not include administrative fees etc.[1]

Composition of 30-year loan — A



Note: Composition of homeowners' coupon rates on 30-year fixed-rate mortgages.
Source: Danmarks Nationalbank.

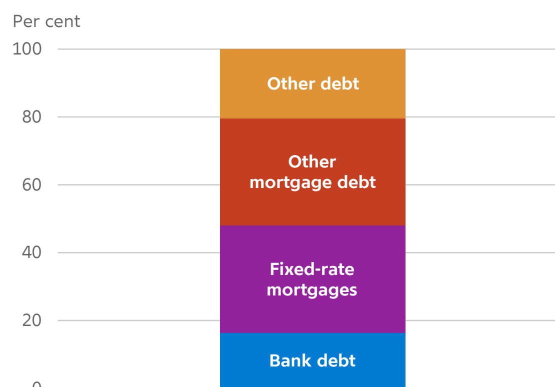
1. See Box 2 for further explanations of variable and fixed costs of raising mortgages in Denmark.

100 and thus refinance the loan without incurring a significant increase in the outstanding debt. Home-owners are thus protected from ending up with debt that is expensive to repurchase in connection with interest rate decreases, see Box 2.

Fixed-rate mortgages also differ from other types of housing loans by having longer fixed-interest periods. The majority – roughly 80 per cent of fixed-rate mortgages – have a 30-year fixed-interest period. In comparison, the fixed-interest period on other types of mortgages, for example adjustable-rate mortgages, is significantly shorter. Homeowners with mortgages with, for example, a five-year fixed-interest period (so-called F5 loans) will, as a minimum, have their loans refinanced after five years. Therefore, an interest rate change will (as a minimum) have a full pass-through on homeowners' interest rates every fifth year. This differs from fixed-rate mortgages, where the interest rate is only changed if the old loan is prepaid and a new loan is raised.

Fixed-rate mortgages make up a significant proportion of household debt

Chart 2



Note: The composition of households' liabilities. 'Other debt' covers debt to public authorities, other financial payables and consumption debt. Other mortgage debt covers variable-rate mortgages and adjustable-rate mortgages.
Source: Danmarks Nationalbank and own calculations.

Refinancing is attractive in the Danish mortgage system in an international context. Box 2

Fixed-rate mortgages in Denmark are based on callable bonds. The special feature of callable bonds is that they allow the borrower to repay the mortgage at par (i.e. price 100).

When a homeowner refinances a mortgage, the bank buys the underlying mortgage bond for an amount equal to the size of the homeowner's debt. The value of the repurchased debt depends on whether the bonds are repurchased at market price or at par. In an environment with declining interest rates, the bond will be repurchased at par, whereas, in an environment with rising interest rates, it will be repurchased at market price. In comparison, the underlying bonds on other types of mortgages (for example adjustable-rate mortgages) can only be repurchased at the market rate, which will be higher than par in case of declining interest rates. This will make it more expensive for borrowers to repay these loan types prematurely relative to fixed-rate mortgage.

Fixed-rate mortgages are issued with discrete coupon rates. Under normal circumstances, the issuances occur at a price below 100. This means that homeowners who refinance their mortgage at a lower interest rate can repurchase their existing loan at par and raise a new loan at a price below par, for example 95-99. This entails a loss on the principal of 1-5 per cent exclusive of refinancing costs. The yield to maturity on the homeowner's debt is thus always higher or equal to the coupon rate on issuance. In other words, this means that the interest rate saving from refinancing to a loan with a lower interest rate is equal to the difference between the homeowner's current coupon rate and the yield to maturity of the new loan.

If a homeowner refinances a mortgage at a higher interest rate, a debt reduction is instead achieved. This reflects that the old mortgage is repaid at the market price, which will typically be lower than the market price of the new loan.

Mortgage refinancing is connected with one-off costs, including redemption and establishment costs to the bank and the mortgage credit institution. There are also variable costs connected with the administration of the loan, also known as administration fees. These fees constitute compensation to the bank for the credit risk it has incurred in the event of default. The administration fees depend on the borrowers' loan-to-value (LTV) and have amounted to an average of 0.7 per cent since the financial crisis.

