Danish Families' Financial Robustness, Variable Rates and Deferred Amortisation

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INTRODUCTION AND SUMMARY

The far higher gross debt-to-income ratio of Danish families compared with families in other countries has attracted considerable attention among international organisations, credit rating agencies and a number of observers. In a report from November 2012, the European Commission (2012) describes the level of family indebtedness as unsustainable, and in the press release from Fitch credit rating agency, in which it affirms Denmark at AAA – Fitch (2012) – the level of family indebtedness is referred to as exceptional. As a counterpart of the substantial debt, Danish families also hold considerable assets, not least in the form of individualised pension wealth. Concerns have been expressed about families' ability to service their debt in the event of rising interest rates or higher unemployment, the considerations being that the families with large debt are not necessarily the ones that hold substantial assets.

In continuation of a previous article on the wealth and debt of Danish families, cf. Andersen et al. (2012), the possible threat to financial stability in Denmark from the income and debt of Danish families is examined at family level. The families' overall balance sheet is good and has contributed to Denmark's current-account surpluses for many years.

The main conclusion is that the threat to financial stability from Danish families' debt and debt structure is limited. The assessment is based on the share of the debt held by families with particularly tight personal finances, among other factors. Indeed, the credit institutions have suffered only moderate losses on private customers in recent years.

Most families have robust finances and, if they reduce consumption or savings, are resilient to negative events such as a strong increase in interest rates or a protracted period of unemployment, although this may entail considerable lifestyle changes. This assessment does not take into positive account that a rise in interest rates is very likely to go hand in hand with an economic recovery and hence better opportunities for families to increase their income by seeking further employment. Moreover, most families by

far have a buffer of liquid assets, which can, in most cases, cover the additional costs of interest-rate increases for more than one year.

This article contains a detailed analysis of the number of families that will encounter financial problems in the event of interest-rate increases, unemployment or expiry of the deferred-amortisation period, and whether this will entail losses on lending by credit institutions. The basis of the sensitivity analysis is how the individual family's income after tax, interest and redemptions and fixed expenditure, i.e. the disposable amount, changes if interest rates increase by 5 percentage points, or in the event of higher debt redemptions or a temporary loss of income due to a period of three or six months' unemployment for the family's principal earner. It is calculated whether the disposable amount is large enough to sustain an average budget or a tight budget, respectively, and the changes in the disposable amount are broken down. Disregarding the calculations of the consequences of a temporary loss of income, the family's income is regarded as fixed in the analysis.

The families whose disposable amounts become insufficient represent a risk of default for the credit institutions. Whether the end result is default and possibly enforced sale, depends on the family's scope for e.g. cutting down their consumption further or divesting assets. In the event of enforced sale, the credit institutions' losses depend on the sales price of the assets that may have been pledged as collateral for the loans, cf. the analysis in Danmarks Nationalbank (2012).

In the analysis, special focus is on the loan types raised by Danish families from the mortgage banks. No such previous analysis exists at detailed level. Families who have raised mortgage loans with deferred amortisation tend to have had higher debt than other families before raising the mortgage loan. Moreover, they tend to raise larger loans and generally, they do not compensate for this by otherwise saving up.

Specifically, the degree to which families with deferred amortisation use it to reduce other, and often more expensive, debt is examined. This happens, but is not common. Families with deferred amortisation clearly tend to have lower savings than families with amortisation.

As a result of the combination of falling house prices and the fact that mortgage banks have often granted loans with deferred amortisation up to the limit of 80 per cent of the market value of a home, a large share of these loans now exceed 80 per cent of the market value. This applies to around half of the loans with deferred amortisation.

Loans with deferred amortisation pose a serious problem in that they are efficient only in periods of rising house prices. This is probably reflected in some mortgage banks bringing an end to granting loans with deferred amortisation at up to 80 per cent of the value of the home.

THE DATA APPLIED

This article applies new, detailed data. The mortgage banks have made data on all lending to private individuals available to Danmarks Nationalbank and the Ministry of Business and Growth, among others. In anonymised form, this information has been pooled with income, tax and wealth data from Statistics Denmark's income and population data registers at individual level and then aggregated, using the family as the economic unit. Box 1 contains a statistical definition of a family.

For each mortgage loan, the data provided by the mortgage banks shows the original principal, disbursement date, maturity, number of due dates per year, any interest-rate adjustment period and proportion of the loan subject to interest-rate adjustment and interest cap, if any. Moreover, the mortgage banks have provided information on remaining maturity, remaining debt, current interest rates, the latest administration margin, any arrears on the loan, any start and end dates for the most recent period of deferred amortisation and any access to deferred amortisation in the future. On the basis of this information, the individual mortgage loans can be classified as fixed-rate or variable-rate loans and loans with or without deferred amortisation. It is possible to calculate redemptions and interest payments.

The data also includes the mortgage banks' valuation of the loan-to-value, LTV, ratios for the properties pledged as collateral for the respective loans. The mortgage banks use different property valuation

DEFINITION OF A FAMILY — Box 1

The analyses in this article are based on Statistics Denmark's definition of "E-families". According to this definition, a family consists of one or two adults and any children living at home. Two adults are regarded as members of the same family if they live together and meet at least one of the criteria below:

- They are spouses or registered partners
- They have at least one joint child registered in the Civil Register (CPR)
- They are of opposite sex with an age difference of less than 15 years, are not close relatives and live in a household with no other adults.

Adults living at the same address who do not meet at least one of the above criteria are regarded as members of different families.

Children living at home are regarded as members of their parents' family if they are under the age of 25, live at the same address as at least one of their parents, have never been married or in registered partnership and have no children registered in CPR.

Given these criteria, a family may consist of two generations only. If there are more than two generations living at the same address, the family consists of the two youngest generations together.

DANISH FAMILIES' ASSETS AND LIABILITIES Box 2

Family gross debt consists of all debt items appearing in Statistics Denmark's personal income register. It includes debt to banks and mortgage banks, the Mortgage Bank of the Kingdom of Denmark, financing companies and municipalities as well as debt related to credit cards and mortgage deeds. Gross debt does not include private debt. The gross debt ratio is given as gross debt divided by income after tax.

Family assets consist of bank deposits, the market value of stocks and bonds as well as mortgage deeds in custody accounts. Moreover, the value of real property is included in some analyses while excluded in others. Whether it is included is specified in the text and in the notes for the individual Charts. The value of real property has been calculated at an approximated market price, as described in Andersen et al. (2012). Pension wealth is not included in family assets.

A family's net wealth is the difference between the value of its total assets (with or without real property) and its gross debt. The family's net wealth ratio is net wealth divided by income after tax.

For a number of assets information is not available. Cash holdings, the value of the family's durable consumer goods, including cars, boats, household effects and art, and the value of private cooperative housing are not included, whereas any debt accumulated for acquisition of these goods is included. This reflects that most income and wealth data stems from the individual family members' notices of assessment, which do not include these items.

methods. The methods are approved by the Danish Financial Supervisory Authority. All variables have been calculated at year-end for the years 2009, 2010 and 2011.

Data from Statistics Denmark is derived from the personal income and population registers. The personal income register is mainly based on data from the Danish tax authority, SKAT, on private individuals' income, tax, wealth and debt. The population register makes it possible to link this information to a number of socioeconomic variables. This data covers the period from 2002 to 2010.

For some families, the registered income after tax is zero or negative. Since income is a key variable in the analyses below, only families with an annual income after tax of at least kr. 25,000 are included. The families thus excluded are dominated by the very young. Moreover, families where the main source of income of at least one member is self-employment or employment as an assisting spouse are excluded.[1] All adults in the family must be fully liable to income tax in Denmark in order for the family to be included in the analysis.

In addition, the analysis of families with mortgage debt is limited to families whose mortgage loans are based on owner-occupied homes or

[1] A self-employed person is the sole proprietor of a firm, the profit of which is higher than the sum of that person's wages, old-age pension or early retirement pension.

AGGREGATED DATA FOR ALL FAMILIES AND FAMILIES WITH MORTGAGE LOANS, 2010 Table 1

	All families			Families with mortgage loans		
	Number of families	Share of liabilities, per cent	Share of assets, per cent	Number of families	Share of liabilities, per cent	Share of assets, per cent
All families	2,837,195	100.0	100.0	1,076,142	100.0	100.0
Families with self-employed	166,713	24.6	22.2	95,570	18.5	17.9
Families without full tax liability	54,724	0.4	0.4	3,856	0.4	0.4
Families with income after tax of less than kr. 25,000	74,661	2.4	1.7	5,667	1.5	1.2
Families without self-employed, with full tax liability and income after tax of at least kr. 25,000	2,570,518	74.3	76.8	973,459	80.5	81.3

Note: Families with self-employed members are defined as families in which at least one of the adult members can be classified as self-employed or assisting spouse. Families without full tax liability are defined as families in which at least one of the adult members has less than full tax liability in Denmark. Pension wealth is not included in the assets, but housing wealth is included.
Source: Mortgage banks, Statistics Denmark and own calculations.

summer cottages as collateral. Where several private individuals are liable for the same mortgage loan, equal liability is assumed. The analyses also assume joint and several liability among family members.

In order to obtain a comprehensive overview of Danish families' assets and liabilities, the families' gross debt, total assets, net wealth and net wealth ratios are examined. They are described in Box 2.

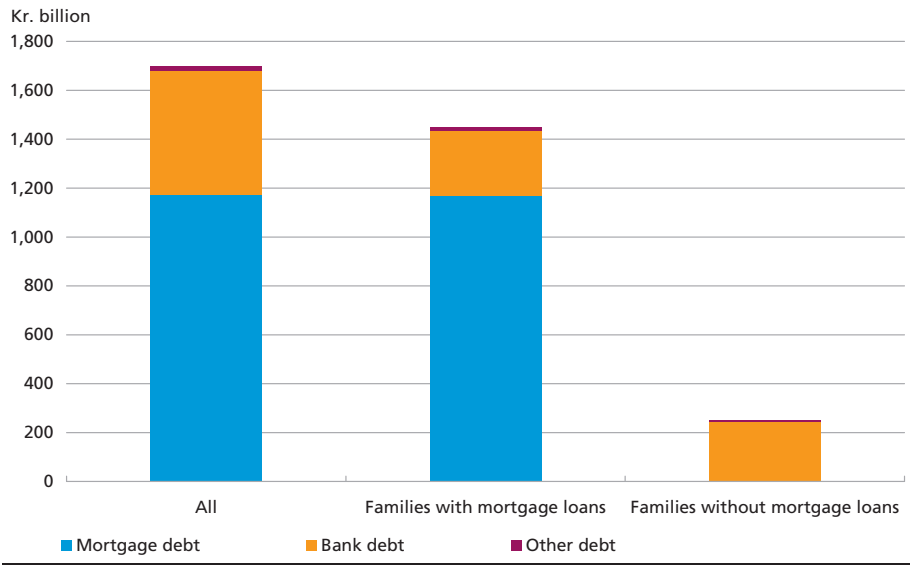
The analysis for 2010 relates to just over 90 per cent of both the whole population and the share of families with mortgage debt, cf. Table 1. In terms of income, these families cover just under 90 per cent of all families' total incomes as well as total incomes of families with mortgage debt.

DEBT STRUCTURE

Just over two thirds of the families' total debt is mortgage debt, just under one third is bank debt, while debt to other creditors represents only just over 1 per cent. Out of the 2.6 million families included in the study, around 38 per cent had mortgage debt in 2010. These families account for 85 per cent of the families' total debt, cf. Chart 1.

By tradition, mortgage loans in Denmark have been fixed-rate loans with amortisation, most often annuity loans. But product development and liberalisation over the last 10-15 years have enabled borrowers to raise variable-rate loans and loans with deferred amortisation. Since these loan types provide more flexibility, they can improve the family's

TOTAL FAMILIY DEBT, 2010 Chart 1



Note: Other debt includes all calculated debt other than debt to mortgage banks and banks.
Source: Mortgage banks, Statistics Denmark and own calculations.

welfare. Deferred-amortisation loans can thus make it easier to obtain higher consumption than would otherwise have been the case when younger, and spend the savings later in life. At the same time, the new loan types expose the families to other risks than previously.

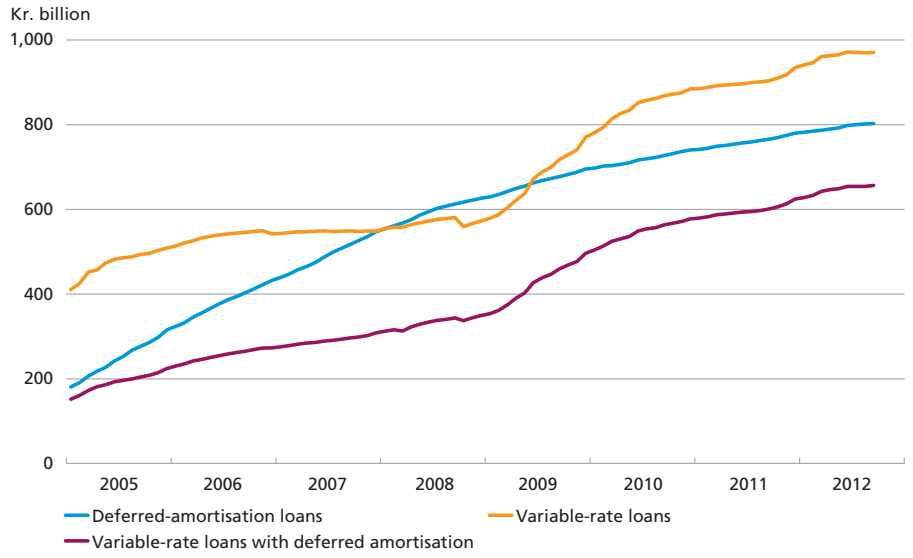
A key factor for a loan to work as intended is that the borrower actually understands and has insight into the consequences and risks associated with the individual loan types. This applies especially to the risks associated with future income and interest-rate and property-price developments. Borrowers who have raised mortgage loans on the basis of excessively optimistic expectations could make themselves vulnerable in the event of loss of income, rising interest rates or expiry of the deferred amortisation period.

The new mortgage loan types have gained considerable ground in recent years, cf. Chart 2. From the 1st quarter of 2005 to the 3rd quarter of 2012, the share of variable-rate loans out of total lending by mortgage banks thus rose from 46 per cent to 68 per cent. During the same period, deferred-amortisation loans rose from 20 per cent to 56 per cent of total mortgage lending.

Previous analyses indicate that some families have used the lower repayments of deferred-amortisation loans and variable-rate loans to raise larger loans than they would otherwise have done, cf. Danmarks Nationalbank (2011). Other analyses indicate that a considerable part of the increase in property prices until 2008 was driven by the introduction

MORTGAGE LOANS FOR OWNER-OCCUPIED HOMES AND SUMMER COTTAGES

Chart 2



Note: "Deferred-amortisation loans" cover both fixed-rate and variable-rate loans with deferred amortisation. "Variable-rate loans" cover variable-rate loans with and without deferred amortisation.
Source: Danmarks Nationalbank.

of deferred-amortisation loans, among other factors, cf. Dam et al. (2011).

At end-2010, most families had only one type of mortgage loan, cf. Table 2. Fixed-rate loans with amortisation and variable-rate loans with deferred amortisation – i.e. the safest and most risky types – are the most popular types of mortgage loans. The number of families whose entire mortgage debt consists of traditional fixed-rate debt with amortisation is slightly higher than the number of families whose entire mort-

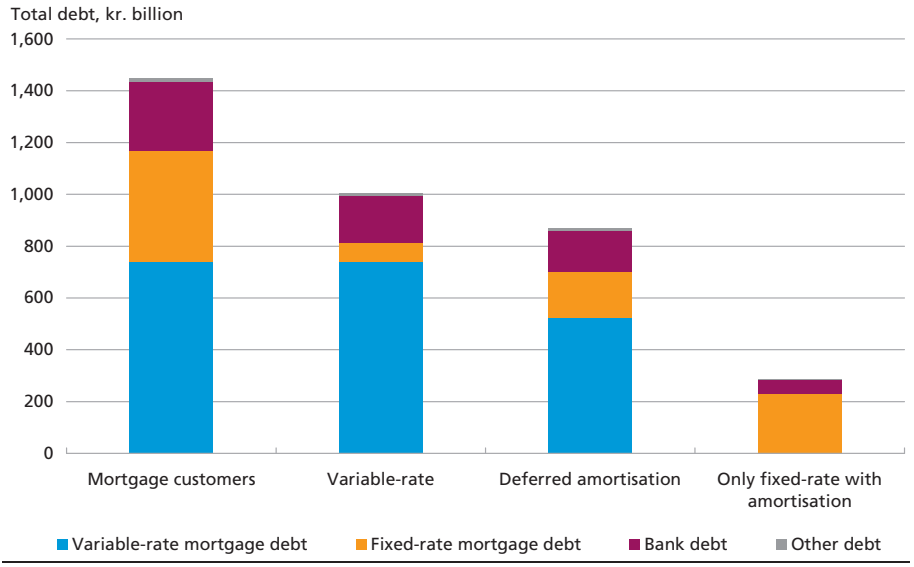
NUMBER OF FAMILIES WITH MORTGAGE DEBT BROKEN DOWN BY LOAN TYPE, 2010

Table 2

Number of families	All mortgage debt is this loan type	Part of the mortgage debt is this loan type	No mortgage debt of this loan type
Variable-rate loans with amortisation	173,744	82,705	717,010
Variable-rate loans with deferred amortisation	269,242	78,519	625,698
Fixed-rate loans with amortisation	301,990	82,799	588,670
Fixed-rate loans with deferred amortisation	93,493	36,067	843,899

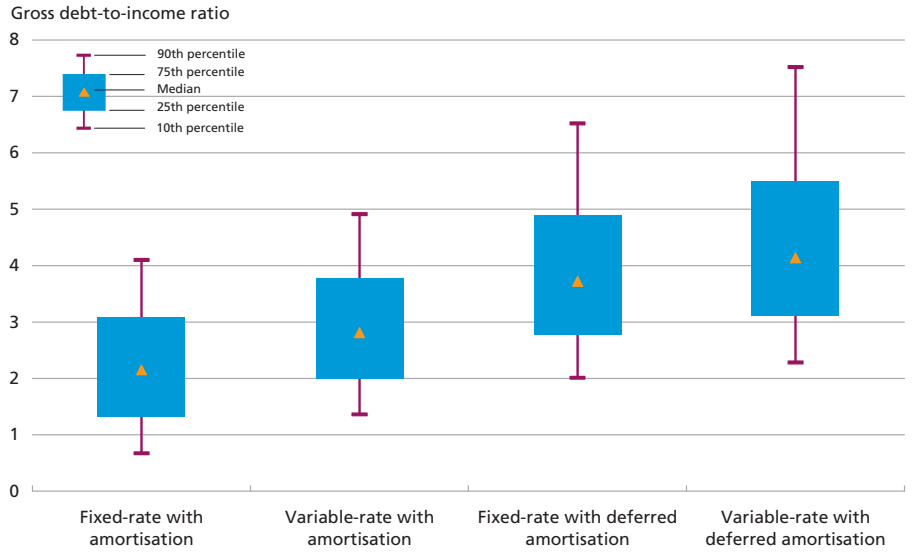
Source: Mortgage banks, Statistics Denmark and own calculations.

