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Lending rules in light of higher interest rates

Written by

Christian Sinding Bentzen
Advisor

csb@nationalbanken.dk
+45 3363 6138

Cecilie Walsted Gaarskær
Quantitative Risk Analyst

cwg@nationalbanken.dk
+45 3363 6379

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The higher interest rates since 2022 have made housing finance more expensive. This means that it is mainly the higher interest expenses that currently determine the loan amount of homebuyers rather than the lending rules. The purpose of the rules that were introduced in the years following the financial crisis has in part been to address risks related to the persistent low interest environment, where borrowers, in the absence of lending rules, could leverage heavily against their incomes. The higher interest rates have reduced the number of borrowers affected by the lending rules.

The lending rules restrict the leverage of homeowners

The main purpose of the lending rules is to reduce homeowners' leverage by setting minimum standards for the credit policies of banks. In part because of these rules, the very low interest rates during the period 2010-2021 did not fully translate into higher lending growth. Consequently, the measures have contributed to reducing risks associated with the low interest environment and enhancing the resilience of both homebuyers and credit institutions.

Higher interest rates implies that fewer borrowers are restricted by the rules

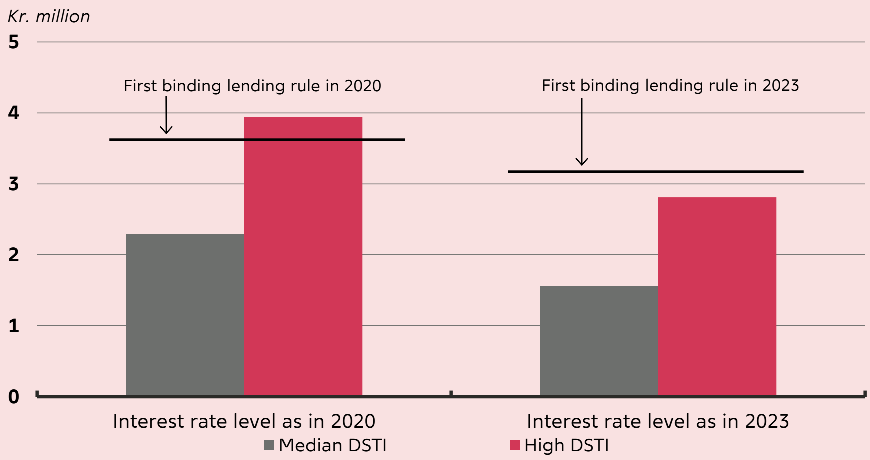
The lending rules are structural rules, and the limits do not vary over time. Some of the rules are designed to particularly restrict borrowers when interest rates are relatively low. It is an appropriate feature of the lending rules that relatively more borrowers are constrained when interest rates are low and less so when interest rates are higher.

Why is it important?

Housing market imbalances have historically been a catalyst for recessions and periods of financial instability. Since 2013, both Danish and foreign authorities have introduced several rules that directly affect households' access to mortgages. The rules were implemented during a period when nominal interest rates were historically low. Some of the rules therefore aim to address risks related to the low interest environment. Since 2022, interest rates have risen rapidly, providing a natural opportunity to evaluate the effectiveness of the lending rules.

Main chart:
The lending rules are relatively more binding when interest rates are low

Loan amount for the "typical" homebuyer with different debt service-to-income ratios



Note: See box 1 for a description of assumptions etc. The debt service-to-income ratio (DSTI) is defined as the sum of interest and instalments divided by after-tax income. The "typical" homebuyer is defined as a homebuyer with income and down payment equivalent to the median for the group. High DSTI is defined as a DSTI of 30 per cent, corresponding to approximately the 90th percentile for families with two children who purchased a home during the period 2020-23. The median was 17 per cent for this group.
Source: Own calculations based on data from the Credit Register and Statistics Denmark.

Keywords

Housing finance | Banks and mortgage credit institutions | Financial stability | The Credit Register | Macroprudential policy | Regulation | Interest rates

01
The lending rules restrict highly indebted homebuyers

Danish banks and mortgage credit institutions are subject to certain rules when granting mortgages to households, so-called borrower-based measures. The rules were implemented during a period of accommodative monetary policy and interest rates that were significantly lower than today. The purpose of the rules is to protect homeowners from risks such as rising interest rates or falling property prices, and to ensure that lenders do not loosen credit standards.[1]

The rules mainly restrict the most highly indebted borrowers. The rules include limits on e.g., the loan-to-value ratio, the borrower's debt relative to income, and the access to interest-only mortgages and variable-rate mortgages. Table 1 provides an overview of the lending rules implemented since 2013.

TABLE 1

Overview of the lending rules

Applicable from	Legal basis and rule	Description
2013	*Good Practice for Mortgage Lending* – Service a 30-year fixed-rate repayment mortgage	Interest-only and variable-rate mortgages should only be granted to borrowers who can service an equivalent 30-year fixed-rate repayment mortgage. Reduces the loan amount on interest-only or variable-rate mortgages.
2015	*Good Practice for Mortgage Lending* – Down payment requirement	Minimum down payment requirement of 5 per cent.
2016	*Growth Area Guidelines* – Debt-to-income, DTI	If the DTI is between 4 and 5, borrowers' net wealth should remain positive after a 10 per cent drop in house prices. If the DTI is above 5, net wealth should remain positive after a 25 per cent drop. Borrowers with high job security are exempted from the rule if they choose a fixed-rate repayment mortgage. Restricts high leverage when interest rates are low.
2016	*Growth Area Guidelines* – Interest stress	The credit assessment on variable-rate mortgages should be based on a rate one percentage point higher than the current rate on a 30-year fixed-rate bond, with a minimum of 4 per cent. Reduces the loan amount variable-rate mortgages.
2018	*Good Practice for Mortgage Lending* – Debt-to-income (DTI)	Borrowers with a DTI ratio greater than four and an LTV ratio exceeding 60 per cent can only choose 30-year fixed-rate mortgages or repayment mortgages with at least 5-year interest rate fixation. Restricts the availability of interest-only mortgages with variable interest rate when the DTI ratio is high.

Note: *The Growth Area Guidelines* only apply to Copenhagen and Aarhus.

[1] See, for instance, The Systemic Risk Council (2017) or The Danish Supervisory Authority (2023b).

The down payment should be at least 5 per cent and interest-only mortgages with variable rate are not permitted when the debt-to-income and loan-to-value ratios are high. Furthermore, interest-only mortgages as well as variable-rate mortgages should only be granted to borrowers who are able to pay both interest and principal on an equivalent 30-year fixed-rate repayment mortgage. The rules outlined in the so-called Growth Area Guidelines apply solely to Copenhagen and Aarhus. These rules include a so-called interest rate stress where borrowers applying for variable interest rate are assessed based on a higher rate than the rest of the country.