Several factors affect homeowners' average interest rate on fixed-rate mortgages

The average interest rate on homeowners' fixed-rate mortgages is also affected by factors other than refinancing. New lending and repayments on debt also play a role. Overall, changes in homeowners' average interest rate can be divided into three channels:

1. Refinancing channel
2. Entry channel
3. Exit channel

Refinancing entails that existing borrowers refinance their fixed-rate mortgages to new fixed-rate mortgages with an interest rate equal to the market rate. Refinancing therefore increases the interest rate pass-through because, alternatively, the homeowners' existing loans would have to be kept until maturity. This means that the average life of fixed-rate mortgages is usually substantially lower than the agreed maturity of the mortgage.

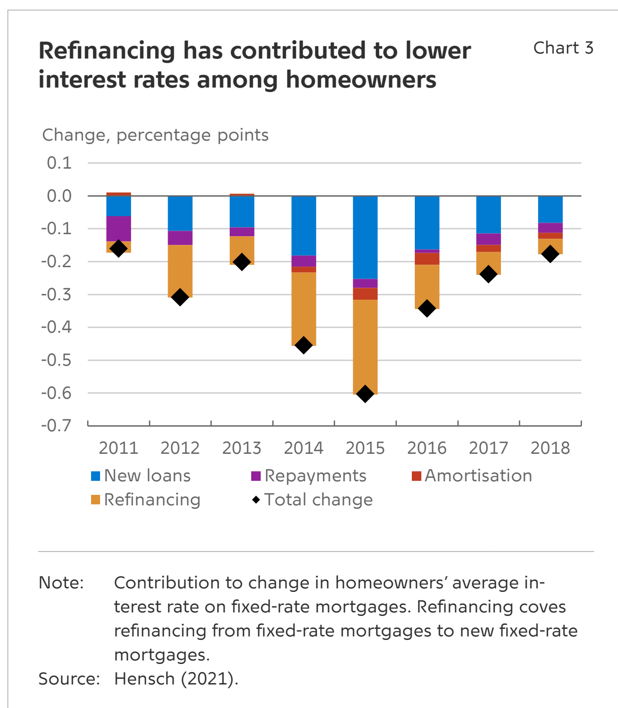
Refinancing of fixed-rate mortgages to mortgages with lower interest rates have contributed to a significant part of the decrease in homeowners' average interest rate since the financial crisis, see Chart 3.

The entry channel comprises borrowers who raise new fixed-rate debt at the market rate. New lending occurs in connection with relocations, switching from other loan types and borrowers who for the first time enter the housing market.

The exit channel comprises borrowers with existing fixed-rate mortgages who repay the debt by instalments or terminate their loans without refinancing. Terminations typically cover relocations, switching to other loan types and foreclosure auctions.

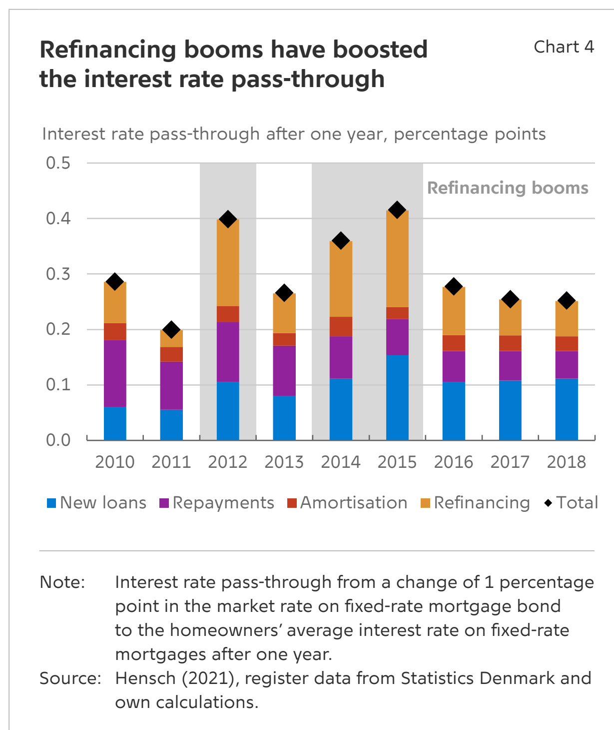
New lending, instalments and repayments, i.e. channels 2-3, are not special to fixed-rate mortgages. However, the refinancing channel plays by contrast only a role for fixed rate mortgages.