TOTAL FAMILY DEBT BROKEN DOWN BY LOAN TYPE, 2010 Chart 3



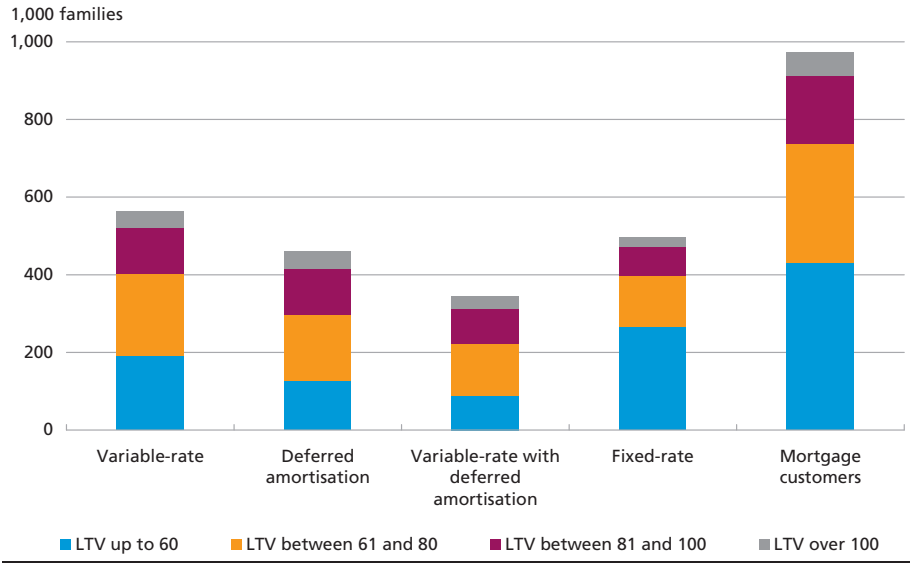
Note: The "variable-rate" and "deferred amortisation" bars, respectively, include all families with at least one variable-rate mortgage loan and at least one deferred-amortisation mortgage loan, respectively. The "only fixed-rate with amortisation" bar solely includes families whose *entire* mortgage debt is fixed-rate loans with amortisation. Other debt includes all other debt than mortgage bank and bank debt.
Source: Mortgage banks, Statistics Denmark and own calculations.

GROSS DEBT-TO-INCOME RATIO BROKEN DOWN BY LOAN TYPE, 2010 Chart 4



Note: The Chart includes only families whose *entire* mortgage debt consists of one loan type.
Source: Mortgage banks, Statistics Denmark and own calculations.

REMAINING DEBT RELATIVE TO PROPERTY VALUE BROKEN DOWN BY LOAN TYPE, 2010 Chart 5



Note: The LTV ratios state the remaining debt as a ratio of the value of the property pledged as collateral for the loan measures in per cent. Property valuations are the mortgage banks' valuations as at end-2010. If a family has loans in several properties, *only* the loans in the property with the highest LTV ratio are included in the Chart. The loan type categories include all families with at least one loan of the type in question. The same family may therefore appear in several of the above categories if it has several loans in the same property. The category "mortgage customers" thus does not equal the sum of the other categories.

Source: Mortgage banks, Statistics Denmark and own calculations.

gage debt is variable-rate debt with deferred amortisation, but the latter group has higher total debt. Slightly less than half of all families with mortgage debt have variable-rate mortgage debt only, while 41 per cent has fixed-rate debt only. 37 per cent of all families have opted for deferred amortisation on their entire debt, and 28 per cent have chosen variable rates with deferred amortisation for their entire debt. The families with variable-rate loans and/or deferred amortisation account for more than half of mortgage borrowers.

On average, families with variable-rate loans and/or deferred amortisation are liable for a larger share of the total debt compared with families who choose only fixed-rate mortgage loans with amortisation, cf. Chart 3. This relationship between loan types and the amount of debt raised is also reflected in debt as a ratio of disposable income, cf. Chart 4.

Variable-rate mortgage loans and/or loans with deferred amortisation are especially popular among families with large loans relative to the property value, cf. Chart 5.

The mortgage banks are more exposed to families with variable-rate loans and deferred-amortisation loans than to families with fixed-rate

loans with amortisation. Given the higher LTV ratios, this will, all else equal, increase the probability of losses for the mortgage banks if the families' ability to pay deteriorates. Since variable-rate mortgage loans entail an interest-rate risk and borrowers with deferred amortisation do not reduce their debt on an ongoing basis, the new loan types are taken to be more risky than the traditional ones.

FAMILIES WITH MORTGAGE LOANS WITH DEFERRED AMORTISATION

The age structure among families with deferred-amortisation mortgage loans differs from that of other families with mortgage debt, cf. Table 3. For families whose oldest member is less than 40 years old and families with members over 65 years, deferred amortisation loans account for a larger share of total debt than for other families. These differences are not surprising. Families in the 40-59 age group often have high incomes and typically repay previously raised debt and really accumulate pension savings at that stage of life.

The share of old-age pensioners and early retirement benefit recipients is higher among families with deferred-amortisation mortgage debt, cf. Table 4. Moreover, families with deferred-amortisation loans are overrepresented in the Greater Copenhagen area. As regards other characteristics, there is little difference between families with and without deferred amortisation.

The income distribution among families with deferred-amortisation loans is characterised by greater dispersion than the income distribution

NUMBER OF FAMILIES WITH MORTGAGE LOANS BROKEN DOWN BY AGE GROUP, 2010 Table 3

Oldest family member	Families with deferred-amortisation loans	Families with loans with amortisation only	Total
15-24 years	4,634	3,178	7,812
25-29 years	20,537	15,279	35,816
30-34 years	41,346	32,986	74,332
35-39 years	55,208	54,045	109,253
40-44 years	55,263	65,027	120,290
45-49 years	53,086	72,955	126,041
50-54 years	43,719	69,196	112,915
55-59 years	39,636	65,180	104,816
60-64 years	44,847	56,058	100,905
65-69 years	44,142	36,279	80,421
70-74 years	28,292	18,892	47,184
75-79 years	16,516	11,545	28,061
80+ years	13,128	12,485	25,613
Total	460,354	513,105	973,459

Source: Mortgage banks, Statistics Denmark and own calculations.

CHARACTERISTICS OF FAMILIES WITH AND WITHOUT DEFERRED-AMORTISATION MORTGAGE LOANS, 2010 Table 4

Percentage of families	Families with deferred-amortisation loans	Families with loans with amortisation only
With two adult members	70.9	74.5
With children	43.5	44.0
With children aged 10 or below	27.4	24.2
At least one member in education programme	1.0	0.6
At least one member in old-age retirement or early retirement	23.6	17.2
At least one member is a recipient of social benefits or social pension benefits	5.9	6.8
At least one member has tertiary education	13.9	12.7
All adult members are unskilled	11.9	12.5
Resident in the Capital Region of Denmark	28.8	22.9
Resident in the Central Denmark Region	22.5	23.7
Resident in the North Denmark Region	10.2	12.3
Resident in Region Zealand	18.2	16.6
Resident in the Region of Southern Denmark	20.3	24.5

Source: Mortgage banks, Statistics Denmark and own calculations.

among other families. In 2010, there was a considerably larger share of families with family income after tax of less than kr. 300,000 among the families with deferred-amortisation loans. On the other hand, this group also included a slightly higher share of families with family income after tax of more than kr. 800,000. Naturally, the differences in income distribution should be viewed in light of the different age structures of the two groups of families. Accounting for the different age structures, the two groups' average family incomes after tax do not differ substantially.

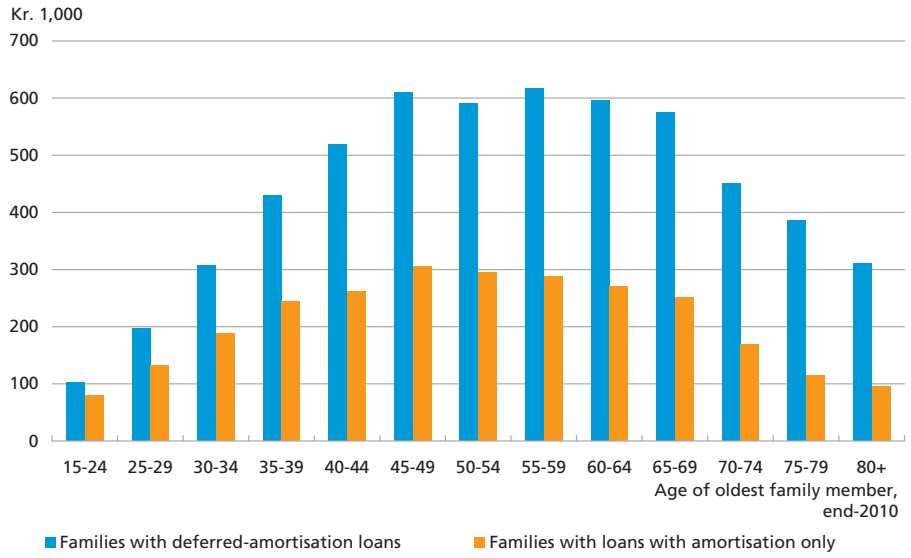
Gross debt among families with deferred-amortisation loans

Mortgage loans with deferred amortisation were introduced in 2003. The following sections compare the behaviour regarding indebtedness and savings for the group of families with deferred-amortisation loans and the group of families paying redemptions on all of their mortgage loans. In order to obtain an accurate picture, the focus is solely on families who raised at least one mortgage loan in the period 2003-10.

On average, the gross debt is higher for families with deferred-amortisation loans than for other families. The share of families with a gross debt ratio of more than 500 per cent is thus markedly larger for families with deferred-amortisation loans than for other families irrespective of age.

The higher gross debt among families with deferred-amortisation mortgage loans is driven by at least one of the following three factors: Families with deferred-amortisation loans may have repaid a smaller

AVERAGE GROSS DEBT BEFORE RAISING THE FIRST MORTGAGE LOAN Chart 6



Note: The Chart shows the average gross debt at the beginning of the year in which the family raised its most recent mortgage loan. The Chart includes only families without mortgage debt at the beginning of that year. Only families who raised mortgage loans in the period 2003-10 are included.
Source: Mortgage banks, Statistics Denmark and own calculations.

share of their debt in the period between the year of raising the debt and 2010; families with deferred-amortisation loans may have raised larger mortgage loans; or families with deferred-amortisation loans may have had larger debt before raising the mortgage loans.

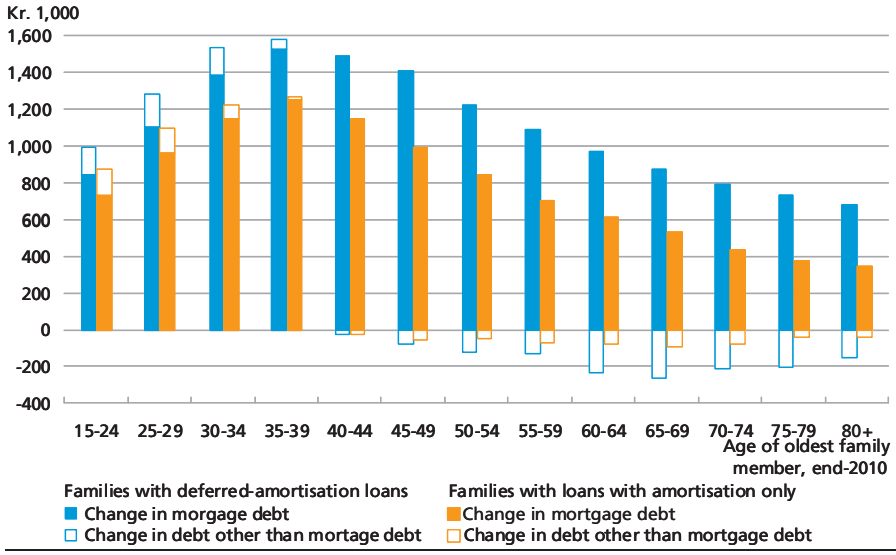
Families who opted for deferred amortisation on their mortgage loans in 2010 on average had larger debt than other families with mortgage debt already before they raised their first mortgage loan, cf. Chart 6.[1] This difference is seen in all age groups, and in most cases it is around kr. 200,000-300,000.

On average, families with deferred-amortisation loans also experienced stronger increases in debt than other families during the year of raising their first mortgage loan, cf. Chart 7. This difference is seen in all age groups, peaking for the 45-49 age group at approximately kr. 400,000. This is a clear indication that families with deferred-amortisation loans have raised larger mortgage loans than other families with mortgage debt.

[1] The focus here is solely on families with no mortgage debt at the beginning of the year of raising their most recent mortgage loan. For these families, the year of raising their most recent mortgage loan is taken to be the year of raising their first mortgage loan. Only families who have raised mortgage loans in the period 2003-10 are included. The calculations are thus based on around 111,000 families, of whom just over half opted for deferred amortisation in 2010. Naturally, this group may include a few families with previous mortgage loans that have been repaid in full. This number is very low, however, probably among older families, so it has no impact on the overall picture.

AVERAGE CHANGE IN GROSS DEBT DURING THE YEAR OF RAISING THE FIRST MORTGAGE LOAN

Chart 7



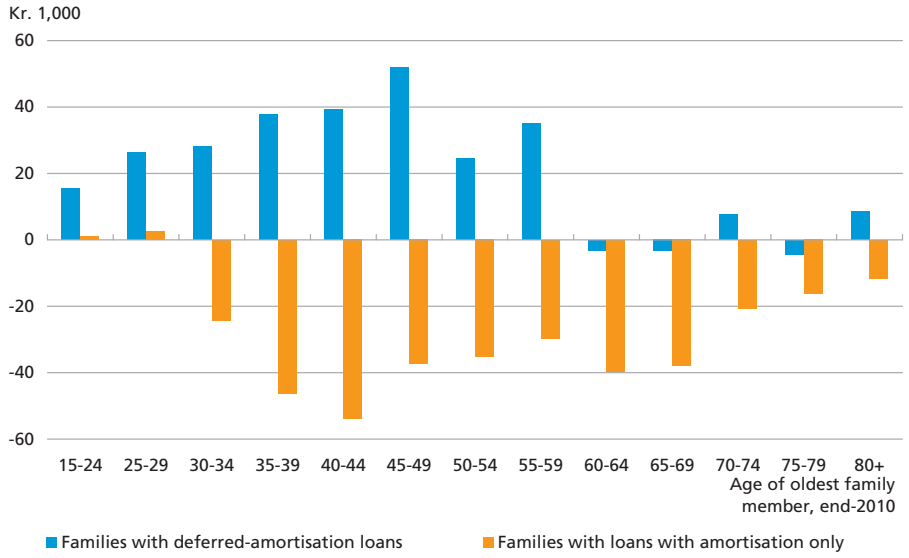
Note: The Chart shows the average change in gross debt from the beginning of the year in which the family raised its most recent mortgage loan until the end of that year. The Chart includes only families without mortgage debt at the beginning of that year. Only families who raised mortgage loans in the period 2003-10 are included. Changes in debt other than mortgage debt cover both bank debt and debt to creditors other than banks and mortgage banks.

Source: Mortgage banks, Statistics Denmark and own calculations.

Finally, the development in average gross debt from the year of raising the debt to 2010 differs considerably for the group of families with deferred-amortisation loans relative to other families with mortgage debt, cf. Chart 8. This difference is most pronounced for the age groups up to 59 years: While the average family in the group of families without deferred-amortisation loans reduced their debt during these years, the average gross debt was increased in families with deferred-amortisation loans. In the older age groups, the average gross debt in families with deferred-amortisation loans was relatively unchanged.

Therefore, the gross debt was markedly higher, on average, for families with deferred-amortisation loans than for families without deferred-amortisation loans. This difference is most pronounced in the 45-49 age group, where it amounts to around kr. 780,000. Of this amount, up to kr. 390,000 is attributable to the size of the first mortgage loan, while approximately kr. 300,000 can be attributed to families with deferred-amortisation loans having larger debt than other families before raising their first mortgage loan. The remaining kr. 90,000 can be explained by further indebtedness on the part of families with deferred-amortisation loans since raising the first loan, while other families have reduced their debt.

AVERAGE CHANGE IN GROSS DEBT FROM YEAR OF RAISING THE FIRST MORTGAGE LOAN UNTIL 2010 Chart 8



Note: The Chart shows the average change in gross debt from the year in which the family raised its most recent mortgage loan until 2010. The Chart includes only families without mortgage debt at the beginning of the year of raising the debt. Only families who raised mortgage loans in the period 2003-10 are included.
Source: Mortgage banks, Statistics Denmark and own calculations.