The rules restrict borrowers in various ways. The down payment requirement, the interest stress, and the rule regarding the ability to service a 30-year fixed-rate repayment mortgage are "hard" rules in the sense that the loan amount should not exceed the specified limits. In contrast, the debt-to-income ratio rule in the Executive Order on Good Practice for Mortgage Lending is a "soft" rule in the sense that it only prohibits certain loan types if both the loan-to-value and debt-to-income ratios exceed the specified thresholds.

The rules are implemented in consumer protection legislation (Good Practice for Mortgage Lending) and in the Executive Order on governance (the Growth Area Guidelines). Thus, the Danish lending rules do not have a legal basis in legislation specifically addressing risks to the overall financial system. In practice, lending rules with a consumer protection purpose can have the same impact on financial stability as lending rules implemented with a financial stability purpose. However, there may be instances however where this is not the case. For example, if financial stability considerations would warrant measures that are stricter than what can be justified by consumer protection, such measures could not be implemented in the current legal framework. The implementation of the lending rules in the consumer protection legislation also means that institutions have some flexibility to deviate from the measures if their credit assessments warrant it; cf. section 4.

Authorities in other countries have implemented lending rules that are similar to the Danish rules. This analysis focuses solely on the effect of higher interest rates on the Danish lending rules, but the conclusions are generally in line with experiences in other countries; cf. ECB (2023). Some of the Danish lending rules address risks related to the low interest rate environment. Low nominal interest rates – or loose monetary policy in general – can have unintended consequences for financial stability, for instance because of increased risk-taking; cf. De Nicolò et al. (2010) and Lian et al. (2019). Lending rules may dampen the transmission of monetary policy by reducing some households' ability to increase indebtedness and thus to take full advantage of the low interest rates. However, monetary policy and lending rules can also complement each other as lending rules make the financial system more stable; cf. Laeven et al. (2022). Hence, lending rules can increase the transmission of monetary policy, as monetary policy operates through banks and the financial system more generally. Thus, lending rules contribute to making the financial system more stable. In what follows, the analysis will focus on the lending rules and how they limit borrowers when interest rates change.

The interest rate level matters for the relative bindingness of the lending rules

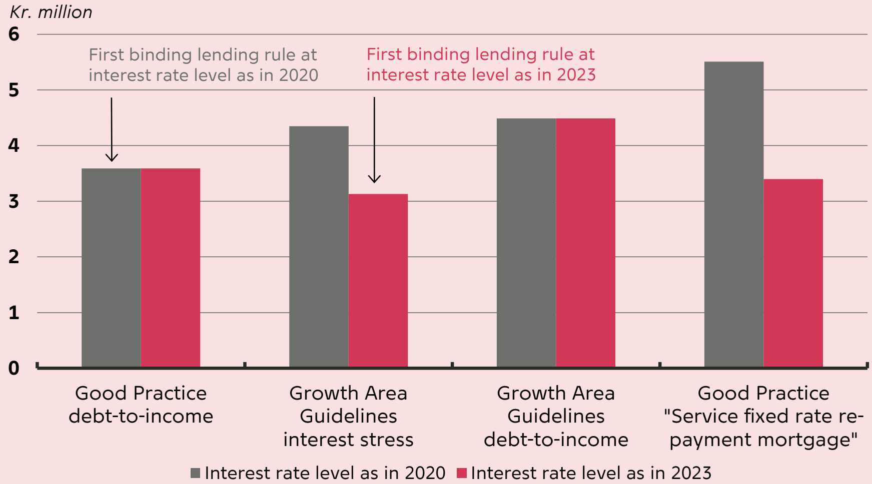
The higher interest rates since 2022 have impacted how and when the lending rules restrict borrowers; cf. chart 1. The chart illustrates the maximum amount a typical homebuyer can borrow until the rules become binding. The typical homebuyer is defined as a family consisting of two adults and two children, whose income and down payment corresponds to the median for the group (see box 1 for a description of assumptions). To illustrate how interest rate developments

affect the bindingness of the rules, we keep incomes and down payments constant. Hence, only interest rates vary over time.
At low nominal interest rate levels, as in 2020, the first binding lending rule was the rule regarding the debt-to-income in the Executive Order on Good Practice for Mortgage Lending. Thus, the typical homebuyer could borrow kr. 3.6 million without being restricted by any rule. At a larger loan amount, the debt-to-income ratio would exceed 4, at which point the debt-to-income rules apply.[2]

CHART 1

The interest rate level matters for the relative bindingness of the lending rules

Loan amount for the typical homebuyer before each lending rule become binding



Note: See box 1 for a description of assumptions. Good Practice refers to the Executive Order on Good Practice for Mortgage Lending. The term "typical" homebuyer refers to a homebuyer with income and down payment corresponding to the median among homebuyers with two adults and two children. Incomes and down payments are held constant, so only interest rates vary over time. The interest rate stress and the rule of servicing a fixed-rate repayment mortgage are assumed to bind when the monthly payment on the total housing debt equals the after-tax income (net of minimum variable and fixed expenditures). The down payment requirement is not shown for presentation purposes, as it binds for a loan amount of kr. 12.8 million, given the typical homebuyer's down payment of kr. 674,000.
Source: Own calculations based on data from the Credit Register and Statistics Denmark.

At higher interest rates, as in 2023, the first binding rule is instead the interest rate stress from the Growth Area Guidelines. The interest rate stress applies to homebuyers in Copenhagen and Aarhus opting for a variable-rate mortgage. In the rest of the country – or for homebuyers not opting for a variable-rate mortgage – it is the rule requiring the homebuyer to be able to service a 30-year fixed-rate repayment mortgage that is the first binding rule with interest rates as in 2023. In general, the rule requiring the homebuyer to be able to service a 30-year fixed-rate repayment mortgage constitutes an upper limit for the loan amount that credit institutions can offer.[3]

[2] For the rule to be binding, the loan-to-value ratio should also exceed 60 per cent. For the typical homebuyer, the loan-to-value ratio will always be greater than 60% when the debt factor exceeds 4.
[3] Credit institutions should base the credit assessment on the individual client and there may be cases where larger loans can be granted; cf. box 1. The calculations assume that homebuyers can sustain modest consumption expenditures in addition to paying interests and instalments on the mortgage.

The change in the relative bindingness of the rules primarily stems from the fact that the typical homebuyer can service a lower debt when interest rates increase – and thus, also a lower debt according to the credit assessment in the interest rate stress. Conversely, the loan amount under the debt-to-income rules is not directly affected by interest rate developments; here, only pre-tax income matters.[4]

The interest rate level thus affects which rule will be the first constraint. The debt-to-income rules are often the first constraint when interest rates and borrowing costs are relatively low. When interest rates are higher, it is typically the rules related to the borrower's ability to service the debt that will be the first constraint.