Refinancing has contributed to lower interest rates among homeowners Chart 3



Note: Contribution to change in homeowners' average interest rate on fixed-rate mortgages. Refinancing coves refinancing from fixed-rate mortgages to new fixed-rate mortgages.
Source: Hensch (2021).

Refinancing booms have boosted the interest rate pass-through Chart 4



Note: Interest rate pass-through from a change of 1 percentage point in the market rate on fixed-rate mortgage bond to the homeowners' average interest rate on fixed-rate mortgages after one year.
Source: Hensch (2021), register data from Statistics Denmark and own calculations.

Refinancing booms have boosted the interest rate pass-through

Costs influence homeowners' refinancing decisions. Refinancing to a lower rate typically becomes attractive to a borrower when the current market rate falls sufficiently relative to the borrower's current mortgage rate. In other words, this means that refinancing to a mortgage with lower rate is financially advantageous when the interest rate saving exceeds the refinancing costs. The proportion of homeowners who refinance their mortgages is thus typically higher in periods following large interest rate decreases. Substantial interest rate declines may thus tend to increase the pass-through on homeowners' interest rates on fixed-rate mortgages.

The so-called interest rate pass-through defined above is used to measure how an interest rate change has affected refinancing activity and thus how it has passed-through to homeowners' interest rates. In the period 2010-2018, the interest rate pass-through was 0.30 on average, measured over a term of one year, see Chart 4. This means that a one percentage point change in the market rate has, on average, resulted in a change of 0.30 percentage points in the homeowners' average interest rate on fixed rate mortgages after one year.

The interest rate pass-through has varied over the period and was at its highest in 2012 and in the years 2014-2015. These periods were marked by large interest rate decreases, which increased the refinancing volume markedly and hence the interest rate pass-through.

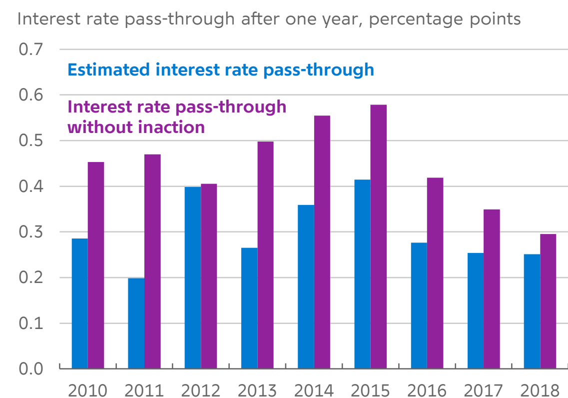
Interest rate pass-through is also affected by new lending and debt repayments
Both new lending and repayments (entry channel and exit channel) affect the size of the interest rate pass-through. For the entry channel, the reason is that a higher share of new lending increases the volume of debt on which interest is charged at the market rate, which pulls the homeowners' average interest rate towards the market rate more rapidly.

The effect from the exit channel depends on whether the repaid debt pulls the average interest rate in the same direction as the market rate. If the homeowners' average interest rate is higher

than the market rate and concurrently lower than the interest rate on the repaid debt, the exit channel will contribute to boost the interest rate pass-through and vice versa.[2]

On average, the entry and exit channels have increased the interest rate pass-through over a one-year term by 0.2 percentage points in the period 2010-2018. The fluctuations in the contributions from new lending and debt repayments have been lower than the contribution from the refinancing. One reason for this is that the decision to raise/repay fixed-rate mortgages does not depend to the same extent on financial incentives that fluctuate in line with the development in the market rate.

Inaction has reduced the interest rate pass-through Chart 5



Note: The calculation homeowners' financial incentives to refinance fixed-rate mortgages follows the method in Agarwal et al. (2013). For further details, see Hensch (2021).
Source: Hensch (2021), register data from Statistics Denmark and own calculations.