Net debt among families with deferred-amortisation loans

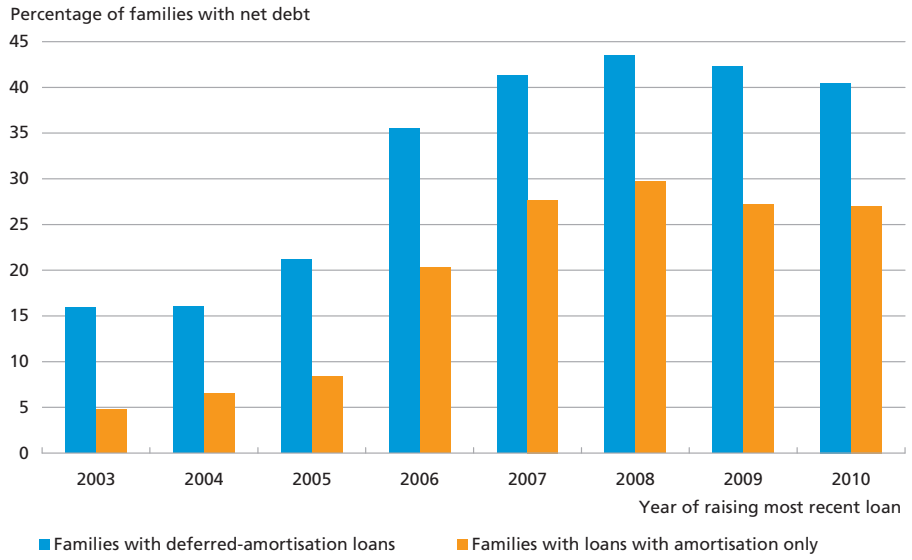
In order to obtain a more accurate picture of Danish families' finances, it is also important to look at the families' assets and the difference between assets and debt, i.e. net wealth. At the end of 2010, 37 per cent of the families with deferred-amortisation loans had net debt, while debt exceeded assets (including housing wealth) for only 19 per cent of the families who pay redemptions on their mortgage debt.

As a result of property price hikes until 2007 and subsequent declines, the size of the net debt is connected to when the family bought its first home. Families who raised mortgage loans for house purchase while property prices were peaking, will generally have seen a decrease in the value of their homes, while the market value of their debt has remained unchanged. Consequently, many of these families have net debt. Since deferred-amortisation loans have gradually increased in popularity, these loans have generally been raised later than other loans. This might distort the comparison of net debt between families with and without deferred amortisation.

Consequently, the frequency of net debt in families with deferred amortisation is compared with the frequency of net debt in other families with amortisation who have raised their most recent mortgage loan in the same year, cf. Chart 9. In general, the frequency of net debt is

NET DEBT IN 2010 BROKEN DOWN BY YEAR OF MOST RECENT RAISING OF LOAN

Chart 9



Note: Only families who raised mortgage loans in the period 2003-10 are included. Assets are calculated including housing wealth, but excluding pensions.

Source: Mortgage banks, Statistics Denmark and own calculations.

CORRELATION BETWEEN DEFERRED AMORTISATION AND NET DEBT IN 2010 – TO BE CONTINUED

Box 3

On average, the net debt is higher or the net wealth smaller for families with deferred amortisation than for other families with mortgage debt.[1] As mentioned previously, the group of families with deferred amortisation includes a higher number of younger families, whose income level tends to be slightly higher than that of families of the same age with other mortgage debt. Since the size of the net debt varies systematically with both age and income, it is relevant to allow for these differences between the two groups. For this purpose, the following linear regression model is estimated:

$$Net\ debt_i = \beta_0 + \beta_1 \cdot deferred\ amortisation_i + x_i\delta + \varepsilon_i$$

where *Net debt*$_i$ is the net debt in kroner for family *i* at the end of 2010, *deferred amortisation*$_i$ is a dummy variable indicating whether family *i* opted for deferred amortisation in 2010, and $\mathbf{x}_i$ is a vector of control variables for age, income and year of raising the most recent mortgage loan. Dummy variables are included for each age group in order to take the non-linear relationship between age and net debt into account. In the same way, income is adjusted by including dummy variables for seven different intervals for family income after tax. Finally, dummy variables for the years 2003-10 are included, where the value of each variable is 1, if the family's most recent mortgage loan was raised in the year in question.[2]

CORRELATION BETWEEN DEFERRED AMORTISATION AND NET DEBT IN 2010 – CONTINUED Box 3

Estimation of the model results in a positive coefficient for the dummy variable for deferred amortisation, cf. the Table below. This means that families with deferred amortisation in 2010 tend to have higher net debt than other homeowner families in the same age and income groups who raised their most recent mortgage loans in the same year. The average difference across all age and income groups and years of raising the loan is around kr. 300,000. The difference is highly statistically significant.

LINEAR REGRESSION MODEL FOR FAMILY NET DEBT IN 2010

Variable	Coefficient estimate	Standard error
Deferred amortisation in 2010	298,367	3,754
Age of oldest family member		
15-24 years	-121,266	19,952
25-29 years	110,836	10,363
30-34 years	178,668	7,985
35-39 years	103,362	7,123
45-49 years	-121,389	6,919
50-54 years	-305,159	7,148
55-59 years	-549,043	7,339
60-64 years	-879,761	7,529
65-69 years	-1,214,449	8,290
70-74 years	-1,372,753	10,137
75-79 years	-1,426,823	12,697
80+ years	-1,595,240	14,213
Family income after tax		
Under kr. 200,000	376,289	7,231
Kr. 200,000-300,000	162,000	5,911
Kr. 300,000-400,000	43,880	5,890
Kr. 500,000-600,000	-131,332	5,765
Kr. 600,000-700,000	-346,205	7,096
Kr. 700,000-800,000	-597,235	9,709
Over kr. 800,000	-1,435,489	9,318
Year of raising most recent mortgage loan		
2003	-520,589	9,544
2004	-457,322	9,029
2005	-394,202	7,221
2006	-103,619	7,618
2008	7,105	*8,363
2009	-64,722	6,860
Constant	-241,091	8,195

Note: The dependent variable is the family's net debt in kroner at end-2010. The variable "Deferred amortisation in 2010" indicates whether the family, at end-2010, had at least one mortgage loan for which it had, during the year, exercised the deferred amortisation option. The calculations include only families who raised mortgage loans in the period 2003-10. * Insignificant.
Source: Mortgage banks, Statistics Denmark and own calculations.

[1] The calculation of assets includes housing wealth, but not pensions.
[2] The reference category for the age of the oldest family member is 40-44 years. The reference category for family income after tax is kr. 400,000-500,000, while the reference category for the year of raising the most recent loan is 2007.

considerably higher in families who raised their most recent mortgage loan after 2005 than in families who raised their most recent mortgage loans in the period up to and including that year.

Notwithstanding the time of raising the most recent loan, it is remarkable that the frequency of net debt is substantially higher in families with deferred-amortisation loans than in families with amortisation.

Even considering differences in age, income and year of raising the loan, the conclusion is that net debt is higher for families with deferred amortisation than for families without it, cf. Box 3. The average difference across all age and income groups and year of raising the loan is around kr. 300,000.

It should be emphasised that the analysis does not show a direct causal link between opting for deferred amortisation and higher net debt. The results merely show that the difference in average net debt between the two groups in 2010 cannot be explained by variations in age or income structure or year of raising the loan. But it is a distinct possibility that the group of families with deferred-amortisation loans differs from the group of families without such loans in other ways and that one or more of these differences induce them to raise deferred-amortisation loans and increase their debt. Therefore, it cannot be ruled out that families with deferred amortisation would have raised more debt via other channels than families who pay redemptions on their entire mortgage debt, if the option of deferred amortisation had not existed.

Overall, the conclusion is that, on average, families with deferred amortisation mortgage loans have more debt than families with amortisation. These results also apply if adjusted for an overweight of families whose oldest member is under 40 years or over 65 years, respectively, among families with deferred-amortisation loans. The higher average debt levels can be attributed to higher gross debt before raising mortgage loans, larger mortgage loans raised and lower current savings.

SAVINGS AND REDEMPTIONS IN FAMILIES WITH DEFERRED-AMORTISATION LOANS

All else equal, redemptions on mortgage debt lead to higher home equity, meaning that families who pay redemptions on their mortgage loans save up in their homes. But redemptions on mortgage loans are only one of several types of savings, and families with deferred-amortisation loans can compensate for the lack of redemptions in other ways. For example, deferred amortisation on mortgage loans can be utilised for redemptions on other debt, savings in financial assets or pension savings.

The Association of Danish Mortgage Banks (2011) has conducted a survey of borrowers' utilisation of deferred amortisation on the basis of interviews with 860 homeowners with deferred amortisation. The interviewees were asked about their main motives for choosing deferred amortisation, among other questions. 57 per cent of the respondents stated that they opted for deferred amortisation in order to reduce debt, save up or invest. 88 per cent stated that they used the saved repayments as intended.

In order to achieve an accurate picture of the relationship between the choice of deferred amortisation and savings behaviour, an analysis is performed of the size of both redemptions on mortgage debt and other types of savings for families with and without deferred amortisation, respectively. A comparison is therefore given of redemptions on mortgage debt, redemptions on other debt, pension contributions, savings in free funds and total net savings in 2010 for each of the two groups.[1] Since the focus here is on those who are active in the labour market, families with members over 59 years are excluded. Since income plays a large role in the individual family's scope for saving up, all savings components are expressed in per cent of income after tax. The calculation of the individual savings components is described in Box 4.

A typical family with deferred-amortisation loans tends to have slightly lower savings in free funds than a typical family with amortisation, cf. Chart 10. For both categories, however, the largest contribution to savings by far comes from pension savings. Again, the typical family with deferred-amortisation loans tends to have slightly lower savings of this type. But the most pronounced difference between the two categories is related to redemptions on mortgage debt. The typical family with deferred amortisation pays no redemptions at all, while the typical family in the group of other families spends around 6 per cent of their income after tax on redemptions on mortgage debt. However, the typical family with deferred-amortisation loans pays some redemptions on other debt, although this is not sufficient to compensate for the lack of redemptions on the mortgage debt. As a result, the saving ratio is considerably lower for the typical family with deferred amortisation than for the typical family without it.

Table 5 shows the median values by age group.[2] It is worth noting that the median value for redemptions on other debt is somewhat higher among families with deferred-amortisation loans in the younger age groups. Consequently, a typical young family with deferred amortisation

[1] The focus is still only on families who raised mortgage loans in the period 2003-10.
[2] A breakdown by income groups shows a similar picture.

CALCULATION OF SAVINGS IN 2010 Box 4

With a view to assessment of Danish families' total net savings, four different savings components are calculated for each family. Redemptions on mortgage debt, redemptions on other debt, savings in free funds and pension contributions.

Redemptions on mortgage debt are calculated on the basis of information on all mortgage loans of the family. For each loan, the redemptions in 2010 are calculated as the decrease in the remaining debt (stated at par value) from end-2009 to end-2010. If this is not possible, due to lack of data, the size of the redemptions is calculated assuming that the loan is an annuity loan. It is then possible to calculate the redemptions on the basis of information on principal, remaining debt, loan type, maturity, number of due dates per year and nominal interest rate. The family's total redemptions on mortgage debt are calculated as the sum of redemptions on the individual loans.

Other debt consists of bank debt, debt related to mortgage deeds and debt to banks and mortgage banks abroad. These debt items are sourced from Statistics Denmark's personal income register, which is mainly based on information from SKAT. Redemptions on other debt are calculated as the reduction in debt from end-2009 to end-2010. If the family, during 2010, raised new debt exceeding the redemptions on the old debt, the redemptions on other debt will be negative.

Pension savings are calculated as the sum of all contributions to labour-market pensions and private pension schemes. Again, this information is sourced from Statistics Denmark's personal income register.

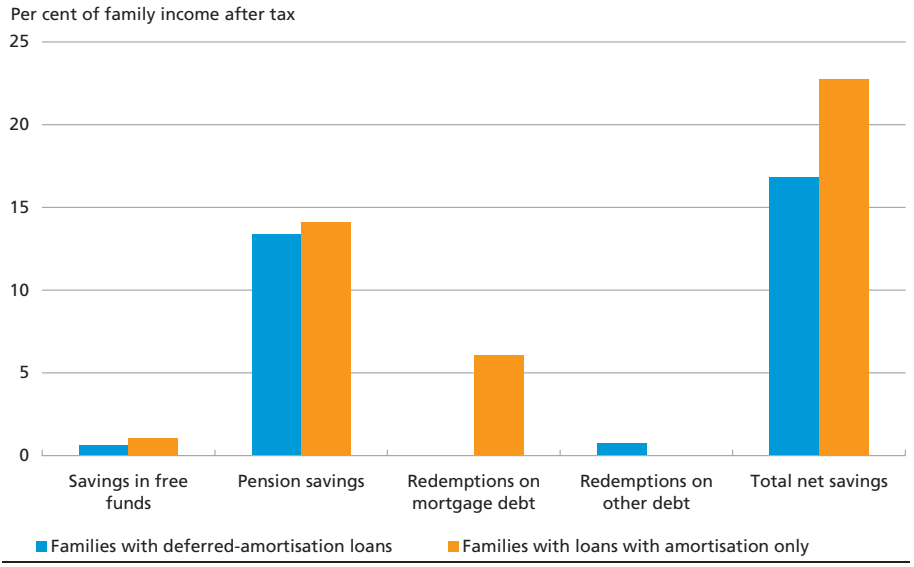
Free funds cover bank deposits, the market value of stocks and bonds, mortgage deeds in custody accounts and foreign assets, all sourced from Statistics Denmark's personal income register. Savings are calculated as the change from end-2009 to end-2010. If the family, during 2010, reduced the value of these assets, savings will be negative. This type of savings is influenced by changes in stock and bond prices, but for most families, the impact is modest.

Family net savings are calculated as the sum of the four savings components mentioned above. However, the calculation excludes a number of asset items. This applies first and foremost to the value of real property, which constitutes the largest asset by far for most families. Real property is excluded from the calculation, because for most families by far changes in the value of real property are solely attributable to property prices and not to changes in the family's holdings. Consequently, changes in housing wealth are not necessarily indications of real savings behaviour. But the exclusion of real property may also have unfortunate consequences: For a family selling a house and e.g. depositing the proceeds from the sale at the bank, savings in free funds will be registered at a high value, while there will be no record of the sale of the asset. A similar problem applies to other assets, e.g. cars. In order to mitigate this problem, all families who were involved in property transactions in 2010 are excluded. However, it is not possible to similarly exclude families who have been involved e.g. in car transactions.

The calculation also excludes families who raised mortgage loans in 2010, because raising a new mortgage loan will be registered as a large negative redemption on mortgage debt, while the value of the acquired property will not be registered.

Subject to these reservations, the above calculation methods will provide an accurate picture of families' real savings in 2010 in most cases by far, although the calculation may be influenced by noise in some cases.

MEDIAN VALUES FOR SAVINGS AND REDEMPTION RATIOS, 2010 Chart 10

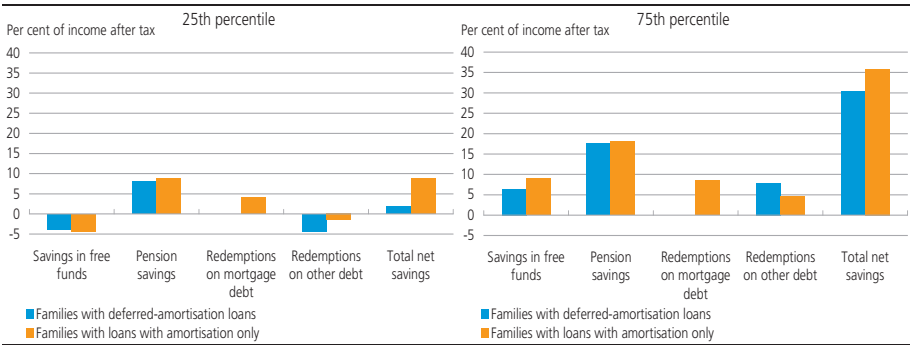


Note: The Chart shows the median value in 2010 for each stated savings and redemption ratio among homeowner families who raised mortgage debt in the period 2003-09, whose oldest family member was under 60 years old in 2010, and who were not involved in real property transactions or raised mortgage loans during 2010.
Source: Mortgage banks, Statistics Denmark and own calculations.

tends to pay slightly more redemptions on other debt compared with a typical young family with amortisation. This difference is also seen among families in the highest income groups. In none of these groups, the difference is large enough to compensate for the lack of redemptions on mortgage debt.

Chart 11 focuses on the tails in the breakdowns of savings and redemption ratios. The picture is generally the same as that for median values.

25TH AND 75TH PERCENTILES FOR SAVINGS AND REDEMPTION RATIOS, 2010 Chart 11



Note: The Charts show the 25th and 75th percentiles, respectively, in the distributions for each of the savings components shown among homeowner families who raised mortgage loans in the period 2003-09, whose oldest member was under 60 years in 2010, and who were not involved in real property transactions or raised mortgage loans during 2010.
Source: Mortgage banks, Statistics Denmark and own calculations.

MEDIAN VALUES FOR SAVINGS AND REDEMPTION VARIABLES BROKEN DOWN BY AGE OF OLDEST FAMILY MEMBER

Table 5

Per cent of family income after tax	Families with deferred-amortisation loans	Families with loans with amortisation only
Savings in free funds		
25-29 years	-0.2	0.0
30-34 years	0.5	0.5
35-39 years	0.4	0.5
40-44 years	0.4	0.7
45-49 years	0.5	0.9
50-54 years	0.8	1.3
55-59 years	0.8	1.3
Pension savings		
25-29 years	6.5	8.6
30-34 years	11.2	11.8
35-39 years	13.3	13.8
40-44 years	14.0	14.8
45-49 years	13.9	14.8
50-54 years	13.5	14.3
55-59 years	13.5	13.9
Redemptions on mortgage debt		
25-29 years	0.0	5.0
30-34 years	0.0	5.3
35-39 years	0.0	5.9
40-44 years	0.0	6.3
45-49 years	0.0	6.3
50-54 years	0.0	6.1
55-59 years	0.0	6.1
Redemptions on other debt		
25-29 years	0.1	0.0
30-34 years	2.2	0.4
35-39 years	3.0	0.4
40-44 years	1.7	0.1
45-49 years	0.6	0.0
50-54 years	0.2	0.0
55-59 years	0.2	0.0
Total net savings		
25-29 years	8.1	13.2
30-34 years	14.6	19.2
35-39 years	17.6	21.9
40-44 years	17.3	23.2
45-49 years	16.8	23.0
50-54 years	16.3	22.8
55-59 years	17.0	22.8

Note: The Table includes only families who raised mortgage loans in the period 2003-10.
Source: Mortgage banks, Statistics Denmark and own calculations.