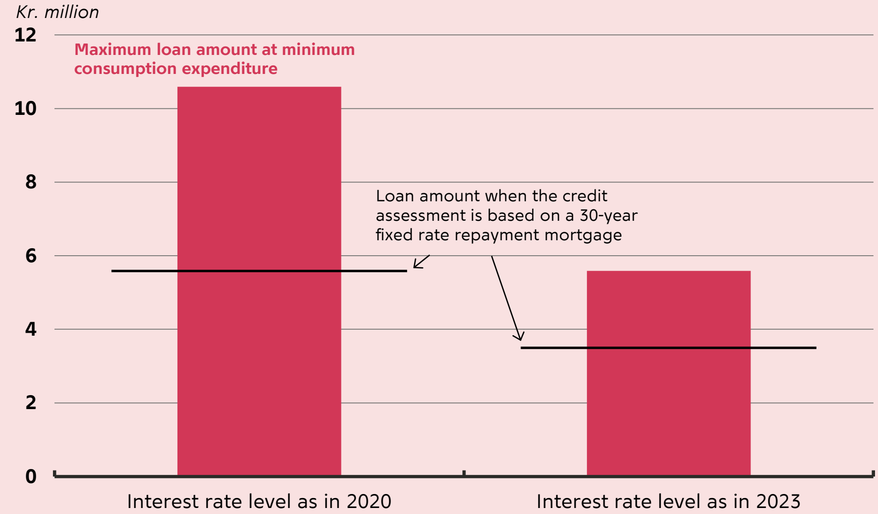
Before the lending rules: Interest-only loans could imply highly indebted homebuyers

Some of the lending rules restrict access to interest-only mortgages. That is the case for the first rule introduced in 2013, which requires borrowers to be able to service a fixed-rate repayment mortgage to get an interest-only mortgage. Prior to 2013, the individual credit institution would themselves determine the minimum credit standards when offering interest-only mortgages.

CHART 2

The lending rules have reduced the size of interest-only mortgages

Loan amount on an interest-only mortgage for the typical borrower vs. loan amount when the credit assessment is based a 30-year fixed-rate repayment mortgage



Note: See box 1 for a description of assumptions. The loan amount refers to the largest interest-only mortgage with a variable interest rate that the typical homebuyer can service based on the first-year payment. It does not necessarily reflect a mortgage that has actually been granted.
Source: Own calculations based on data from the Credit Register and Statistics Denmark.

The rule that borrowers must be credit-assessed based on a fixed-rate repayment mortgage significantly reduced the maximum loan amount for interest-only mortgages with variable rate; see chart 2. With interest rates and incomes as in 2020, the typical homebuyer could theoretically sustain a modest consumption

[4] The income of the typical homebuyer is held constant over time in the calculation, but the qualitative conclusions remain the same in a calculation with the actual incomes over time.

expenditure while simultaneously servicing a first-year payment equivalent to a total mortgage debt of kr. 10.6 million or 12 times the pre-tax income of the typical homebuyer. The combination of interest-only and variable-rate could thus enable some very large mortgages. The chart illustrates a possible mortgage given data on incomes and down payment. It does not show whether credit institutions would grant such a mortgage or whether homebuyers would apply for it. However, in the years before the financial crisis, when there were no rules regarding interest-only loans, credit institutions granted many large loans relative to borrowers' incomes; cf. Danmarks Nationalbank (2017).

Overall, the lending rules restricted borrowers' ability to increase leverage. The impact was greater when interest rates were relatively low. Accordingly, the lending rules have contributed to preventing the very low nominal interest rates during the period 2010-2021 to fully translating into larger mortgages. As a result, some homebuyers have had to borrow less than they would have been able to if there were no lending rules in place. The lending rules have thus moderated the extent to which the low interest rate environment affected both debt accumulation and housing prices.

BOX 1

Assumptions etc.

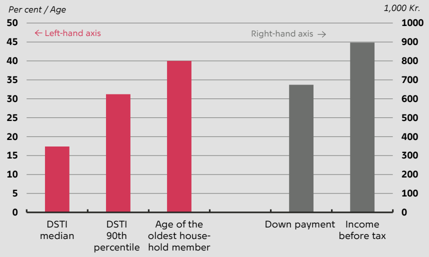
To assess how the lending rules restrict homebuyers, part of the analysis is based on a "typical" homebuyer defined as a family consisting of two adults and two children. The family's income and down payment correspond to the median among such families. The calculations show how much the typical homebuyer can borrow until the lending rules become a binding constraint. Hence, it is not necessarily the loan amount that the typical homebuyer has actually borrowed or the actual price of house that was purchased which is considered.

The Danish lending rules apply to new lending, whether it is the purchasing of a new home or home equity withdrawal. However, this analysis focuses solely on home purchases, as home equity withdrawals are more volatile. The qualitative results are robust to including home equity withdrawals.

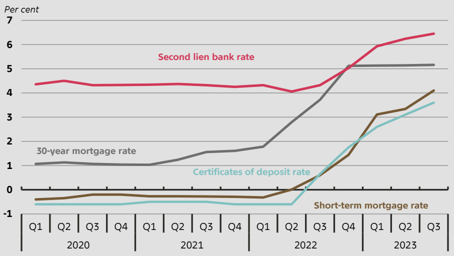
The debt service-to-income ratio (DSTI) and minimum consumption expenditure: The debt service-to-income ratio is defined as the sum of interest payments and instalments divided by the after-tax income. Incomes are estimated using Statistics Denmark's quarterly registers for all individuals who receive wages or transfers in Denmark, including transfers from private pensions. Capital income etc. is not included. Hence, the estimated DSTIs should be interpreted as upper-bound estimates. During the credit assessment, credit institutions are required to create a budget based on the applicant's actual expenses. This information is not part of the data set used for the analyses, however. Therefore, a conservative budget is estimated for the borrowers' fixed and variable expenses – the minimum consumption expenditure. Fixed costs include expenses related to day care, property taxes, transport etc. and is estimated using data from Statistics Denmark. The variable costs are based on the amounts in the Guidelines on Creditworthiness Assessment as specified by the Danish Financial Supervisory Authority and the Consumer Ombudsman. The maximum DSTI for a homebuyer is when the entire after-tax income is used to pay interest, instalments as well as fixed and variable costs (i.e., when the so-called economic margin of the household equals 0). For the typical homebuyer, the maximum DSTI is around 35-40 per cent over the sample period. For other homebuyers it can be both higher and lower. The interest rate stress as well as the rule on being able to service a fixed-rate and repayment mortgage are assumed to be binding when the DSTI equals the maximum DSTI and the homebuyer uses all income on paying interest, instalments as well as fixed and minimum variable costs. Unless otherwise specified, the calculations will assume a 30-year fixed-rate repayment mortgage on mortgages issued within an LTV of 80 per cent (the maximum LTV-value for mortgage credit institutions) and a maturity of 20 years on any second lien bank loans above an LTV of 80 per cent. Where interest-only mortgages are considered, however, a maturity of 10 years is used on second lien bank loans. This reflects that borrowers with interest-only mortgages generally pay off the second lien bank loans more quickly. However, the results are not significantly affected in relation to these assumptions.