It takes time for an interest rate change to fully pass-through

A new study shows that it has taken around 5-6 years for an interest rate change to have a nearly full pass-through on homeowners' average interest rates, see Hensch (2021).[3] One reason for this is that some homeowners do not react to market rate changes immediately. For many of them, the reason is simply that they do not have financial incentives to refinance. For a smaller part, however, the reason is that they exhibit inaction in their refinancing decisions, see Andersen et al. (2020). This means that some homeowners only refinance their fixed-rate mortgages long after they have had financial incentives to do so. Seen in isolation, this kind of behaviour delays the pass-through of changes in the market rate to homeowners' mortgage rates. It also explains why homeowners refinance their mortgages without any major changes in the market rate.

Inaction among homeowners has in isolation reduced the interest rate pass-through by 0.15 percentage points over a one-year term, see Chart 5. This means that if all homeowners with financial incentives had chosen to refinance their mortgages immediately, an interest rate change would have passed through two years earlier than the observed interest rate pass-through.

Much quicker interest rate pass-through than what fixed interest period would indicate

A full interest rate pass-through of 5-6 years is relatively quick compared to the majority of fixed-rate mortgages have a fixed interest period of 30 years. In comparison, this is only moderately higher than for homeowners who finance their housing loans via, for example, five-year adjustable-rate mortgages. Here, an interest rate change will pass through in line with the mortgage being refinanced every five years. This indicates that the overall pass-through has not been significantly affected by the fact that around half of the homeowners financing their home debt via long-term mortgages.

2 See Hensch (2021) for details.

3 A full interest rate pass-through is roughly equal to the time it takes for an interest rate change of, for example, one percentage point to change the homeowners' average interest rate by one percentage point.

Interest rate environment after financial crisis may have had an impact on the interest rate pass-through

A homeowner's refinancing decision is different when interest rates are increasing. This is because the homeowner can no longer obtain an interest rate saving from refinancing. Instead, the homeowner can obtain a debt reduction by refinancing, as the existing loan can be repurchased at a price that is lower than the price of the new loan, see Box 2. The financial benefits from refinancing to a higher rate mortgage must be weighed against the cost, just as for refinancing to a lower rate mortgage.

The different financial incentives when refinancing to a higher rate mortgage may affect the interest rate pass-through in environments with increasing interest rates. If homeowners on average are less likely to refinance to higher fixed-rate mortgages, the interest rate pass-through will be reduced. If, instead, they to a greater extent want to refinance to a higher rate mortgage, the interest rate pass-through will increase. There is currently no data basis for an assessment of the magnitude of the pass-through in connection with increasing interest rates.[4]

Interest rate pass-through may affect household consumption

The magnitude of the interest rate pass-through may be of importance to monetary policy transmission to homeowners' consumption. The reason for this is that a change in the market rate of fixed rate mortgages will only pass through to the homeowners' budget if they refinance their existing loans. Refinancing to lower rate mortgages affects homeowners' finances through lower current interest payments, which reduces the debt service on the homeowner's total housing financing.

A different interest rate pass-through in environments with increasing interest rates may be of importance to homeowners' financial scope, and hence the transmission of monetary policy rates to household consumption.

In addition, inaction among some homeowners results in a lower interest rate pass-through. In Denmark, where many homeowners finance their home debt through fixed-rate mortgage, a lower interest rate pass-through on fixed-rate mortgage may have a real economic effect by delaying the transmission of monetary policy interest rates to, for example, household consumption.

Literature

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Andersen, S., Campbell, J.Y., Nielsen, K.M, and Ramadorai, T. (2020), Sources of inaction in household finance: Evidence from the Danish mortgage market, *American Economic Review,* Vol. 110, No. 4.

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4 The latest extensive period of increasing interest rates on long-term fixed rate mortgage bonds was from 2005 to 2008.

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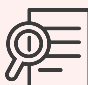

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The analysis consists of a Danish and an English version. In case of doubt regarding the correctness of the translation the Danish version is considered to be binding.

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