The main impression is that the typical family with deferred-amortisation mortgage loans may pay slightly more redemptions on other debt compared with other families, but the extra redemptions are not sufficient to compensate for the lack of redemptions on the mortgage debt. Therefore, the typical family with deferred amortisation tends to

have lower total savings than the typical family in the same age and income group with amortisation.

It is important to keep in mind that a causal link may not necessarily exist from the option of raising deferred-amortisation loans to the savings ratio. The difference in savings ratio may be attributable to unobservable systematic variations between families opting for deferred amortisation and families who do not. If the option of deferred-amortisation mortgage loans did not exist, it can thus not be ruled out that families with deferred amortisation today would have found other ways of reducing their total savings. But deferred-amortisation mortgage loans have no doubt facilitated reduction of savings.

FAMILIES WITH VARIABLE-RATE MORTGAGE LOANS

At any given time, the interest rate on variable-rate mortgage loans is normally lower than the interest rate on fixed-rate loans with the same maturity. However, the drawback of the lower interest rate is the risk of interest-rate increases, which is avoided for families with fixed-rate mortgage loans only. Consequently, families with variable-rate mortgage debt need a financial buffer in the form of budgetary scope to absorb any future interest-rate rises. Periods of temporary interest-rate hikes may also be weathered by selling assets. It is therefore necessary to take liquid assets[1] into account in an assessment of a family's financial robustness.

Families with variable-rate mortgage loans do not differ significantly from families with fixed-rate loans as regards region of residence and the probability of a family member receiving public benefits, cf. Table 6. Families with variable-rate loans include a higher share of families whose oldest member is under 50 years, cf. Chart 12, and also a higher share of families with children.

Income and assets among families with variable-rate loans

Gross debt is higher for families with variable-rate mortgage debt than for families with fixed-rate mortgage debt only. At the same time, the disposable income is higher, on average, for families who opt for variable-rate loans than for families with fixed-rate mortgage loans only, cf. Chart 13. Thus, the annual income is, on average, just over kr. 54,000 lower for families with fixed-rate loans only than for families with variable-rate loans. This relationship also applies after adjustment for age structure.

[1] In the following, a family's liquid assets are assumed to be the sum of bank deposits, the market value of stocks and bonds and mortgage deeds in custody accounts.

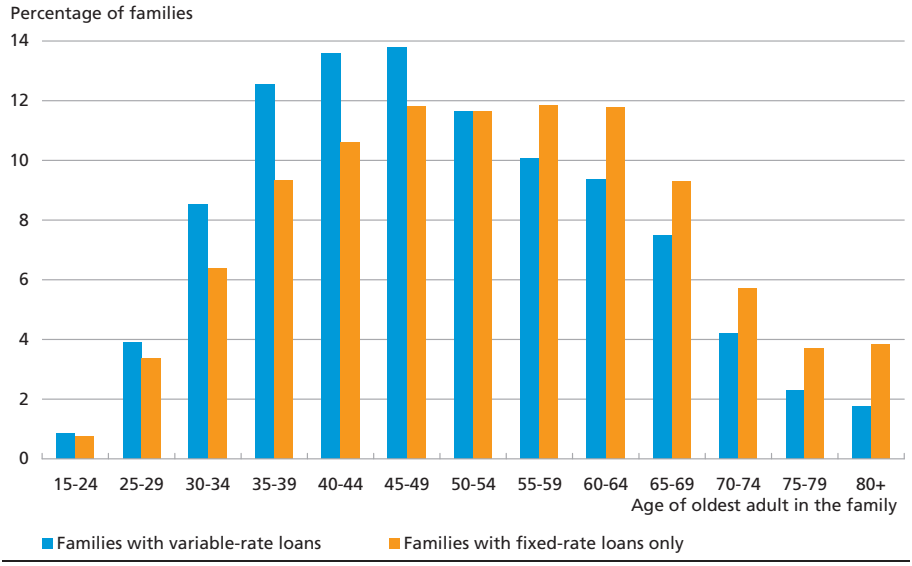
CHARACTERISTICS OF FAMILIES WITH VARIABLE-RATE MORTGAGE LOANS, 2010 Table 6

Percentage of families	Families with variable-rate loans	Families with fixed-rate loans only
With two adult members	74.6	70.3
With children	48.5	37.3
With children aged 10 or below	29.2	20.9
At least one member in education programme	0.9	0.6
At least one member in old-age retirement or early retirement	17.0	24.6
At least one member is a recipient of social benefits or social pension benefits	5.6	7.5
At least one member has tertiary education	13.5	12.0
All adult members are unskilled	9.9	15.4
Resident in the Capital Region of Denmark	26.4	24.8
Resident in the Central Denmark Region	23.4	22.8
Resident in the North Denmark Region	11.0	11.7
Resident in Region Zealand	16.5	18.6
Resident in the Region of Southern Denmark	22.8	22.2

Source: Mortgage banks, Statistics Denmark and own calculations.

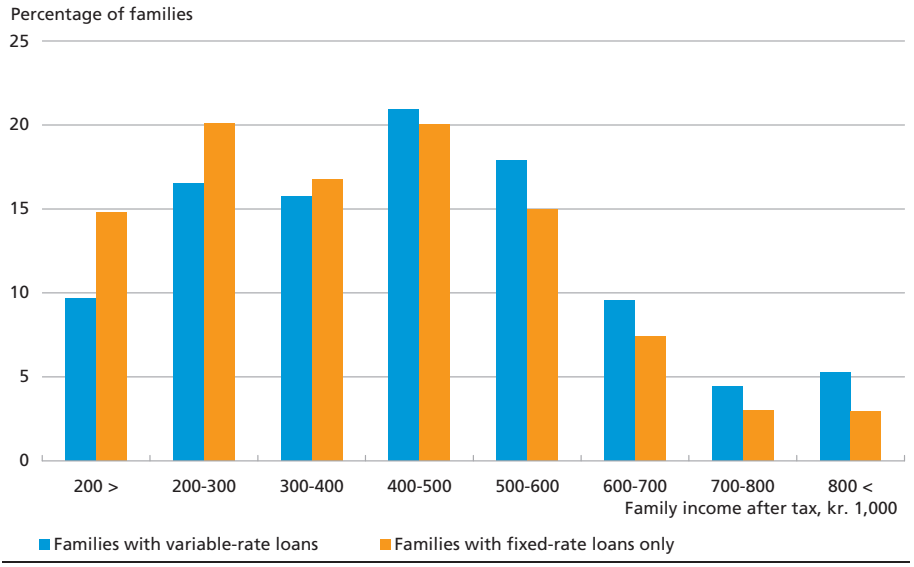
On the other hand, families with variable-rate mortgage debt, on average, have approximately kr. 10,000 less of assets, excluding housing wealth and pension, compared with families with fixed-rate mortgage debt only.

AGE OF OLDEST ADULT IN THE FAMILY AND LOAN TYPE, 2010 Chart 12



Note: Families with variable-rate loans cover all families with at least one variable-rate mortgage loan.
Source: Mortgage banks, Statistics Denmark and own calculations.

DISPOSABLE INCOME AND LOAN TYPE, 2010 Chart 13



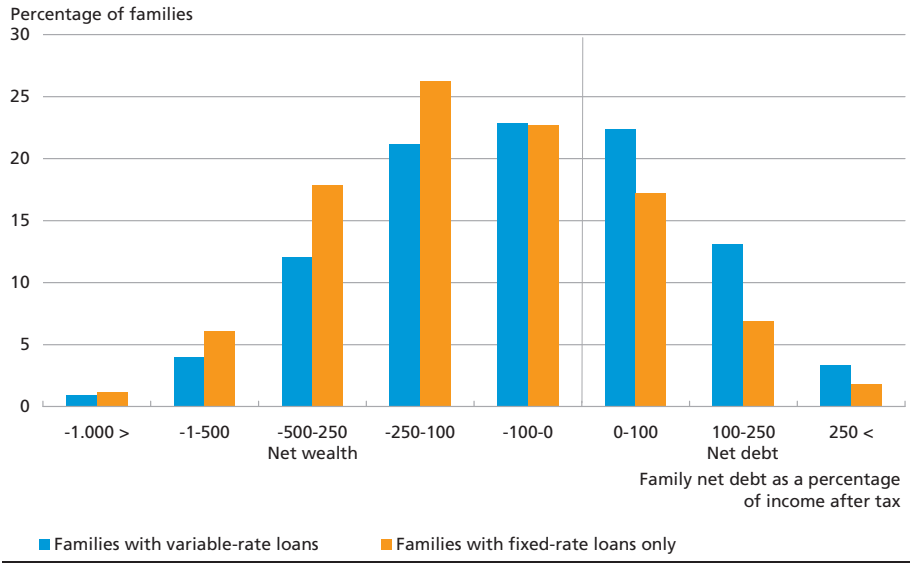
Note: Families with variable-rate loans cover all families with at least one variable-rate mortgage loan.
Source: Mortgage banks, Statistics Denmark and own calculations.

As a result of higher gross debt and fewer assets, the net debt ratio is higher for families with variable-rate mortgage loans than for families with fixed-rate loans only.[1] Average net wealth for families with fixed-rate mortgage loans only is almost 300 per cent of income after tax, while it is around 180 per cent of income after tax for families with variable-rate loans. This trend is particularly pronounced for families whose oldest member is under 60 years old, cf. Chart 14.

As already mentioned, variable-rate loans are also more widespread among families with mortgages in properties with high LTV ratios. The reason may be that variable-rate loans were not reintroduced until 1996. Thus, some families with only fixed-rate loans raised their mortgage debt before the reintroduction of variable-rate debt. This is taken into account by comparing the changes in total indebtedness for new mortgage borrowers in the year of raising their first mortgage loan[2]. The comparison is limited to the years 2002-10, covering a period when variable-rate loans were available. Irrespective of age group, new borrowers who opted for variable-rate loans, raised more debt than new mortgage borrowers who chose fixed-rate loans, cf. Chart 15.

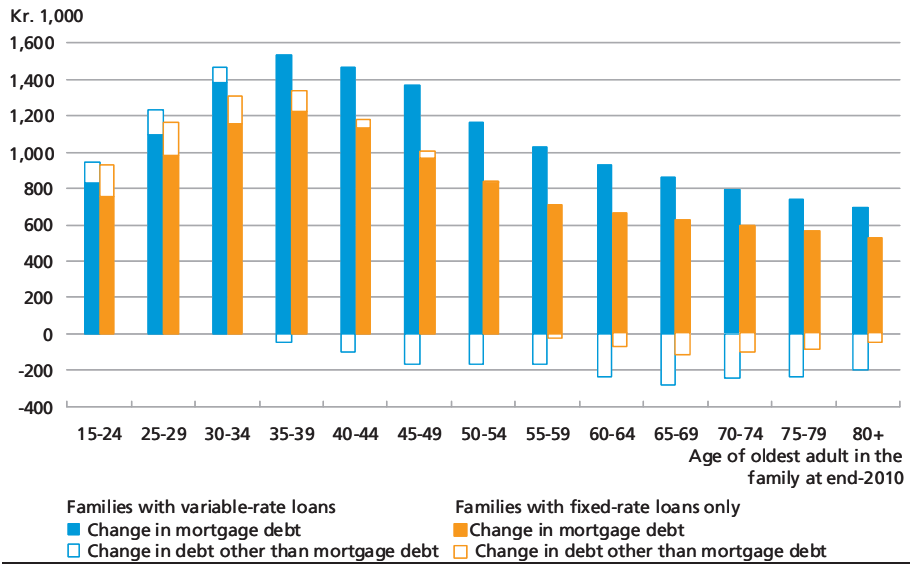
1 This result applies whether or not housing wealth is included.
2 The focus here is solely on families without mortgage debt at the beginning of the year of raising their most recent mortgage loan. For these families, their most recently raised mortgage loan is also assumed to be their first mortgage loan.

NET DEBT RATIO OF FAMILIES WHOSE OLDEST MEMBER IS UNDER 60 YEARS, 2010 Chart 14



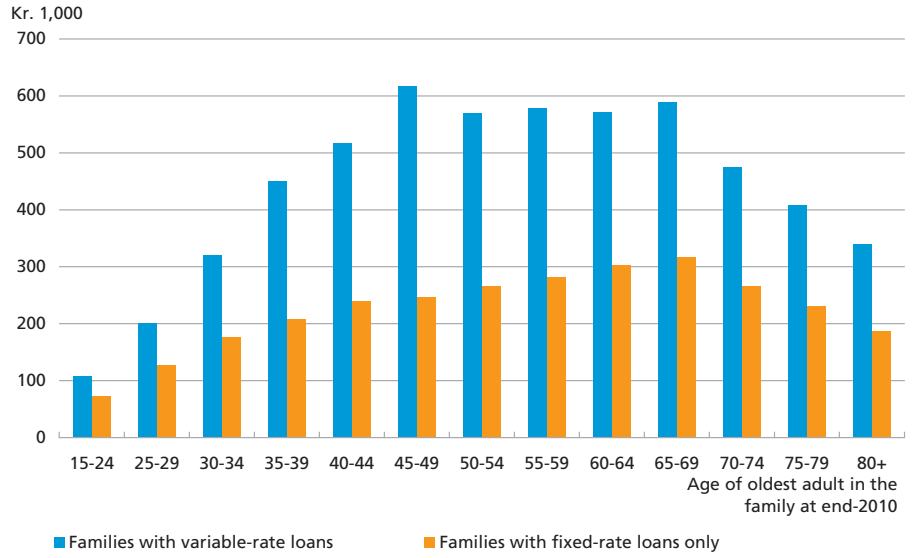
Note: Assets are calculated including housing wealth, but excluding pensions. Families with variable-rate loans cover all families with at least one variable-rate mortgage loan.
Source: Mortgage banks, Statistics Denmark and own calculations.

AVERAGE CHANGE IN GROSS DEBT DURING THE YEAR OF RAISING THE FIRST MORTGAGE LOAN Chart 15



Note: The Chart shows the average change in gross debt from the beginning of the year when the family raised its first mortgage loan until the end of that year. Only families without mortgage debt at the beginning of that year are included. Only families who raised mortgage loans in the period 2002-10 are included. Changes in debt other than mortgage debt cover both bank debt and debt to creditors other than banks and mortgage banks. Families with variable-rate loans cover all families with at least one variable-rate mortgage loan.
Source: Mortgage banks, Statistics Denmark and own calculations.

AVERAGE GROSS DEBT BEFORE RAISING THE FIRST MORTGAGE LOAN Chart 16



Note: The Chart shows the average gross debt at the beginning of the year in which the family raised its first mortgage loan. Only families without mortgage debt at the beginning of that year are included. Only families who raised mortgage loans in the period 2002-10 are included. Families with variable-rate loans cover all families with at least one variable-rate mortgage loan.
Source: Mortgage banks, Statistics Denmark and own calculations.

In terms of new mortgage borrowers' debt before raising their first mortgage loan, it is also seen that new borrowers who raised variable-rate debt had higher debt before raising their first mortgage loan, compared with new borrowers raising fixed-rate loans, cf. Chart 16.

Overall, it can be concluded that families with variable-rate loans tend to have higher current income than other families, but fewer assets. Together with higher gross debt, this entails higher net debt as well. This also applies to the debt-to-income ratio. Families with high debt before they raise their first mortgage loans and families who raise higher-than-average loans tend to opt for variable-rate debt more frequently than other families.

FINANCIAL MARGIN

Whether a family encounters financial distress depends on its ability to adjust its consumption to its current income, and on whether the family holds liquid assets as a buffer if its current income becomes insufficient to meet its current consumption. A family should be regarded as financially vulnerable if its current income is insufficient and there are not enough liquid funds to cover the difference between expenses and consumption for a relevant period.

With a view to assessment of a family's financial robustness, a standardised budget method is applied below – the financial margin – to measure whether the current income is sufficient to meet current consumption. The financial margin is defined as the amount at the family's disposal after paying housing occupancy expenses, other fixed expenses and general costs of living in line with standard budgets for different family types. If the disposable income does not exceed the sum of these expense items, the financial margin is negative, and the family's current income should be regarded as insufficient.

A similar method has been used in Sweden, Norway and Finland (see e.g. Mäki-Fränti (2011), Jönsson et al. (2011), Persson (2009), Johansson and Persson (2006), and Vatne (2006)), and Danmarks Nationalbank previously applied a similar approach in the *Financial stability* publications (see e.g. Danmarks Nationalbank (2007) and (2010)).

The applied data contains detailed information on each family's income, holdings of liquid assets and expenses for interest and redemptions on debt. However, there is no information on the individual family's consumption. That is why standardised budgets are used as measures of the families' consumption, taking into account owner occupancy or not, as well as the number of adults and children in the family.

Two budgets are applied: an average budget reflecting the consumption pattern of an average family and a tight budget reflecting the consumption of families in the lowest income group. It should be noted that the tight budget cannot be regarded as a poverty limit, but that it reflects the actual consumption of a segment of the population.

It is also important to point out that even families with very positive financial margins may mismanage their finances to such a degree that they default on their debt. Out of the 5,800 families in arrears on their mortgage loans at end-2010, only 3,000 had negative margins irrespective of the budget applied.

Bearing this in mind, the breakdowns of the financial margin and underlying budgets are regarded as fair indications of the families' financial situation. The budgets applied and the financial margin are described in more detail in Box 5.

The families' financial situation

Chart 17 shows the breakdown of the financial margin by all families and families with mortgage debt for both budgets. The Chart shows the share of families with a financial margin of zero or less – i.e. the share of families with insufficient current income to cover an average budget and tight budget, respectively. It is clear that the share with insufficient

CALCULATION OF FINANCIAL MARGIN – TO BE CONTINUED Box 5

The financial margin can be used as an expression of families' financial scope. It can also be used to examine how exposed families are at the outset and how vulnerable they are to changes in their financial situation. The financial margin is defined by:

Disposable income
- redemptions on mortgage loans
- housing occupancy expenses
- other fixed expenses
- a sufficient disposable amount
= *financial margin*

The disposable income is sourced from Statistics Denmark, and it excludes interest expenses and tax payments, including any property taxes. Redemptions on mortgage debt are sourced from the mortgage banks' reporting, and they are deducted from disposable income. Redemptions on other debt are not included.