Homebuyers with high and medium DSTI: A value of 30 per cent is used as a "high" DSTI. This corresponds to approximately the 90th percentile in the empirical distribution for a homebuyer consisting of two adults and two children over the period 2020-2023. The high DSTI of 30 per cent is thus lower than the maximum DSTI described above. A "medium" DSTI is defined as the median of the corresponding empirical distribution. The median DSTI is 17 per cent for the period considered.

Selected characteristics of a typical homebuyer



Interest rate development



Note: Right chart: The short-term mortgage rate includes mortgages with interest rate fixation of up to three years. Second lien bank loans are bank loans collateralised by owner-occupied real estate that have a junior priority to a standard LTV 80 per cent mortgage issued by a mortgage credit institution.
Source: Own calculations based on data from the Credit Register, Statistics Denmark, and Finance Denmark

02
Higher interest rates imply that the lending rules become less of a restriction

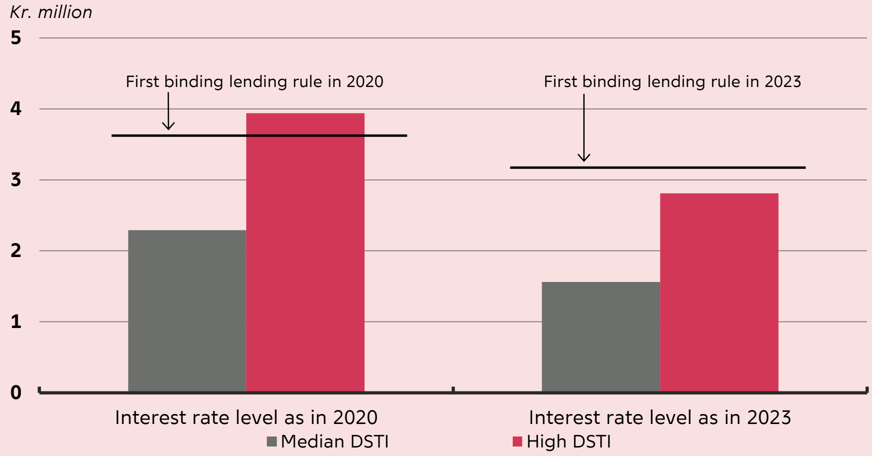
Many homebuyers choose to borrow less than the maximum loan amount according to the lending rules. Where the previous section illustrated the maximum loan amount for each of the lending rules, this section instead illustrates how the lending rules restrict homebuyers depending on how much of their income they use to service the housing debt. Hence, the starting point is not the maximum loan amount according to the lending rules, but rather how much the typical homebuyer can borrow given a fixed amount spent on servicing the housing-related debt relative to the after-tax income.

The lending rules do not constitute a restriction for the typical homebuyer with a debt service-to-income ratio corresponding to the median; cf. chart 3. The debt service-to-income (DSTI) is defined as the sum of interest payments and instalments divided by the after-tax income. The horizontal lines represent the loan amount where the first lending rule is binding, as illustrated in the previous section. The loan amount for the typical homebuyer with a median DSTI is below the maximum loan amount according to the lending rules in 2020 as well as in 2023. Hence, a typical homebuyer with a DSTI corresponding to the median can in principle borrow more according to the lending rules but chooses not to.

CHART 3

Homebuyers with a high DSTI are more often restricted by the lending rules

Loan amount for the typical homebuyers at different debt service-to-income ratios, DSTIs



Note: See box 1 for a description of assumptions. High DSTI is defined as a DSTI of 30 per cent corresponding to approximately the 90th percentile for the group, while the median DSTI is 17 per cent. Incomes and down payments are kept constant, so only the interest rate vary over time. The calculations assume a 30-year fixed-rate repayment mortgage and a second-lien bank loan above an LTV of 80 per cent with a maturity of 20 years.
Source: Own calculations based on data from the Credit Register and Statistics Denmark.

For the typical homebuyer with a DSTI of 30 per cent, the interest rate level inversely affects whether the lending rules constitute a constraint. When interest rates were low as in 2020, a DSTI of 30 per cent would imply that the limits in one or more lending rules would be exceeded. The reason is that homebuyers can service a large debt relative to their incomes when interest rates are low. Therefore, the rules regarding borrowers' DTI ratio will typically be binding during periods of low interest rates. Conversely, when interest rates are higher, the lending rules do not restrict the typical homebuyer with a high DSTI. This is because a mortgage interest rate of around 5 per cent and a DSTI of 30 per cent entail a loan amount that is less than four times the income of the typical homebuyer. At the same time, it falls within the limits set by the other lending rules.

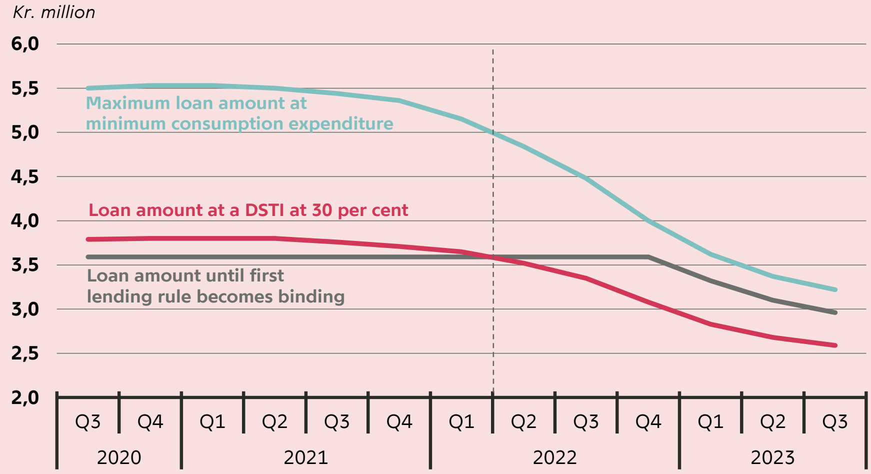
When borrowing is cheap, more homebuyers are restricted by the lending rules

In the following, the starting point is how homebuyers with a high DSTI of 30 per cent are restricted by the lending rules. How lending rules constrain the typical homebuyer over time is illustrated in chart 4. The maximum loan amount according to the lending rules is when the typical homebuyer has only a minimum consumption expenditure, see box 1 and the turquoise curve in chart 4.

CHART 4

Fewer homebuyers are affected by the rules after interest rates have increased

Loan amount for the typical homebuyer with a high DSTI – with and without lending rules



Note: See box 1 and the note for chart 3 for a description of assumptions. The chart depicts the loan amount for a typical homebuyer in terms of income and down payment and who has a DSTI of 30 per cent. The maximum loan amount is computed for a 30-year fixed-rate repayment mortgage and a minimum consumption as described in box 1.
Source: Own calculations based on data from the Credit Register and Statistics Denmark.