Housing occupancy expenses and other fixed expenses are found via the Consumer Survey of Statistics Denmark. For tenants, housing occupancy expenses cover rent, electricity, heating, gas, etc. and for owners also electricity, gas, heating, but also maintenance of the home, renovations, etc. Repayments on debt, including mortgage debt, are not included in order to avoid duplication. Other fixed expenses cover insurance, transport, TV licence, telecom subscriptions, and for families with children expenses for daycare institutions. Most expenses for housing occupancy and other fixed expenses will be difficult to reduce in the short term for the individual family.

As regards the average budget, the figures from the Consumer Survey for the average family are used, while the tight budget is based on the average consumption of households with annual gross income of less than kr. 150,000. For each family, the expense budget set out takes into account only whether they own their home and neither the size of the home in question, nor total family income.

The sufficient disposable amount is determined using the Danish Financial Supervisory Authority's classification of bank customers, cf. Danish Financial Supervisory Authority (2012).

Under the average budget, the sufficient disposable amount is used to achieve the grade 2a. This grade is given to private customers with good credit quality. Under the tight budget, the sufficient disposable amount is used to achieve the grade 2c, which is given to customers with strong indications of weakness, but without objective evidence of impairment.

current income is considerably smaller for families with mortgage debt than for all families overall.

Applying the average budget, the financial margin is negative for almost 35 per cent of all families. This figure is 16 per cent for families with mortgage debt. Looking at the families' ability to pay their fixed expenses, including interest and redemptions on debt, and to maintain reduced consumption with their current income provides a substantially

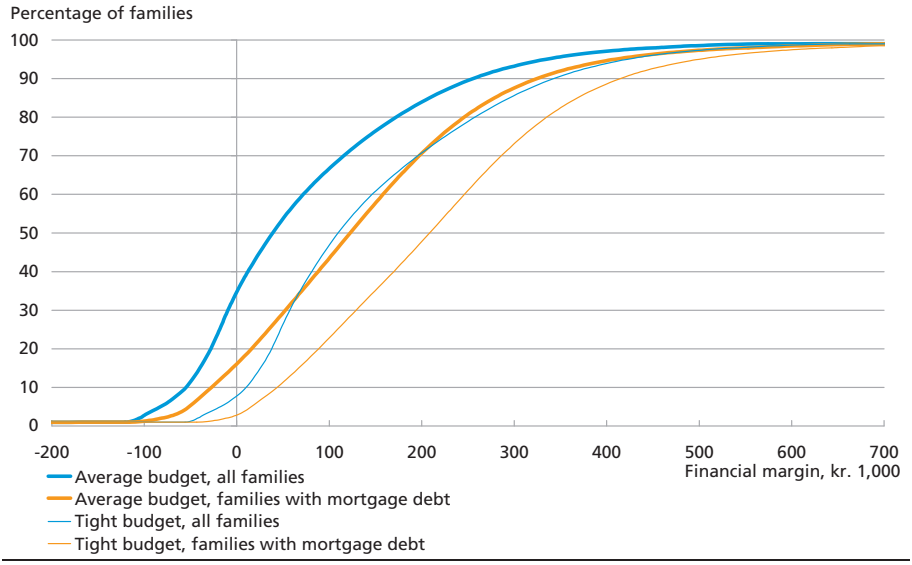
CALCULATION OF FINANCIAL MARGIN – CONTINUED Box 5

ANNUAL EXPENSES, 2010

Kr.	Average budget		Tight budget	
	Homeowners	Tenants	Homeowners	Tenants
Expenses:				
Housing occupancy expenses	58,068	23,344	35,386	17,666
Rent	-	45,854	-	30,328
Other fixed expenses	31,294	31,294	14,918	14,918
Total expenses	89,362	100,492	50,304	62,912
Extra if minimum one child	3,499	3,499	1,032	1,032
Sufficient disposable amount:				
One adult	60,000	60,000	36,000	36,000
A couple	102,000	102,000	66,000	66,000
Extra per child	30,000	30,000	18,000	18,000

Note: Housing occupancy expenses have been adjusted for the family living in an owner-occupied home or a rented home. The average budget refers to average expenses for all families, while the tight budget is based on the level of expenses for families with a total gross income of up to kr. 150,000.
Source: Statistics Denmark's Consumer Survey, the Danish Financial Supervisory Authority and own calculations.

BREAKDOWN OF FINANCIAL MARGIN, 2010 Chart 17



Note: "All families" cover families both with and without mortgage debt.
Source: Mortgage banks, Statistics Denmark and own calculations.

DEBT BROKEN DOWN BY FINANCIAL MARGIN, ALL FAMILIES, TIGHT BUDGET, 2010 Table 7

Financial margin, kr. 1,000	Mortgage debt, kr. billion	Mortgage debt, per cent	Bank debt, kr. billion	Bank debt, per cent	Other debt, kr. billion	Other debt, per cent
Below 0	34.8	3.0	29.0	5.7	31.3	5.9
0-75	101.7	8.7	75.2	14.8	77.5	14.7
75-150	164.8	14.1	93.3	18.3	96.2	18.2
150-250	296.3	25.3	117.5	23.1	121.5	23.0
Over 250	573.3	49.0	194.6	38.2	202.2	38.2
Total	1,170.9	100.00	509.6	100.00	528.7	100.00

Note: All families cover families both with and without mortgage debt.
Source: Mortgage banks, Statistics Denmark and own calculations.

different picture. The share of all families with a negative financial margin thus drops to 8 per cent. This percentage holds far less than 8 per cent of the debt, be it mortgage debt, bank debt or other debt, cf. Table 7. As regards families with mortgage debt, the share with a negative financial margin falls to 3 per cent if the tight budget is applied in the calculations.[1]

Among those with a negative financial margin, under the average but not the tight budget, old-age pensioners and recipients of early retirement benefits are clearly overrepresented, cf. Table 8. However, most of the families whose principal earner is in the oldest age groups have a substantial amount of assets. Irrespective of the size of the financial margin, the 10th percentile of families whose oldest member is at least 60 years has more assets than liabilities, cf. Chart 18. Moreover, it appears that the ratio of assets to liabilities is highest in the lowest margin intervals.

The clear overrepresentation of old-age pensioners and recipients of early retirement benefits is in accordance with the overall income pattern for families with a negative financial margin under the average budget, cf. Chart 19. Since low-income families typically have a tight budget, the average budget distorts the picture of the families' ability to service their debt.

Moreover, the size of the individual families' mortgage debt tends to rise with income. The higher the income, the higher the price of the properties for which the family can raise debt. Out of all families, 38 per cent had mortgage debt at end-2010, and they accounted for 55 per cent of total income after tax.

[1] A corresponding analysis on Finnish data finds that the financial margin is negative for slightly over 30 per cent of homeowners and around 40 per cent of tenants, applying an average budget. Under a minimum budget, the figures are 1 per cent for homeowners and 3.5 per cent for tenants, cf. Mäki-Fränti (2011). A Swedish analysis shows that the financial margin is negative for 7.35 per cent of the households, cf. Persson (2009).

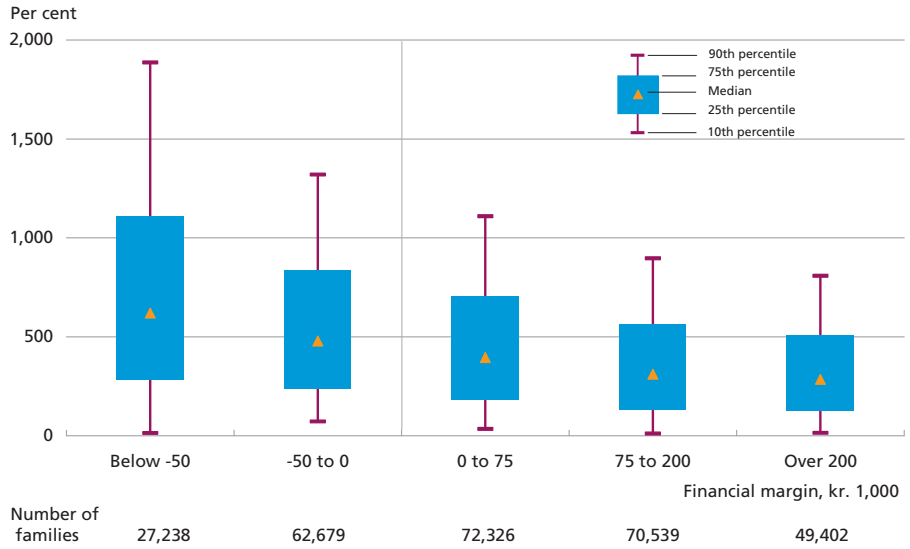
CHARACTERISTICS OF FAMILIES WITH A NEGATIVE AND POSITIVE FINANCIAL MARGIN, RESPECTIVELY, UNDER THE TWO BUDGETS, 2010 Table 8

	Average budget		Tight budget	
Percentage of families	Negative financial margin	Positive financial margin	Negative financial margin	Positive financial margin
With two adult members	16.0	62.6	8.7	49.6
With children	11.0	35.1	6.5	28.4
With children aged 10 or below	8.0	19.9	4.7	16.7
At least one member in education programme	9.8	1.0	34.8	1.4
At least one member in old-age retirement or early retirement	41.7	21.0	11.1	29.6
At least one member is a recipient of social benefits or social pension benefits	16.9	9.9	16.1	12.0
At least one member has tertiary education	1.6	11.6	1.8	8.7
All adult members are unskilled	51.3	17.1	48.2	27.3
Resident in the Capital Region of Denmark	31.5	32.2	39.1	31.4
Resident in the Central Denmark Region	22.2	22.0	22.8	22.0
Resident in the North Denmark Region	10.9	10.0	9.3	10.4
Resident in Region Zealand	13.9	14.8	11.1	14.8
Resident in the Region of Southern Denmark	21.5	21.0	17.7	21.5

Source: Mortgage banks, Statistics Denmark and own calculations

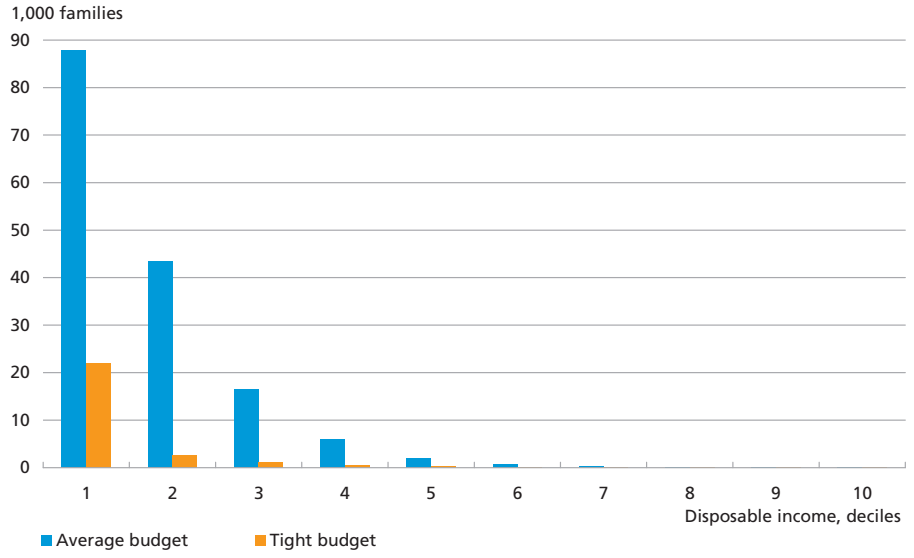
Under the tight budget, around three quarters of the families have a financial margin of more than kr. 50,000. For some families, however, the fixed expenses will be set too low under the tight budget, so they

NET WEALTH RATIO VS. FINANICAL MARGIN FOR FAMILIES WHOSE OLDEST MEMBER IS AT LEAST 60 YEARS – AVERAGE BUDGET, 2010 Chart 18



Note: The family's net wealth as a percentage of income after tax. The Chart covers only families with mortgage loans.
Source: Mortgage banks, Statistics Denmark and own calculations.

FAMILIES WITH A NEGATIVE FINANCIAL MARGIN AND MORTGAGE DEBT, 2010 Chart 19



Note: The calculation of income deciles includes only incomes for families with mortgage debt.
Source: Mortgage banks, Statistics Denmark and own calculations.

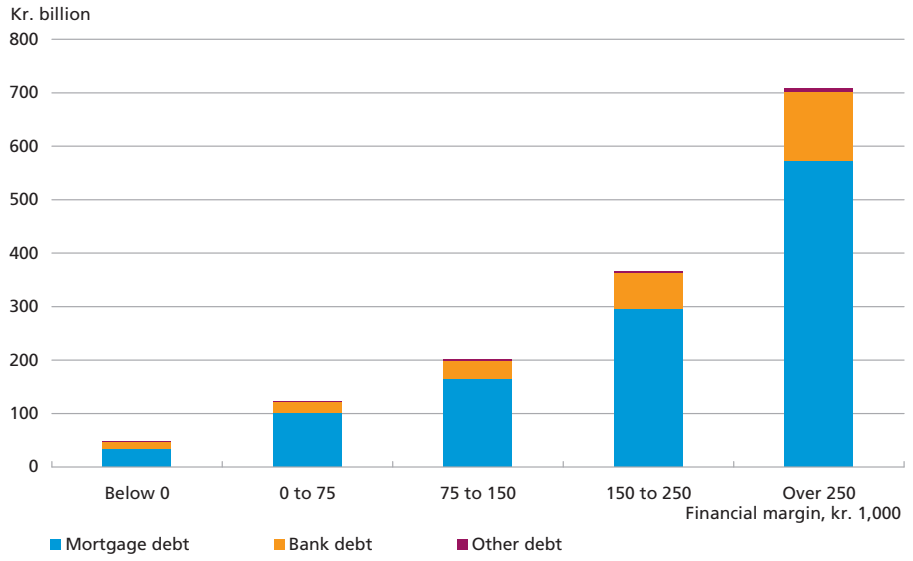
will actually have less money to spend. In some cases, families with a negative financial margin will have a buffer of assets, particularly in the oldest age groups, while in other cases, especially in the youngest age groups, they will have the opportunity to raise debt or perhaps receive support from broader family relations.

Table 8 also shows that the number of families with at least one member in an education programme is relatively higher among the families with *only* a negative financial margin under the average budget, just as the number of singles is higher. This group also has overrepresentation of families resident in the Greater Copenhagen area.

Families with a negative or slightly positive financial margin under the tight budget hold only a small share of the families' total gross debt, cf. Chart 20. Among families with a negative financial margin, only 2,229 families have loans in properties with an LTV ratio exceeding 100, cf. Chart 21. These families hold total debt of approximately kr. 7 billion, of which kr. 5 billion constitutes mortgage debt.

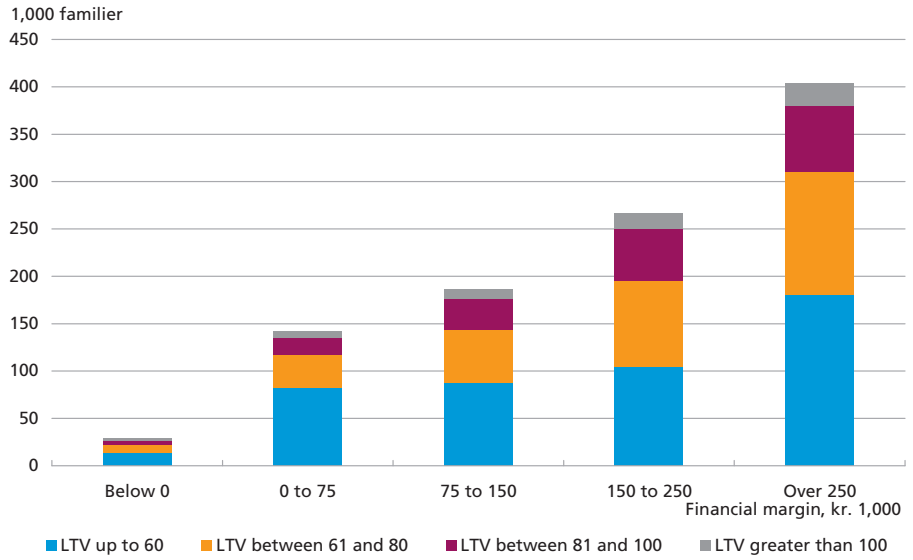
As mentioned previously, a family may choose to sell assets if its current income is insufficient to meet current expenses. Of course, this option exists only if the family has liquid assets and only until they run out. Given a time horizon of one year, some families with mortgage debt are able to bridge the gap between income and expenses by selling assets in the form of bank deposits, stocks, bonds and mortgage deeds in custody accounts. Among families with mortgage debt, the number

BREAKDOWN OF DEBT VS. FINANCIAL MARGIN, FAMILIES WITH MORTGAGE DEBT, TIGHT BUDGET, 2010 Chart 20



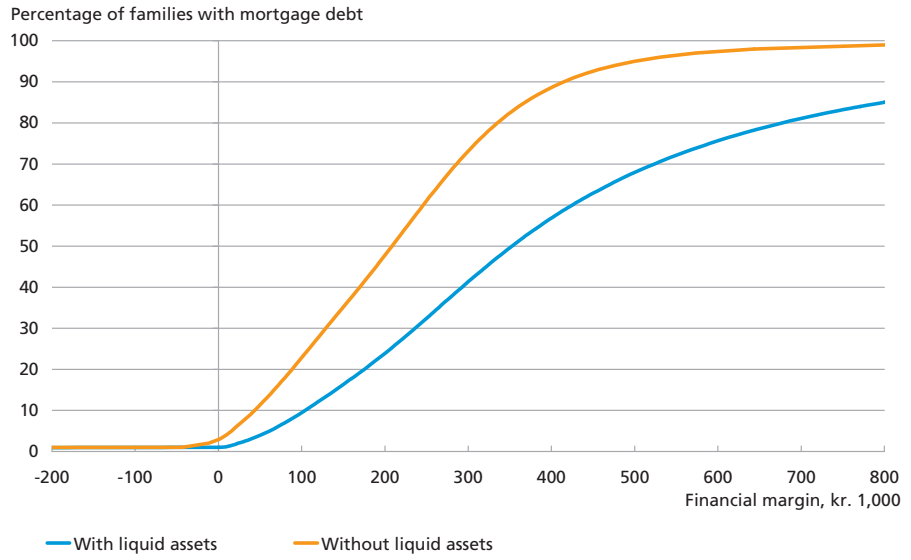
Note: Other debt includes all debt other than debt to mortgage banks and banks.
Source: Mortgage banks, Statistics Denmark and own calculations.