The red curve illustrates the loan amount for the typical borrower with a DSTI of 30 per cent. Around 2021, this loan amount starts decreasing. The declining trend reflects increasing long-term interest rates. The grey curve illustrates the loan amount until the first rule becomes binding. Up to and including the first quarter of 2022, the loan amount corresponding to a DSTI of 30 per cent exceeds the loan amount until the first rule becomes binding. After this point, the lending rules do not restrict the typical homebuyer with a high DSTI.[5] The lending rules have thus contributed to reducing risks related to the low-interest rate environment: When interest rates are low, more borrowers are restricted by the lending rules.[6]

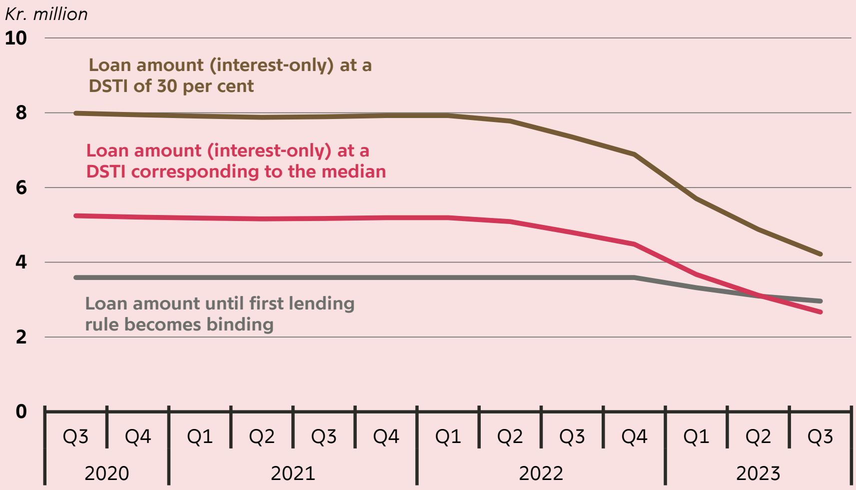
The lending rules have been relatively robust in terms of restricting the maximum loan amount on interest-only mortgages with variable interest rate

The purpose of some of the lending rules is to restrict the access to interest-only mortgages. Chart 5 illustrates how the typical homebuyer who applies for a full interest-only mortgage with variable rate is restricted by the rules over time. Chart 5 differs from charts 3 and 4, which illustrated how the lending rules restrict the typical homebuyer choosing a 30-year fixed-rate repayment mortgage.

CHART 5

The lending rules have been robust in terms of restricting access to interest-only mortgages – even after interest rates have increased

Loan amount for a typical homebuyer opting for a full interest-only mortgage with variable rate



Note: See box 1 for a description of assumptions. The two series displaying the loan amount without lending rules are based on interest-only mortgages within an LTV of 80 per cent and a second-lien bank loan above an LTV of 80 per cent that is amortised over 10 years. The shorter maturity of the second lien bank loan, compared to the other loans depicted in the analysis, is due to the trend among homebuyers who are opting for a full interest-only loan within an LTV of 80 per cent. These buyers typically have shorter maturities on their second lien bank loan. The golden curve does not correspond to chart 2, which is based on the maximum DSTI until the lending rules become binding, while the golden curve here is calculated for a fixed DSTI of 30 per cent.
Source: Own calculations based on data from the Credit Register and Statistics Denmark.

With low interest rates as in 2020-21, the typical homebuyer with a DSTI of 30 per cent would be able to service the first-year payments corresponding to an interest-only mortgage of around kr. 8 million; cf. chart 5. In practice, the typical

[5] The flat part of the gray curve reflects that the borrower's DTI is the first restriction. Interest rates do not directly affect the DTI, only total debt and income before taxes do (and income is held constant). From the beginning of 2023, the interest rate stress becomes the first restriction due to higher interest rates, cf. chart 1.
[6] The lending rules restricts the borrower in different ways in terms of either restricting loan types or loan size, cf. table 1. To keep things as simple as possible, however, the analysis only considers the first binding rule, regardless of how it restricts the borrower.

homebuyer would borrow a significantly smaller amount, as the first lending rules become binding at a loan amount of kr. 3.6 million; cf. the grey curve.

Over time, the lending rules have been relatively robust in terms of limiting the access to full interest-only mortgages with variable interest rates. Thus, the typical homebuyer with a high DSTI of 30 per cent has been restricted by the rules throughout the period, while even a typical homebuyer with a DSTI corresponding to the median was restricted when interest rates were low, as in 2020-21. After the interest rates have increased, the lending rules do not generally constitute the same restriction in relation to interest-only mortgages. This is mainly because the difference in payment between an interest-only mortgage and a repayment mortgage decreases when interest rates rise.

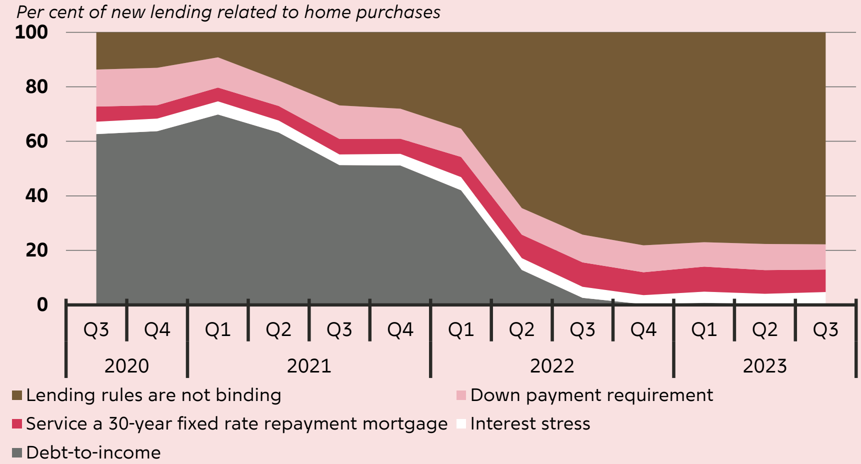
Data for all homebuyers: Higher interest rates have implied that fewer homebuyers with high DSTIs are restricted by the debt-to-income rules

Whereas the previous sections were based on an analysis of a typical homebuyer, the following section is based on data for all homebuyers over the period 2020-23. The starting point is still whether the lending rules will constitute a restriction if the homebuyer chooses a debt service-to-income ratio of 30 per cent. The picture is basically the same as in the analysis of the typical homebuyer: The lending rules restrict fewer homebuyers with a high DSTI today than before; cf. chart 6. In 2020-21, most homebuyers would thus be restricted by one or more lending rules if the chosen loan amount would correspond to a DSTI of 30 per cent. In 2023, on the other hand, only around a quarter of homebuyers with a high DSTI would be restricted by the lending rules.

CHART 6

The debt-to-income rules restricted more homebuyers with a high debt service-to-income ratio before the interest rate increases

First binding lending rule when the loan amount corresponds to a DSTI of 30 per cent



Note: See box 1 for a description of assumptions. The chart is based on data for all homebuyers' incomes and down payments. For each homebuyer, the loan amount corresponding to a DSTI of 30 per cent is calculated. Hence, it is not the DSTI that each homebuyer actually chose. The DSTI calculations assume a 30-year fixed-rate repayment mortgage and a second-lien bank loan above an LTV of 80 per cent with a maturity of 20 years. Debt-to-income includes both the rules in the Executive order on Good Practice for Mortgage Lending as well the Growth Area Guidelines.