FAMILIES' REMAINING DEBT RELATIVE TO PROPERTY VALUATION, TIGHT BUDGET, 2010 Chart 21



Note: LTV ratios indicate the remaining debt as a percentage of the property value of the property serving as collateral for the loan. Property valuations are the mortgage banks' valuations at end-2010. Families with loans in several properties are included once per property, whereby a family may be included more than once in the same bar. Only families with mortgage debt are included in the Chart.
Source: Mortgage banks, Statistics Denmark and own calculations.

BREAKDOWN OF FINANCIAL MARGIN ADJUSTED FOR LIQUID ASSETS, FAMILIES WITH MORTGAGE DEBT, TIGHT BUDGET, 2010 Chart 22



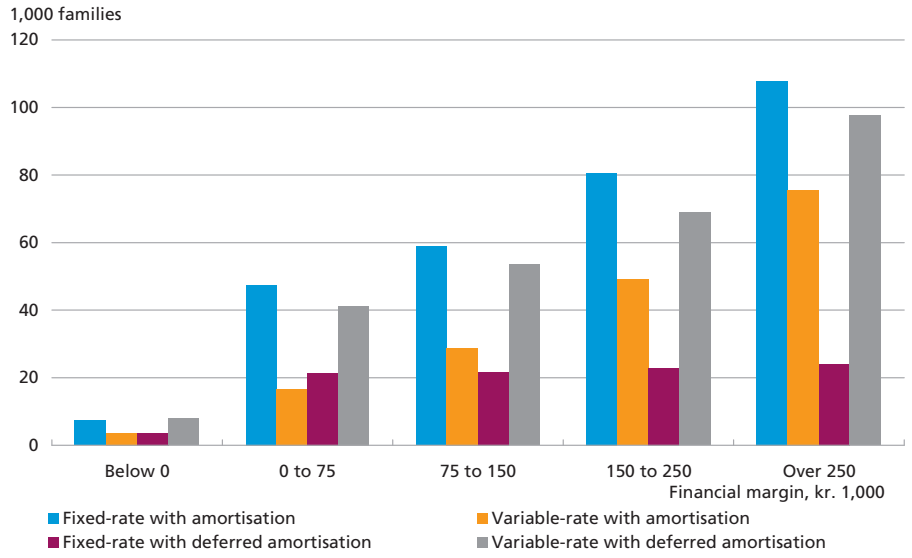
Note: Liquid assets include bank deposits, market value of stocks and bonds and mortgage deeds in custody accounts.
Source: Mortgage banks, Statistics Denmark and own calculations.

with a negative financial margin is thus brought down to 1 per cent when the tight budget is applied to the calculations, cf. Chart 22.

The share of families with variable-rate loans among families with mortgage loans and tight finances is almost the same as the share of families with variable-rate loans among mortgage borrowers in total, cf. Chart 23. This applies despite these families' higher income, on average, the current low level of interest rates and the resulting lower repayments on variable-rate loans. Moreover, a share of the variable-rate debt was raised when short-term interest rates were higher, meaning that when raising the loan these families were able to manage a higher level of interest rates than the current level. Even at the current low level of interest rates, there are still almost 16,000 families with a negative financial margin under the tight budget and with at least one variable-rate loan. These families' total mortgage debt amounts to kr. 27 billion, while other debt totals kr. 11 billion.

All in all, the conclusion is that a large majority of families with debt are able to pay their bills. Moreover, families with financial difficulties only account for a modest share of the total debt. In addition, the LTV ratios for the properties pledged as collateral for this limited part of the debt are low. The risk to financial stability from families with a negative or slightly positive financial margin under the tight budget is assessed to be limited. The credit institutions suffered only marginal losses on pri-

FAMILIES WITH ONE TYPE OF MORTGAGE DEBT ONLY VS. FINANCIAL MARGIN – TIGHT BUDGET, 2010 Chart 23



Note: The Chart covers only families whose entire mortgage debt consists of one loan type.
Source: Mortgage banks, Statistics Denmark and own calculations.

vate customers even during the financial crisis. Thus, loan impairment charges and arrears have been modest. The arrears ratio for mortgage loans for owner-occupied homes was thus only 0.32 per cent at end-June 2012.[1] Naturally, this is also a consequence of the low interest burden due to the drop in interest rates in the wake of the financial crisis, and of the relatively moderate increase in unemployment.

FAMILIES' INTEREST-RATE SENSITIVITY

A sensitivity analysis of the consequences to family finances of an interest-rate increase is performed in order to assess the families' financial robustness.

If the business cycle in Denmark mirrors that of the euro area, and Danish interest rates shadow euro area rates, interest rates will rise in periods of positive economic development and favourable employment trends. This strengthens the income basis of some families, at the same time as repayments on variable-rate mortgage debt increase. Other families will find it easier to work more. There will also be a positive impact on house prices, unless the interest-rate increase is very high and sudden. However, such an interest-rate hike should be expected to be temporary.

[1] The arrears ratio is calculated quarterly by the Danish Mortgage Banks' Federation and the Association of Danish Mortgage Banks and published on the websites of the two institutions. It shows the share of total repayments in arrears 3½ months after the due date.

ANALYSIS OF INTEREST-RATE SHOCK Box 6

In the analysis of families' interest-rate sensitivity, interest rates are assumed to rise both on debt other than mortgage debt (other debt) and on variable-rate mortgage debt.

Variable-rate mortgage loans are granted with many different fixed-rate periods. Interest rates are assumed to rise for all loans with a fixed-rate period of up to one year. For loans with longer fixed-rate periods (e.g. F5 loans), it is assumed that the interest rate is first adjusted at the end of the year equal to the year of raising the loan plus the fixed-rate period. The analysis takes into account that many variable-rate loans are capped. For variable-rate mortgage debt, both interest payments and redemptions are recalculated.

The analysis has two parts. The first – primary – part assumes a time horizon of one year. Here, interest rates are assumed to increase only on loans subject to adjustment in 2010 i.e. around 79 per cent of all variable-rate loans. The second part is a simplified analysis of the consequences of a permanent interest-rate increase in the medium term, and this increase is assumed to be phased in for all variable-rate loans. Just over 14 per cent of variable-rate loans are subject to adjustment in either 2011 or 2012, while approximately 6 per cent are subject to adjustment in 2013 or 2014. Thus, only 1 per cent of variable-rate loans have not been subject to adjustment after four years. The reason is that the fixed-rate period is 5 years or less for most variable-rate loans by far.

The shocks are increases of 5 and 9 percentage points, respectively. An interest-rate increase of 9 percentage points should be assumed to be a short-lived shock.

Interest rates on other debt can be calculated by means of the register data set from Statistics Denmark. The interest rate is assumed to rise by the same number of percentage points as the interest rate on variable-rate mortgage debt, and interest payments are recalculated. However, redemptions, if applicable, are not known, so they cannot be recalculated.

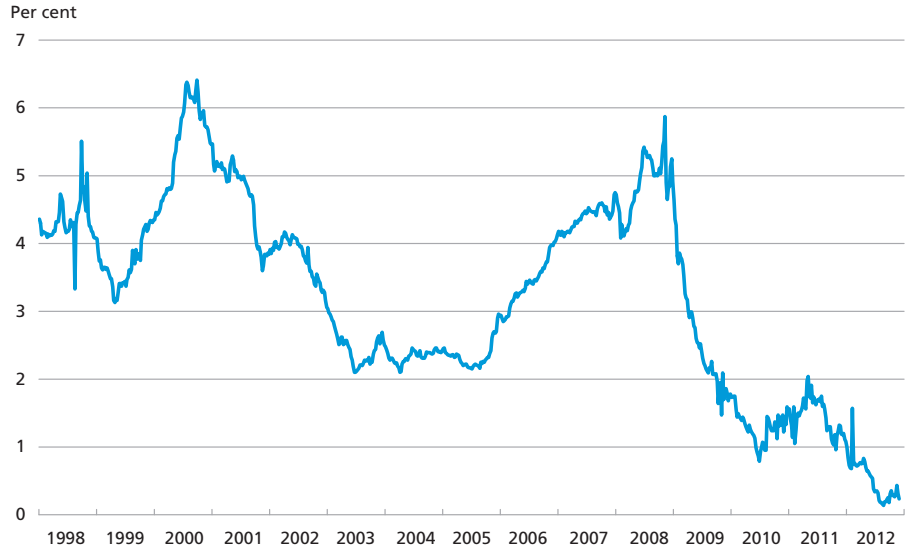
When interest payments go up, tax payments change, since the interest deductibility changes. Tax is therefore recalculated for all individuals, and disposable incomes are adjusted. The tax calculations are made on the basis of tax legislation as at end-2010. Finally, families' new financial margins are calculated.

AVERAGE INTEREST-RATE LEVELS FOR MORTGAGE DEBT BEFORE AND AFTER INTEREST-RATE SHOCK, 2010 Table 9

Interest-rate level for mortgage debt, per cent	Before interest-rate shock	After shock of 5 percentage points	After shock of 9 percentage points
Fixed-rate loans	4.75	4.75	4.75
With adjustment in 2010	1.98	6.34	8.96
- Uncapped	1.96	6.96	10.96
- Capped	2.01	5.18	5.18
Fully phased-in interest-rate shock	2.29	6.79	9.69
- Uncapped	2.39	7.39	11.39
- Capped	2.01	5.18	5.18

Note: The yield to maturity stated by the mortgage banks at end-2010 is used as the basis for the calculations.
Source: Mortgage banks and own calculations.

DEVELOPMENTS IN AVERAGE SHORT-TERM BOND YIELD Chart 24



Note: The Chart shows the development in the average short-term bond yield in Danish kroner. The data applied relates to 1- and 2-year uncallable bullet bonds underlying repayments on adjustable-rate loans. The average yield is calculated on a weekly basis, indicating the average yield to maturity for the week in question.
Source: Danish Association of Mortgage Banks.

The consequences to family finances of interest-rate increases of 5 and 9 percentage points, respectively, are calculated below. The interest-rate shocks are described in Box 6. Table 9 shows the resulting average interest-rate levels. It is taken into account that just under one third of the families with variable-rate loans have capped loans. The caps are in the interval of 3.45-6 per cent.

As regards variable-rate loans with adjustment in 2010, the level of interest rates after an increase of 5 percentage points roughly corresponds to the highest weekly level of the short-term bond yield after 1998, cf. Chart 24.[1] For uncapped loans and loans with adjustment after 2010, the average interest-rate levels are slightly higher after an increase of 5 percentage points. Since the level of interest rates is lower today than at the end of 2010, interest rates would have to rise by more than 5 per cent to reach the levels analysed.

A sudden hike in short-term interest rates of 9 percentage points is an extremely hard stress scenario, which is not very likely as long as the Danish economy is in order. This scenario has been chosen in order to throw light on families' ability to weather temporary strong interest-rate hikes, e.g. in connection with a currency crisis. Since the costs of a

[1] The highest weekly level (in the period from January 1998 to November 2012) of the average short-term bond yield was observed in calendar week 38 in 2000, at 6.41 per cent.

temporary hike may be covered by selling assets, it is particularly relevant to consider the families' asset holdings in this scenario.

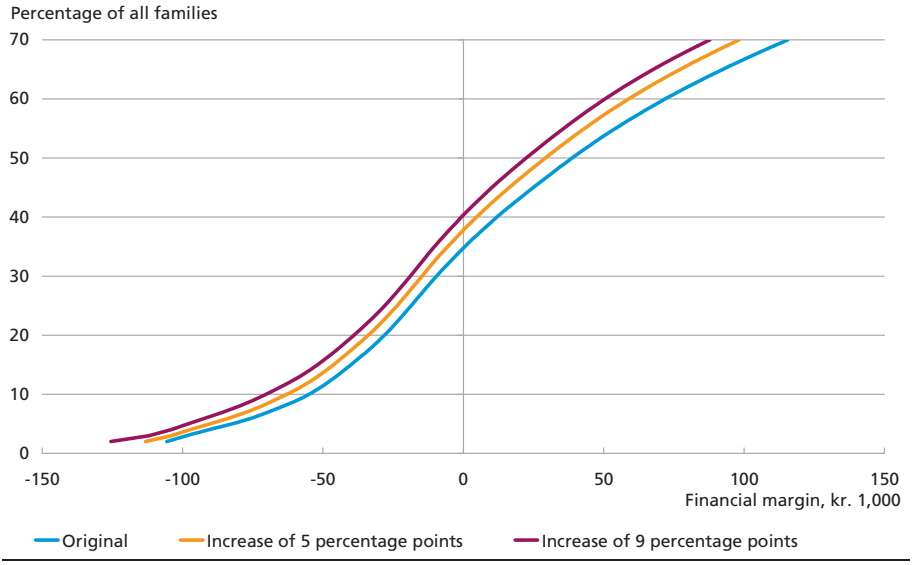
EFFECT OF AN INTEREST-RATE SHOCK

Only a small share of all families move from a positive to a negative financial margin after an interest-rate shock lasting one year, cf. Charts 25 and 26. Under the average budget, the financial margin becomes negative for 3 per cent more families if interest rates rise by 5 percentage points. The figure is 2 per cent under the tight budget. One reason is that one fourth of all families have no debt. In addition, many families have no mortgage debt, and their gross debt ratio is, on average, much lower than the ratio for families with mortgage debt. Moreover, 42 per cent of the families with mortgage debt have only fixed-rate debt, so for them interest-rate changes affect only other debt, if any.

Mainly families without mortgage debt and families with variable-rate mortgage debt move from the positive to the negative interval, cf. Chart 27. However, the number of families with variable-rate mortgage debt is still relatively low compared with the number of families without mortgage debt.

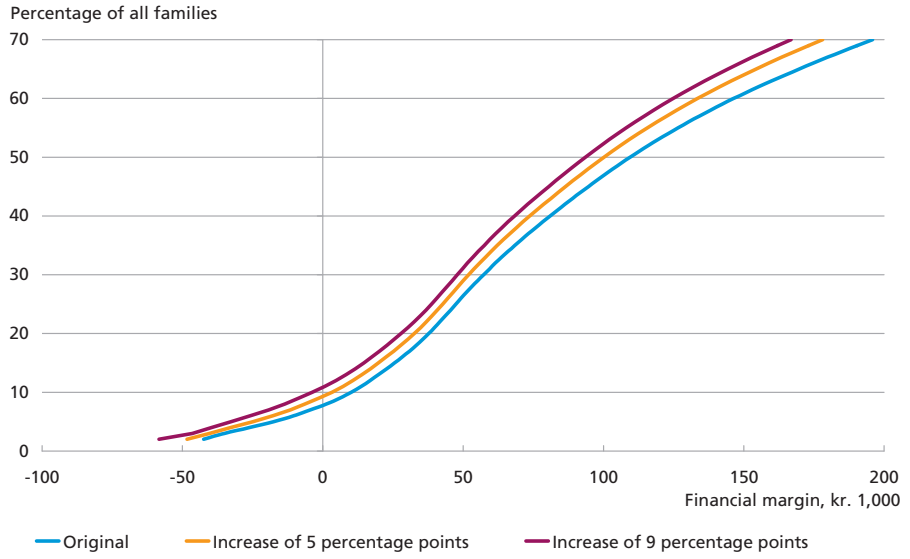
In April 2012, the Association of Danish Mortgage Banks interviewed a sample of homeowners with F1 loans, cf. Association of Danish Mortgage

BREAKDOWN OF FINANCIAL MARGIN UNDER THE AVERAGE BUDGET, INTEREST-RATE SHOCK LASTING ONE YEAR, ALL FAMILIES, 2010 Chart 25



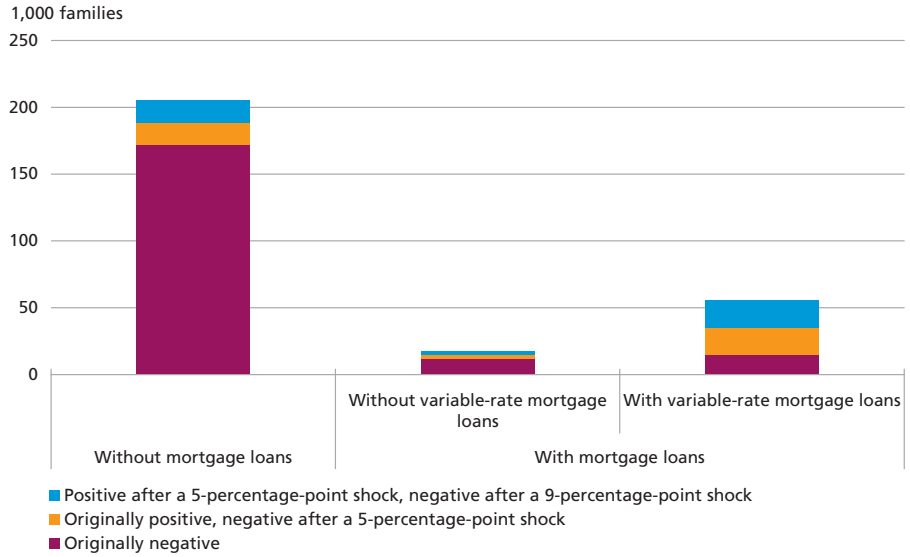
Note: All families cover families both with and without mortgage loans.
Source: Mortgage banks, Statistics Denmark and own calculations.

BREAKDOWN OF FINANCIAL MARGIN UNDER THE TIGHT BUDGET, INTEREST-RATE SHOCK LASTING ONE YEAR, ALL FAMILIES, 2010 Chart 26



Note: All families cover families both with and without mortgage loans.
Source: Mortgage banks, Statistics Denmark and own calculations.

FAMILIES WITH A NEGATIVE FINANCIAL MARGIN – TIGHT BUDGET, 2010 Chart 27



Note: Families with variable-rate loans cover families with at least one variable-rate mortgage loan.
Source: Mortgage banks, Statistics Denmark and own calculations.

DECREASE IN FINANCIAL MARGIN PER MONTH ON AN INTEREST-RATE INCREASE OF 5 PERCENTAGE POINTS, 2010 Table 10

Number of families	Families *with* mortgage debt	Families *without* mortgage debt
No change	141,154	535,193
Kr. 1-500	156,668	704,925
Kr. 501-1,000	131,208	155,221
Kr. 1,001-2,000	190,290	121,673
Kr. 2,001-3,000	116,733	43,867
Kr. 3,001-5,000	127,213	24,164
Over kr. 5,000	110,193	12,016

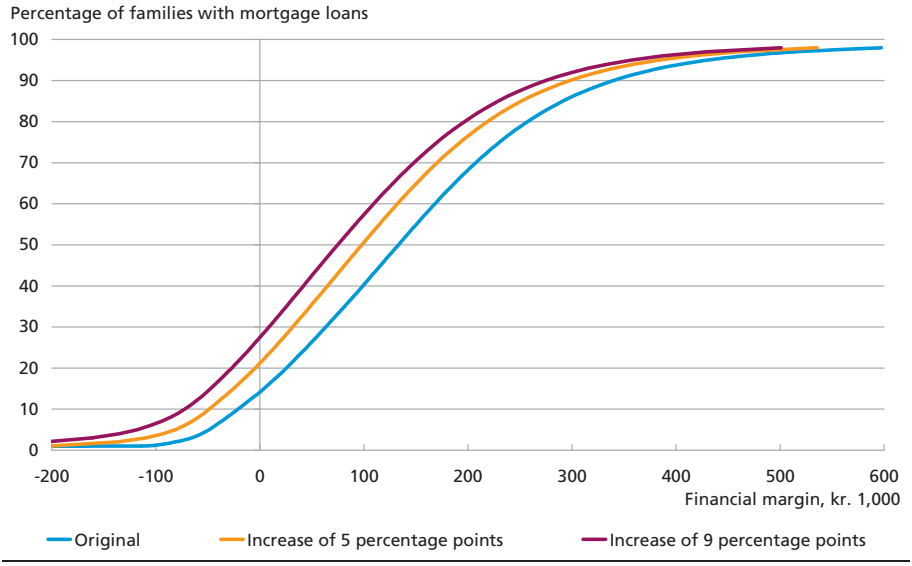
Source: Mortgage banks, Statistics Denmark and own calculations.

Banks (2012). When asked whether they were prepared for a possible increase in the repayments on their adjustable-rate loans at the next adjustment, 85 per cent of the respondents said that they were prepared to a high or some degree. 11 per cent said that they were prepared to a lower degree, and 2 per cent replied that they were not prepared at all.[1] In the same survey, the Association of Danish Mortgage Banks asked the respondents to assess "how much extra they would be able to pay on their loans each month (before tax) before they would encounter notable constraints on their current consumption/savings" (Association of Danish Mortgage Banks (2012) p. 2). On average, the respondents assessed that they could manage an increase in repayments of kr. 3,100 per month before a notable decline in their standard of living would set in. In addition, the respondents assessed that the pain threshold was an increase in repayments of kr. 4,200 per month. For increases beyond this threshold, they found that they would no longer be able to service their mortgage loans.

Table 10 shows the decline in the families' financial margin after an interest-rate shock of 5 percentage points. Almost 240,000 families will have over kr. 3,000 less at their disposal per month, taking into account that higher interest expenses imply lower tax. For 110,000 families, the monthly disposable amount will shrink by over kr. 5,000. The results in the Table are not directly comparable with the survey conducted by the Association of Danish Mortgage Banks. Firstly, the calculation is made on an after-tax basis, secondly interest expenses on other debt are also assumed to rise, and thirdly all families are considered. Last, but not least, the analysis is based on interest rates in 2010, while the survey was conducted in April 2012. With these reservations in mind, quite a few stated, asked directly, that they would experience increases in repayments of a size they would find difficult to manage.

[1] The remainder replied "don't know".

BREAKDOWN OF FINANCIAL MARGIN UNDER THE AVERAGE BUDGET, INTEREST-RATE SHOCK LASTING ONE YEAR, FAMILIES WITH VARIABLE-RATE MORTGAGE LOANS, 2010 Chart 28

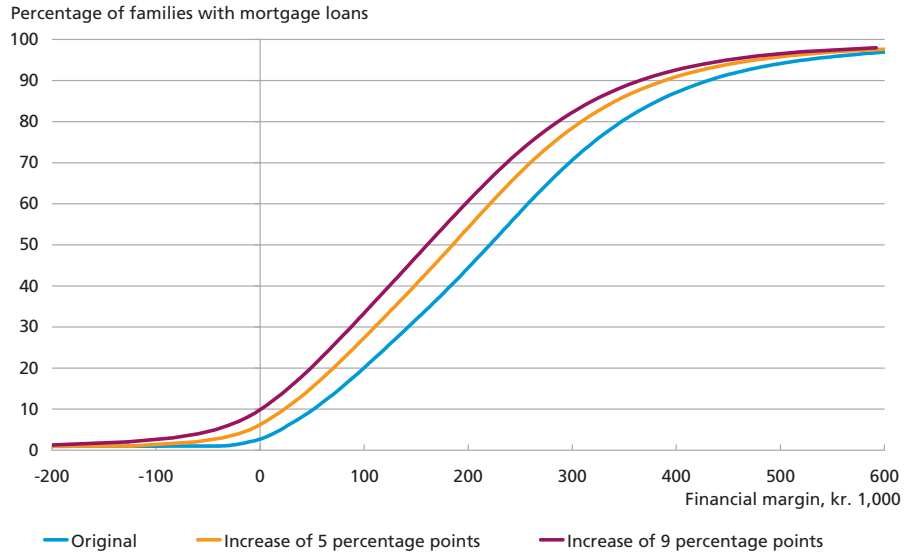


Note: Only families with at least one variable-rate mortgage loan are included.
Source: Mortgage banks, Statistics Denmark and own calculations.

If only families with variable-rate mortgage debt are considered, the effect of an interest-rate shock is relatively pronounced, cf. Charts 28 and 29. Among these families, the number whose financial margin becomes negative under the tight budget grows from around 15,000 to close to 35,000 on an interest-rate increase of 5 percentage points. This corresponds to 6 per cent of the families with variable-rate loans becoming unable to meet current expenses from current income. An interest-rate increase of 9 percentage points would move another 20,000 or so from the positive to the negative interval.

After an interest-rate shock, families with tight finances account for a larger share of the debt burden than previously, cf. Table 11. The share of total mortgage debt held by families with negative financial margins thus grows from 3.0 to 6.4 per cent when the tight budget is applied to the calculations. The share of bank debt among families with a negative financial margin rises from 5.7 to 12.4 per cent. But not many of these families have high LTV ratios. The number of families with a negative financial margin and a home with an LTV ratio of more than 100 per cent rises from around 2,250 initially to approximately 4,750 after an interest-rate increase of 5 percentage points. Among the remaining 51,000 or so families with a negative financial margin, just over 10,000

BREAKDOWN OF FINANCIAL MARGIN UNDER THE TIGHT BUDGET, INTEREST-RATE SHOCK LASTING ONE YEAR, FAMILIES WITH VARIABLE-RATE MORTGAGE LOANS, 2010 Chart 29



Note: Only families with at least one variable-rate mortgage loan are included.
Source: Mortgage banks, Statistics Denmark and own calculations

have homes with LTV ratios of 80-100, while around 41,000 have only homes with an LTV ratio of less than 80, cf. Chart 30.

The 4,750 families with loans in properties with an LTV ratio of over 100 per cent as well as a negative financial margin under the tight budget only hold 1 per cent of total mortgage debt and just over 1 per cent of families' total bank debt, cf. Table 12. Whether this debt leads to losses for credit institutions initially depends on families' ability to e.g. cut consumption further, sell assets or increase their income, and then on how much the loans exceed the sales price of the asset pledged as

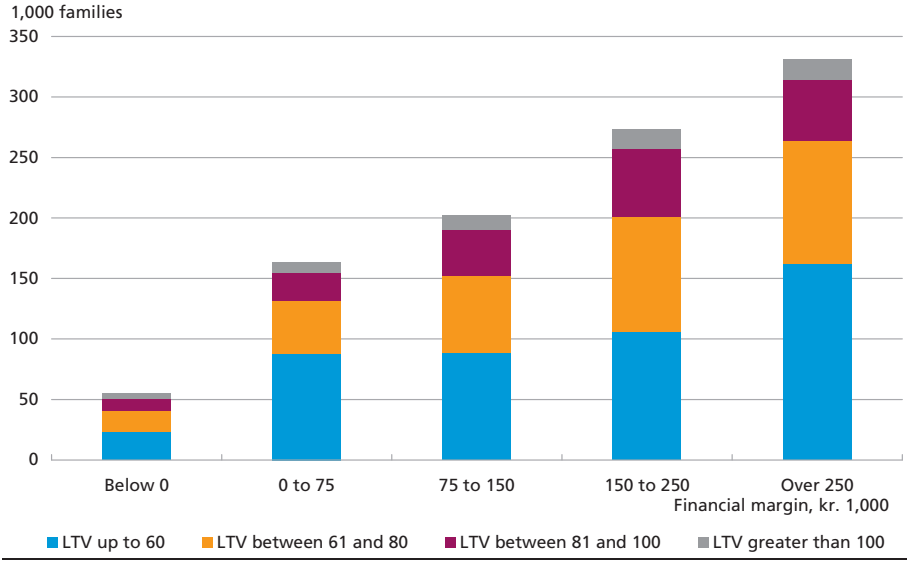
BREAKDOWN OF DEBT BY FINANCIAL MARGIN AFTER INTEREST-RATE SHOCK OF 5 PERCENTAGE POINTS, ALL FAMILIES, TIGHT BUDGET, 2010 Table 11

Financial margin, kr. 1,000	Mortgage debt, kr. billion	Mortgage debt, per cent	Bank debt, kr. billion	Bank debt, per cent	Other debt, kr. billion	Other debt, per cent
Below 0	75.3	6.4	63.3	12.4	68.6	13.0
0-75	129.9	11.1	86.6	17.0	89.4	16.9
75-150	194.9	16.6	98.5	19.3	101.8	19.3
150-250	317.9	27.2	117.2	23.0	120.8	22.8
Over 250	452.9	38.7	144.0	28.3	148.2	28.0
Total	1,170.9	100.00	509.6	100.00	528.7	100.00

Note: All families cover families both with and without mortgage debt.
Source: Mortgage banks, Statistics Denmark and own calculations.

REMAINING DEBT RELATIVE TO PROPERTY VALUE AFTER AN INTEREST-RATE INCREASE OF 5 PERCENTAGE POINTS, 2010, TIGHT BUDGET

Chart 30



Note: LTV ratios indicate the remaining debt as a percentage of the property value of the property serving as collateral for the loan. Property valuations are the mortgage banks' valuations at end-2010. Families with loans in several properties are included once per property, whereby a family may be included more than once in the same bar. Only families with mortgage debt are included in the Chart.
Source: Mortgage banks, Statistics Denmark and own calculations.

collateral with the credit institutions. Mortgage loans will always be based on real property as collateral.

If a family encounters financial problems of such a magnitude that their property ends up in an enforced sale, the sales price will often be lower than the price that could be obtained in the free market, cf.

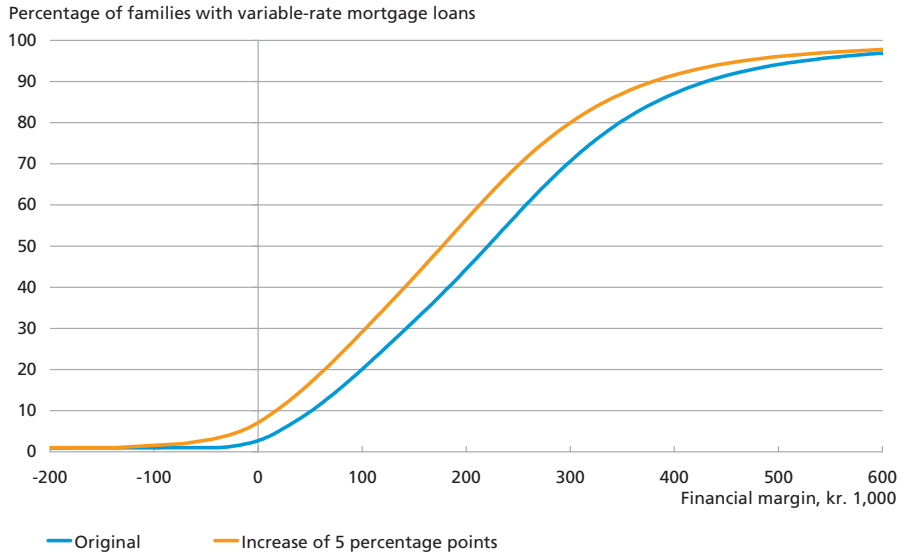
BREAKDOWN OF DEBT BY FINANCIAL MARGIN AFTER INTEREST-RATE SHOCK OF 5 PERCENTAGE POINTS, FAMILIES WITH LTV RATIOS OVER 100, TIGHT BUDGET, 2010

Table 12

Financial margin, kr. 1,000	Mortgage debt, kr. billion	Share of total mortgage debt, per cent	Bank debt, kr. billion	Share of total bank debt, per cent	Other debt, kr. billion	Share of total other debt, per cent
Below 0	12.6	1.1	3.8	1.4	0.6	4.1
0-75	12.4	1.1	2.5	0.9	0.2	1.7
75-150	19.6	1.7	3.9	1.5	0.3	2.4
150-250	29.8	2.5	5.9	2.3	0.4	3.1
Over 250	42.5	3.6	8.0	3.1	0.5	3.3
Total	116.9	10.0	24.1	9.2	2.1	14.7

Note: All families cover families both with and without mortgage debt.
Source: Mortgage banks, Statistics Denmark and own calculations.

BREAKDOWN OF FINANCIAL MARGIN UNDER THE TIGHT BUDGET, FULLY IMPLEMENTED INTEREST-RATE SHOCK, FAMILIES WITH VARIABLE-RATE MORTGAGE LOANS, 2010 Chart 31



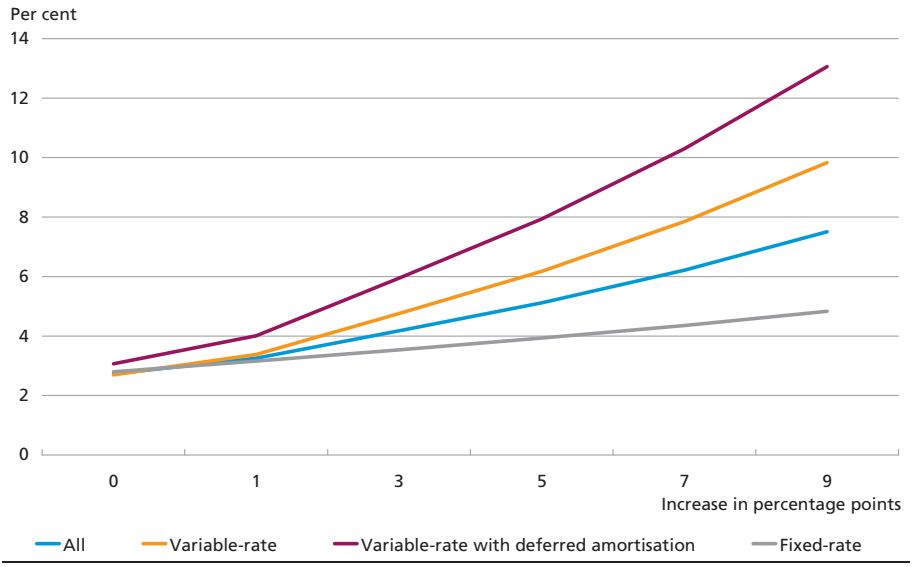
Note: Only families with at least one variable-rate mortgage loan are included.
Source: Mortgage banks, Statistics Denmark and own calculations.

Danmarks Nationalbank (2012). This means that banks and mortgage banks may lose money on enforced sales of properties for which the total loans are assessed to constitute less than 100 per cent of the market price. But their losses will often be smaller than the loss on the property, since the borrower is personally liable, meaning that banks and mortgage banks have other ways of enforcing their claims.

The duration of the shock also influences families with variable-rate mortgage loans, since only part of the variable-rate mortgage debt is subject to adjustment in the first year. Once the interest-rate shock is fully implemented, the financial margin becomes negative for another 5,000 or so families with variable-rate loans, cf. Chart 31. Families with variable-rate loans with adjustment one or more years ahead will, however, have more time to adjust their budgets.

Among families with variable-rate mortgage loans there is substantial variation in the effect of an interest-rate shock for families with and without deferred amortisation, respectively, cf. Chart 32. A total of 63 per cent of the families with variable-rate loans have opted for deferred amortisation, and these families hold around 70 per cent of the mortgage debt among families with variable-rate mortgage loans. The combination of deferred amortisation and variable-rate loans means that an interest-rate increase will be fully passed through to repayments on the

SHARE WITH NEGATIVE FINANCIAL MARGIN, FAMILIES WITH MORTGAGE DEBT, TIGHT BUDGET, 2010 Chart 32



Note: Only families with at least one mortgage loan are included.
Source: Mortgage banks, Statistics Denmark and own calculations.

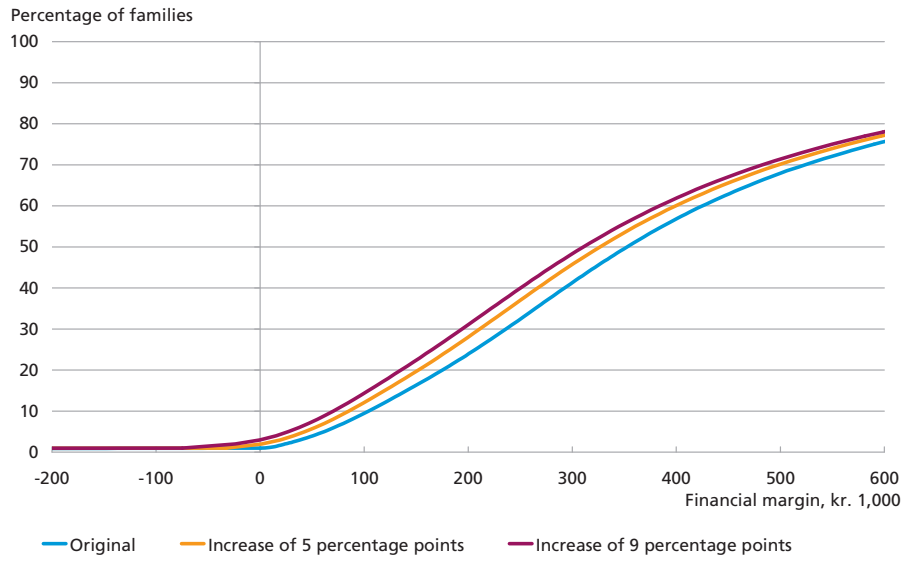
loan. If redemptions are paid on a variable-rate annuity loan, the redemptions will fall if interest rates rise.