Source: Own calculations based on data from the Credit Register and Statistics Denmark.

It is especially the debt-to-income rules that do not constitute the same restriction after interest rates have increased. The down payment requirement as well as the interest rate stress, on the other hand, both constitute a relatively constant restriction for homebuyers with a high DSTI. The relatively constant share of homebuyers that are restricted by e.g., the down payment requirement can be explained by the fact that incomes and down payments do not vary much from quarter to quarter. Accordingly, the share of homebuyers restricted by the down payment requirement at a DSTI of 30 does not vary much over period either.[7] Two factors can explain why the higher interest rates do not imply that more homebuyers become restricted by the interest rate stress or the rule that borrowers should be able to service a 30-year fixed-rate repayment mortgage. On the one hand, higher interest rates imply that the two rules become binding at a lower loan amount. On the other hand, higher interest rates also imply a lower loan amount for the homebuyer opting for a mortgage corresponding to a debt service-to-income ratio of 30 per cent. Hence, increasing interest rates do not necessarily imply that more homebuyers become restricted by either the interest rate stress or the rule requiring borrowers to be able to service a 30-year fixed-rate repayment mortgage, when viewed relative to how rising interest rates affect homebuyers with a fixed budget to pay interest and instalments of 30 per cent of their income.

Not much of a difference between how young and older homebuyers are restricted by the lending rules compared to other homebuyers

The lending rules restrict homebuyers differently because homebuyers have different incomes and wealth. However, all homebuyers share the common experience that the lending rules become more restrictive when interest rates are low, as illustrated in charts 7 and 8. This applies both to first-time buyers under the age of 35 and to homebuyers older than 60.

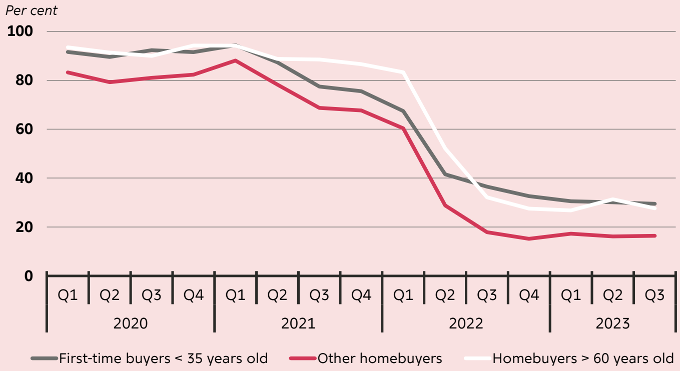
Relatively more homebuyers over the age of 60 are restricted by the lending rules if the loan amount corresponds to a DSTI of 30 per cent.[8] This is mainly because homebuyers older than 60 as a group have a lower income. Accordingly, they will get a DSTI of 30 per cent at a lower loan amount than other homebuyers. However, homebuyers above the age of 60 often borrow less than other groups of homebuyers. Therefore, there is not much of a difference in the extent to which the lending rules bind different groups of homebuyers who have a DSTI corresponding to the median for each group; cf. chart 8. First-time buyers under 35 years with a DSTI corresponding to the median for first-time buyers are more often restricted by the lending rules than the other groups. This is because they tend to have higher DSTIs compared to other homebuyers.

[7] The Credit Register only contains data for loans that have actually been granted and not rejected loan applications. Potential homebuyers who are rejected because of a too low down payment are thus not included in the analysis.
[8] Home equity withdrawals for retired homeowners are exempted from some of the rules under certain requirements, cf. section 4.

CHART 7

Low interest rates imply that the lending rules are more binding across all groups of homebuyers with high DSTIs…

Share of homebuyers restricted by the lending rules at a DSTI of 30 per cent

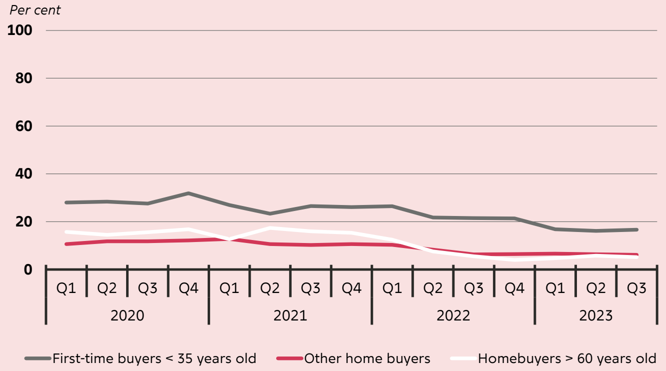


Note: All persons within the household must be a first-time buyer in order for the household to considered a first-time buyer. The age refers to the oldest member of the household.
Source: Own calculations based on data from the Credit Register and Statistics Denmark.

CHART 8

… while they are less binding for homebuyers with lower DSTIs

Share of homebuyers restricted by the lending rules at a DSTI corresponding to the median for the group



Note: See note to chart 7. The median DSTI for first-time buyers under 35 years of age is 20 per cent, 8 per cent for homebuyers older than 60 and 17 per cent for other homebuyers.
Source: Own calculations based on data from the Credit Register and Statistics Denmark.

03

Lower DTIs and higher DSTIs after interest rates have increased

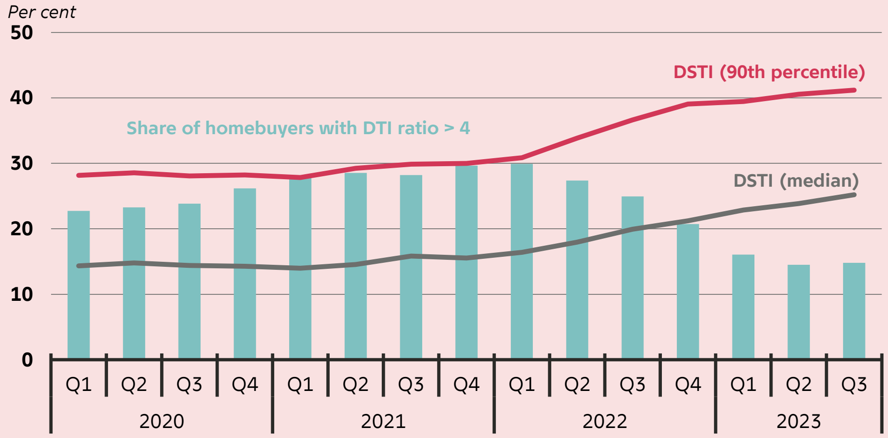
This section highlights the development in some of the variables that are affected by interest rates and lending rules. Where the previous section illustrated that the lending rules generally restrict more homebuyers when interest rates are low, this section describes the development of aggregated variables such as the debt-to-income ratio, the debt service-to-income ratio, etc.

The higher interest rates since 2022 have gone hand in hand with a declining share of homebuyers with a debt-to-income ratio greater than four; cf. chart 9. As a share of total new lending for house purchase, new lending to homebuyers where the total debt exceeded four times the household income before tax, fell from around 30 per cent in 2020-21 to less than 15 per cent in 2023. The decreasing debt-to-income ratios may be a result of debt being more expensive to service. As a result, homebuyers on average tend to borrow less. Also, with a fixed loan amount, the debt-to-income ratio will naturally decease following a decline in housing prices, particularly as wage inflation has remained relatively high during the same period.

CHART 9

Homebuyers spend a larger share of their incomes on servicing their debt

Development of debt service-to-income ratios and share of homebuyers with a high debt-to-income ratio



Note: The chart is based on data for all homebuyers. The median as well as the 90th percentile are therefore higher than the values for the typical homebuyer described in box 1.
Source: Own calculations based on data from the Credit Register and Statistics Denmark.

The higher interest rates have also affected homebuyers' debt service-to-income-ratios. In 2023, homebuyers used a larger share of their disposable income to pay interest and instalments on their housing debt compared to previous years. This applies both to the median homebuyer as well as the 90th percentile. The higher DSTIs can in part, be attributed to lending rules being less of a restriction for homebuyers, when interest rates rise, as discussed previously.

If homebuyers spend a fixed share of their incomes on paying interest and instalments on the housing debt, higher interest rates will imply that they must buy a cheaper home. Instead, the higher observed DSTIs mean that homebuyers have been willing and able to spend a larger share of their incomes on servicing housing debt. The increasing debt service-to-income ratios of homebuyers since 2022 may help to explain why the fall in housing prices in Denmark has been relatively modest since the monetary policy was tightened, cf. e.g. Danmarks Nationalbank (2024).

The higher debt service-to-income ratios as interest rates have increased may, on the one hand, reflect changed preferences among homebuyers regarding the size of debt servicing expenditures as a share of their monthly budget. On the other hand, the higher DSTIs since 2022 may also illustrate that some homebuyers borrowed less during a low interest rate environment than they would ideally have wanted to, because the lending rules would restrict more homebuyers when interest rates were low.[9] Restrictions on the debt-to-income ratios implies, for example, lower DSTIs all else being equal.

Finally, higher DSTIs may also reflect the relatively high price and wage increases since 2022. This is because higher inflation implies that the real value of the debt is eroded faster. High inflation after the debt is originated turns a relatively high DSTI into a smaller DSTI in real terms after a few years, thus making it easier for the homeowner to service the same nominal debt. Homebuyers may therefore be more willing to accept high initial interest burdens in periods of relatively high inflation because the real interest burden is expected to be lower after a few years.

Increasing share of interest-only mortgages with variable rates

The trend of falling debt-to-income ratios and increasing debt service-to-income ratios have coincided with an increasing number of homebuyers who are granted interest-only mortgages with variable rate; cf. chart 10. The proportion of homebuyers with this type of mortgage has thus increased from approximately 10 per cent before the interest rate increases to 15-25 per cent after. The development reflects, on the one hand, that the issuance of mortgages with variable rates has increased, while on the other hand, the total issuance of interest-only mortgages has fallen. The observation that relatively more homebuyers are granted interest-only mortgages with variable rates may reflect that fewer homebuyers have a debt-to-income ratios greater than four. Lower debt-to-income ratios imply that the lending rules are less of a restriction when granting interest-only mortgages with variable rate.

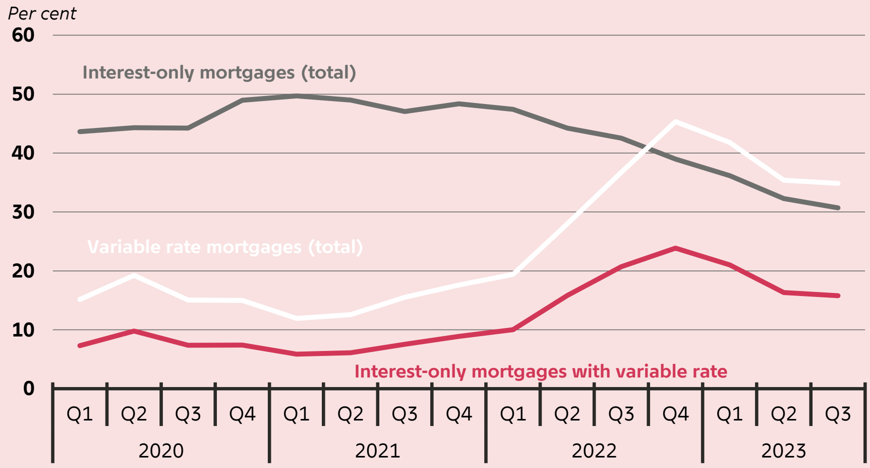
While the issuance of interest-only mortgages with variable rates has increased, the total new lending of interest-only mortgages has fallen. This can be due to several factors. Firstly, the relative difference between the monthly payment on

[9] In addition to lending rules, the relatively low DSTIs during the low interest rate environment may also indicate that homebuyers chose not to borrow as much as the low interest rates would have allowed. Also, credit institutions may have their own limits in terms of DTIs etc. that may be stricter than the lending rules.

an interest-only mortgage and a repayment mortgage decreases when interest rates go up. This may encourage borrowers to choose repayment mortgages to a larger extent. Secondly, instalments are a kind of savings, and when the return on savings increases due to higher interest rates, repayment mortgages become more attractive.

CHART 10

More interest-only mortgages with variable interest rate after interest rates have increased



Note: Data on new lending for home purchases is the sum of bank and mortgage loans. Loans with variable rate include loans with a fixed interest rate of up to 3 years. The figure contains data for all homebuyers.
Source: Own calculations based on data from the Credit Register and Statistics Denmark.