It is relevant to take family assets into account especially in connection with temporary interest-rate increases. Most families have enough liquid assets to meet the extra expenses resulting from the interest-rate increases for a period of more than one year, cf. Chart 33.

All in all, most Danish families have robust finances and are able to weather rather large interest-rate increases, although this will often result in lifestyle changes in the form of lower consumption. The group of families who encounter financial problems as a result of an interest-rate increase mainly consists of families without mortgage debt and families with variable-rate mortgage debt. Among families with variable-rate mortgage debt, those who have opted for deferred amortisation are particularly exposed.

LTV ratios are low among the families whose financial margin becomes negative. Less than 5,000 of the families who encounter financial problems thus have loans in properties with an LTV ratio exceeding 100 per cent, and these families hold only around 1 per cent of families' total debt to banks and mortgage banks. Moreover, most families by far have a buffer of liquid assets, which can cover the additional costs of interest-rate increases for more than one year.

BREAKDOWN OF FINANCIAL MARGIN ADJUSTED FOR LIQUID ASSETS, FAMILIES WITH MORTGAGE DEBT, TIGHT BUDGET, 2010 Chart 33



Note: Liquid assets include bank deposits, market value of stocks and bonds and mortgage deeds in custody accounts.
Source: Mortgage banks, Statistics Denmark and own calculations.

INCOME SHOCKS

As described above, families' exposure depends e.g. on their ability to service their debt commitments from their current disposable income. The stress scenarios for interest rates imply shocks to current debt repayments. However, it is just as relevant to apply stress scenarios to the other side of the equation, i.e. disposable income, by looking at the individual families' robustness to unemployment.

For approximately every second person who became unemployed in 2010, the period of unemployment lasted less than 3 months. For more than 1 in 4 persons who became unemployed, the period of unemployment lasted 3-6 months. It is therefore relevant to examine the families' ability to withstand a decrease in income as a result of a period of unemployment of 3 or 6 months, respectively, taking the rules on unemployment benefits and tax into account.

In order to analyse the individual family's robustness to temporary unemployment, two stress scenarios are constructed in which the family's principal earner loses his or her earned income for 3 and 6 months, respectively.

Families' financial margins under the two stress scenarios are examined below. The calculations take into account whether or not the indi-

ANALYSIS OF TEMPORARY LOSS OF INCOME Box 7

The purpose of this analysis is to examine the individual family's robustness to a temporary loss of income. This means that the analysis is performed at micro level and cannot be aggregated to the economy overall. Whether the individual families can cope with a temporary loss of the principal earner's income is analysed by assuming that the earned income of the principal earner lapses and is replaced by unemployment or social benefits, depending on the person's entitlement. The analysis includes all families, also persons with a very low probability of becoming unemployed, including those in high income groups.

It is only possible to become unemployed if the person had a job to start with. Therefore, the analysis is limited to families whose principal earner was employed throughout 2010. The definition is that the principal earner has not been affected by unemployment, not received pension, early retirement benefits, social pension benefits, sickness or maternity/paternity leave benefits, social benefits, unemployment benefits or student grants and has a positive earned income. Moreover, the analysis is limited to families whose principal earner is in the 18-64 age group. According to this delineation, 1.8 million persons were employed throughout 2010, corresponding to 69 per cent of the total workforce in the 18-64 age group.

The loss of earned income for the family's principal earner is expected to last for 3 or 6 months. Statistics Denmark's registers contain information on whether a person has unemployment insurance. In addition, the rules on social benefits are used for calculation of whether a person is entitled to such benefits in the event of unemployment. The disposable income is recalculated, and tax is also adjusted to match the change in income. All calculations of tax, unemployment benefits and social benefits are based on the rules for 2010, as that is the most recent year for which employment data is available. The change in the family's financial margin given the change in disposable income is then examined. The analysis is performed only with a time horizon of one year. Thus, the assumption is that income is the only factor that changes.

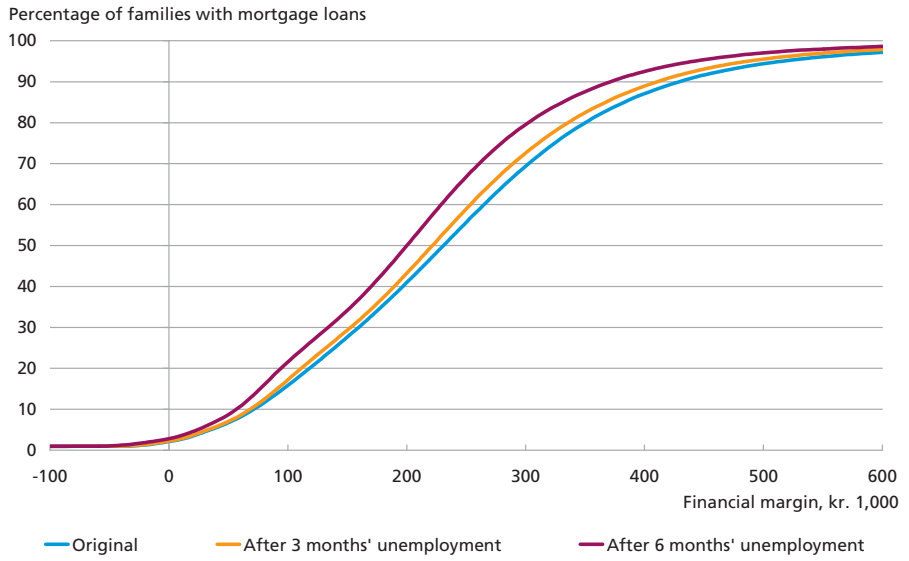
vidual principal earner is entitled to unemployment benefits or social benefits. The calculations are described in more detail in Box 7.

Chart 34 shows the changes in the cumulative distribution of financial margins in the two stress scenarios one year ahead. It appears that very few families move from the positive to the negative interval for financial margins when the principal earner becomes unemployed. A large majority of the families with mortgage loans thus have enough financial scope to sustain lapse of one income for six months on a tight budget.

Since the lapse of income is assumed to be temporary, families' liquid assets should be taken into account when examining the effects of the unemployment shocks. A large majority of families with mortgage debt have enough liquid assets to cover a 6-month decline in the principal earner's income, cf. Chart 35.

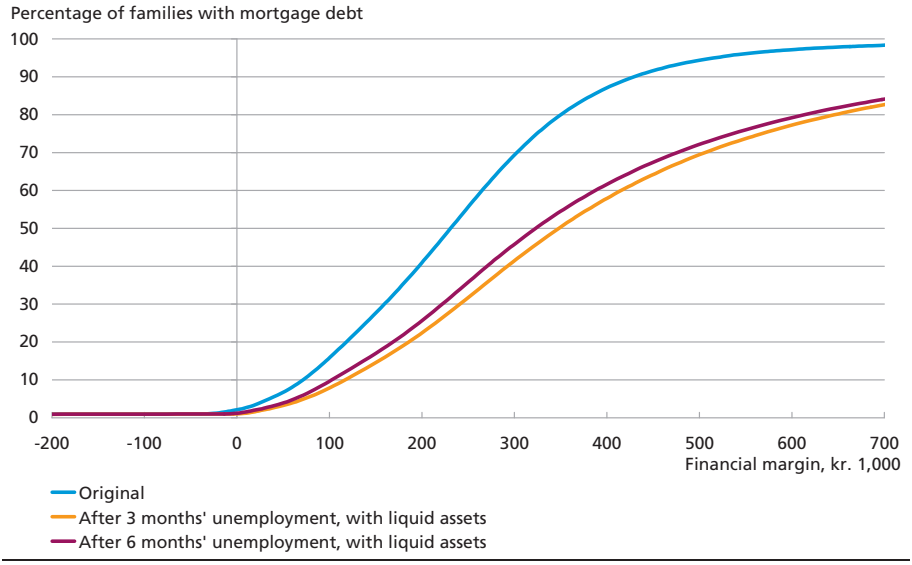
Virtually all of the families with mortgage debt who have a positive financial margin in the baseline scenario have enough budgetary scope to

BREAKDOWN OF FINANCIAL MARGIN IF THE PRINCIPAL EARNER BECOMES UNEMPLOYED, FAMILIES WITH MORTGAGE DEBT, TIGHT BUDGET, 2010 Chart 34



Note: It is assumed that the loss of earned income for the principal earner lasts for 3 or 6 months, respectively, and that the lost income is replaced by unemployment or social benefits, depending on the principal earner's entitlement.
Source: Mortgage banks, Statistics Denmark and own calculations.

BREAKDOWN OF FINANCIAL MARGIN, ADJUSTED FOR LIQUID ASSETS, IF THE PRINCIPAL EARNER BECOMES UNEMPLOYED, FAMILIES WITH MORTGAGE DEBT, TIGHT BUDGET, 2010 Chart 35



Note: It is assumed that the loss of earned income for the principal earner lasts for 3 or 6 months, respectively, and that the lost income is replaced by unemployment or social benefits, depending on the principal earner's entitlement. Liquid assets include bank deposits, the market value of stocks and bonds and mortgage deeds in custody accounts.
Source: Mortgage banks, Statistics Denmark and own calculations.

withstand a decline in the principal earner's income for up to 6 months. Moreover, many families have enough liquid assets to cushion the shock. Families with mortgage loans are thus well positioned to weather temporary periods of unemployment, applying a partial perspective, i.e. the individual family is affected by unemployment without an increase in total unemployment in the economy.

EXPIRY OF DEFERRED AMORTISATION

For the largest share by far of deferred-amortisation loans, the duration of the deferred-amortisation period is 10 years.[1] Since the first deferred-amortisation loans were issued in 2003, deferred-amortisation periods will begin to expire as from 2013. Based on data on the families' mortgage loans at end-2011, the number of families exposed to expiry of deferred amortisation is less than 5,000 in 2013, cf. Chart 36, rising to approximately 27,000 in 2014 and almost 70,000 in 2015. For more than 110,000 families, the period of deferred amortisation will expire in 2019.

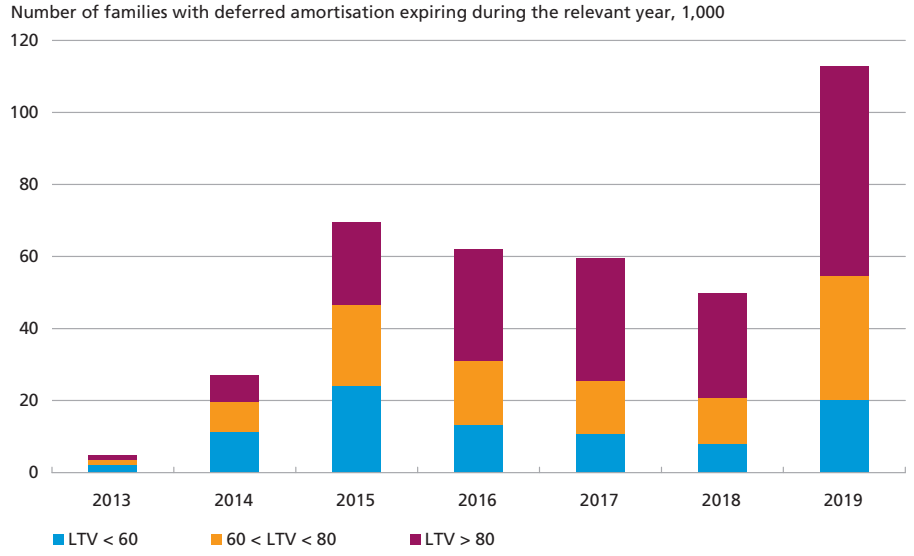
When the deferred-amortisation period expires the principal must be repaid over the remaining maturity, unless the loan is refinanced. For 30-year loans with deferred amortisation for the first 10 years, the principal must thus be repaid over 20 years. Most families with deferred-amortisation loans have enough budgetary scope to begin to pay redemptions on their mortgage debt already now, cf. Box 8.

At this stage, 10 per cent of the families will be unable to repay the mortgage debt over 20 years if the tight budget is applied to the calculations. This does not necessarily mean that they will be unable to do so when their deferred-amortisation period actually expires. Before that time, some of these families may have repaid other debt, obtained a higher income or have assets to sell.

However, many families must be expected to wish to prolong the deferred-amortisation period by raising a new deferred-amortisation loan at up to the limit of 80 per cent of the current property valuation, redeeming the existing loan. Due to the combination of non-repayment of the debt, which is often raised at up to 80 per cent of the property valuation, and falling house prices, the remaining debt of many of the deferred-amortisation loans now exceeds 80 per cent of the market value, cf. Chart 36. Unless house prices rise before the expiry of the deferred-amortisation period, quite a few families will have to find alternative funding of the share of the loan exceeding the 80-per-cent limit. For the

[1] In 2007 it became possible to grant loans with longer deferred-amortisation periods, provided that the LTV ratio is lower than 75.

EXPIRY OF DEFERRED AMORTISATION AND LTV RATIO Chart 36



Note: The Chart shows the number of families with at least one deferred-amortisation loan where the deferred-amortisation period expires at the latest during the year stated. The year of expiry is calculated on the basis of the starting date of the most recent deferred-amortisation period, assuming that the total deferred-amortisation period is 10 years. A family may be included in several different years if it has more than one deferred-amortisation loan. The LTV ratio is the remaining debt as a ratio of the property value of the property serving as collateral for the loan. The property value is the mortgage bank's valuation at end-2011. If a family has more deferred-amortisation loans expiring in the same year, but which are based on different properties as collateral, the loan with the highest LTV ratio is shown in the Chart.

Source: Mortgage banks, Statistics Denmark and own calculations.

median family with deferred-amortisation loans and an LTV ratio of more than 80 per cent, this funding requirement is around kr. 144,000.

If a family has sufficient liquid funds, they may be used for redemption of the existing loan, thereby reducing the borrowing requirement when raising a new deferred-amortisation loan. If this is taken into account, more than 100,000 families with LTV ratios over 80 per cent are facing expiry of the deferred-amortisation period in the coming years.

CALCULATION OF HYPOTHETICAL REDEMPTIONS Box 8

Hypothetical redemptions are calculated for all deferred-amortisation loans in order to examine whether families with deferred amortisation have enough financial scope for paying redemptions on their mortgage loans. The hypothetical redemptions if the loan was to be repaid as from the following year are calculated. Thus, the redemptions are calculated on the basis of the remaining debt and interest rates in 2010, and the loan is to be repaid over the next 20 years. If the remaining maturity is less than 20 years, this is used instead. This increases total redemptions for families with one or more deferred-amortisation loans.

The analysis shows that for around 10 per cent of the families with deferred-amortisation loans, the financial margin will be negative under the tight budget after the calculations of hypothetical redemptions.

LITERATURE

Andersen, Asger Lau, Anders Møller Christensen, Nick Fabrin Nielsen, Sigrid Alexandra Koob, Martin Oksbjerg and Ri Kaarup (2012), The wealth and debt of Danish families, Danmarks Nationalbank, *Monetary Review*, 2nd Quarter, Part 2.

Dam, Niels Arne, Tina Saaby Hvolbøl, Erik Haller Pedersen, Peter Birch Sørensen and Susanne Hougaard Thamsborg (2011), Developments in the market for owner-occupied housing in recent years – can house prices be explained?, Danmarks Nationalbank, *Monetary Review*, 1st Quarter 2011, Part 2.

Danmarks Nationalbank (2009), *Financial stability*.

Danmarks Nationalbank (2010), *Financial stability*.

Danmarks Nationalbank (2011), *Financial stability*.

Danmarks Nationalbank (2012), *Financial stability*.

European Commission (2012), Alert mechanism report 2013, report prepared in accordance with Article 3 and 4 of the Regulation on the prevention and correction of macroeconomic imbalances.

Danish Financial Supervisory Authority (2012), *Vejledning i regnskabsindberetning for kreditinstitutter og fondsmæglerselskaber m.fl.* (Guidelines on financial reporting for credit institutions and stockbroking companies, etc. – in Danish only).

Fitch Ratings (2012) Fitch affirms Denmark at 'AAA'; outlook stable. Press release, 4 April.

Johansson, Martin W. and Mattias Persson (2006), Swedish households' indebtedness and ability to pay – a household level study, *Penning- och valutapolitik 3/2006*, Sveriges Riksbank.

Jönsson, Kristian, Anders Nordberg and Maria Wallin Fredholm (2011), Household indebtedness – consequences for the banks' credit losses and financial stability, Riksbank Commission of Inquiry Into Risks on the Swedish Housing Market, RUTH, Sveriges Riksbank, pp. 135-152.

Mäki-Fränti, Petri (2011), Finnish households' economic margin, *Bank of Finland Bulletin 5/2011*, Bank of Finland.

Persson, Mattias (2009), Household indebtedness in Sweden and implications for financial stability – the use of household-level data, BIS papers 46, pp. 124-135.

Association of Danish Mortgage Banks (2011), *Boligejerne har styr på deres afdragsfrie realkreditlån* (Homeowners in control of their deferred-amortisation loans – in Danish only), *Tema: Afdragsfrihed.*

Association of Danish Mortgage Banks (2012), *9 ud af 10 vil bevare F1-lånene* (9 out of 10 want to keep F1 loans – in Danish only), Press release, 27 June.

Vatne, Bjørn H. (2006), *Hvor store økonomiske marginer har husholdningerne? En analyse på mikrodata for perioden 1987-2004* (How large are households' financial margins? An analysis on microdata for the period 1987-2004 – in Norwegian only), *Penger og Kreditt 3/2006*, Norges Bank.