04

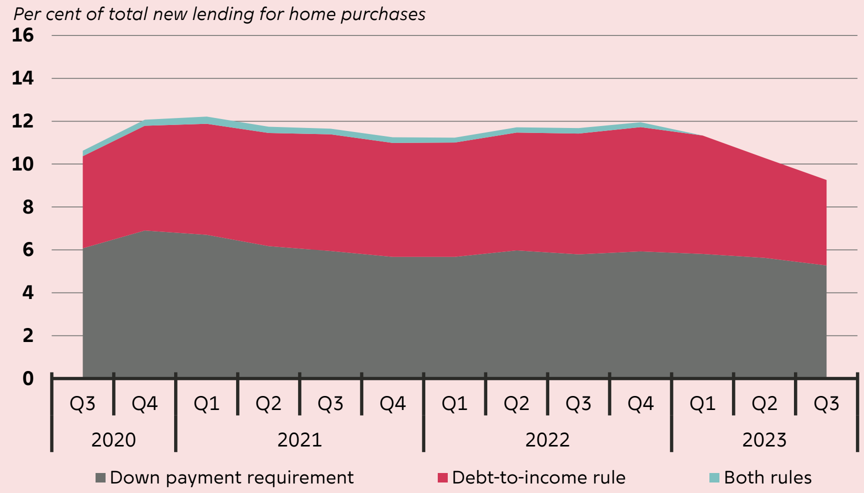
Loans granted above the limits of the rules constitute a relatively constant share

The legal framework provides credit institutions with some flexibility to grant loans even if the limits of the lending rules may be breached. Some of the possibilities to deviate are explicitly mentioned in the set of rules. For example, the credit assessment of older homeowners applying for an interest-only loan to withdraw home equity does not necessarily need to be based on a repayment mortgage. Another example is that the down payment requirement should be "assessed in relation to the specific customer and can be revised both upwards or downwards"; cf. the Danish Financial Supervisory Authority (2023a). A third example is that young customers can be exempted from the DTI rule of Growth Area Guidelines if they have good job prospects and choose a 30-year fixed-rate repayment mortgage. The flexibility of the lending rules differs from the rules in the *Act on Mortgage Loans and Mortgage Bonds*, where the upper LTV-limit for mortgages financed by a mortgage credit institution issuing covered bonds is 80 per cent, regardless of whether an assessment of a specific customer may justify

CHART 11

Steady development of mortgages granted above the limits of the lending rules

Issuance of mortgages for housing purchase granted above the limits of the lending rules



Note: See table 1 for an overview of the lending rules. Four-quarter moving average. The DTI is calculated using incomes from another data source than the Credit Register. Therefore, the share of loans granted above the limits of the lending rules may differ from the credit institutions' reporting. Both series should be interpreted as upper estimates.
Source: Own calculations based on data from the Credit Register and Statistics Denmark.

a higher LTV. [10] However, the two sets of rules have different purposes. The purpose of the *Act on Mortgage Loans and Mortgage Bonds* is to protect bond investors, while the purpose of the lending rules in this analysis is consumer protection etc.

Over the period 2020-23, credit institutions have granted a relatively constant share of loans beyond the limits of the down payment requirement and the DTI rules; cf. chart 11.[11] Thus, around 9-12 per cent of the total new lending for home purchases was issued to homebuyers with either a low down payment or a high DTI and a loan type not permitted according to the rules in the Order on Good Practice for Mortgage Lending. There has been a downward trend in 2023, reflecting fewer home purchases resulting in a DTI ratio greater than four.[12]

Issuing loans beyond the limits of the lending rules does not necessarily imply that the lender does not comply with the rules, cf. the flexibility of the rules. The relatively constant share of deviations over time may indicate that credit institutions have had the same approach to the granting of loans both before and after the interest rate increases. Hence, the higher interest rates do not seem to have changed this part of the credit policy.

First-time buyers and homebuyers with low incomes are more often granted loans beyond the limits of the lending rules

Some groups of homebuyers are on average more likely to be restricted by the lending rules than other groups. A statistical model can illustrate which groups that are more likely to be granted a loan beyond the limits; cf. table 2. The table shows characteristics of homebuyers that are more frequently granted loans beyond the limits of the lending rules. A positive sign means that the variable is associated with a higher frequency when the other variables are taken into account. As in chart 11, only the down payment requirement and the rule are considered.

Table 2 shows that lenders more often grant loans beyond the limits of the lending rules to first-time buyers, who make up 65 per cent of the homebuyers beyond the limits of the rules and 41 per cent below. Younger homebuyers as well as homebuyers with relatively low incomes and low gross wealth are also more frequently approved for loans exceeding the limits. These groups may experience higher income growth after buying a home which may justify why credit institutions approve loans even if some limits in the lending rules are exceeded. The negative sign of income and gross wealth may indicate that homebuyers with higher incomes and assets have less need to borrow up to the limit. The flexibility in the lending rules is thus used to accommodate homebuyers with relatively low incomes, which is in line with the rules' legal basis in the consumer protection legislation.

[10] Underwriting fees etc. can be included in the mortgage above an LTV of 80 per cent and the LTV at origination may thus be slightly higher. The 80 per cent LTV limit only applies to mortgage credit institutions, whereas traditional banks can issue loans with a higher LTV.
[11] Only the down payment requirement and the DTI rules are shown, as the remaining rules do not have a numerical threshold in the same way as e.g., DTI > 4 or down payment > 5 per cent. The other rules are based on an "assessment of the specific customer".
[12] The calculations should be interpreted as upper estimates; cf. the note to chart 11. The DTI is, e.g., calculated using data at loan origination. Homebuyers with salary increases within the year of house purchase thus enter the data with an income that is lower than what the bank can use in the credit assessment. If using income data for the year after the home purchase, the estimated share of loans granted beyond the limits of the rules declines but the constant trend over time remains the same.

TABLE 2

Characteristics of homebuyers that are granted loans beyond the limits of the lending rules

Variable	Probability of granting loans beyond the limits	Average beyond limits	Average below limits
First-time buyer	+	65 per cent	41 per cent
Household income	-	Kr. 708,000	Kr. 811,000
Household gross wealth	-	Kr. 129,000	Kr. 789,000
Household with two adults	+	70 per cent	69 per cent
Number of children living at home	+	0.68	0.63
Age of oldest member of the household	-	36	44
Grater Copenhagen and Aarhus	+	32 per cent	29 per cent
Smaller municipalities	+	53 per cent	54 per cent
Number of observations	*155,749*	*14,306*	*141,443*

Note: The first column shows the signs of the parameter estimates in a logistic regression, where the dependent variable is a dummy for whether a loan has been granted to a homebuyer even if the limits in relation to the down payment requirement or the DTI rule are breached; cf. table 1. The variables are all statistically significant at 5 per cent level of significance. The sign of the geographical variables should be seen in relation to the reference group, which is larger provincial cities. The second and third column show descriptive statistics for the average of homebuyers that have been granted a loan either above or below the limits of the lending rules. First-time buyers are defined as homebuyers where all adults liable for the mortgage are first-time buyers.
Source: Own calculations based on data from the Credit Register and Statistics Denmark.

Homebuyers in households consisting of two adults, generally have a higher probability of getting a loan beyond the limits of the lending rules, all other things being equal. Likewise, a higher probability is associated with having more children living at home. However, there is not much difference between the average family size across homebuyers who are granted a loan beyond the limits and those who are not; cf. the second and third column.

There are also geographical differences in how credit institutions grant loans beyond the limits of the lending rules. All else being equal, the frequency is greater for home purchases in Greater Copenhagen and Aarhus as well as in municipalities outside the larger cities. Conversely, the probability is correspondingly lower in the larger provincial cities, which are the reference group in the regression. However, there are no large geographical differences in loans that have been granted above or below the limits of the loan regulations.

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Danmarks Nationalbank
Langelinie Allé 47
2100 Copenhagen Ø
+45 3363 6363

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