# Danish Families' Financial Robustness, Variable Rates and Deferred Amortisation

*Asger Lau Andersen and Anders Møller Christensen, Economics, Charlotte Duus and Ri Kaarup, Financial Markets*

## INTRODUCTION AND SUMMARY

The far higher gross debt-to-income ratio of Danish families compared with families in other countries has attracted marked attention among international organisations, credit rating agencies and a number of observers. As a counterpart of the substantial debt, Danish families also hold considerable assets. Especially the large individualised pension wealth distinguishes Danish households from households in other countries. 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 pension assets are illiquid in the short term and 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 distribution of wealth and debt 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, 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 sustained 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.

A detailed analysis is performed to establish the number of families that will encounter financial difficulties 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 expenses, 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 3 or 6 months' unemployment for the family's principal earner, given the rules on unemployment benefits and tax. It is calculated whether the disposable amount is large enough to sustain consumption corresponding to an average budget or a tight budget, respectively, and the changes in the disposable amount are broken down. Disregarding the calculated consequences of a period of unemployment, 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 e.g. for 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).

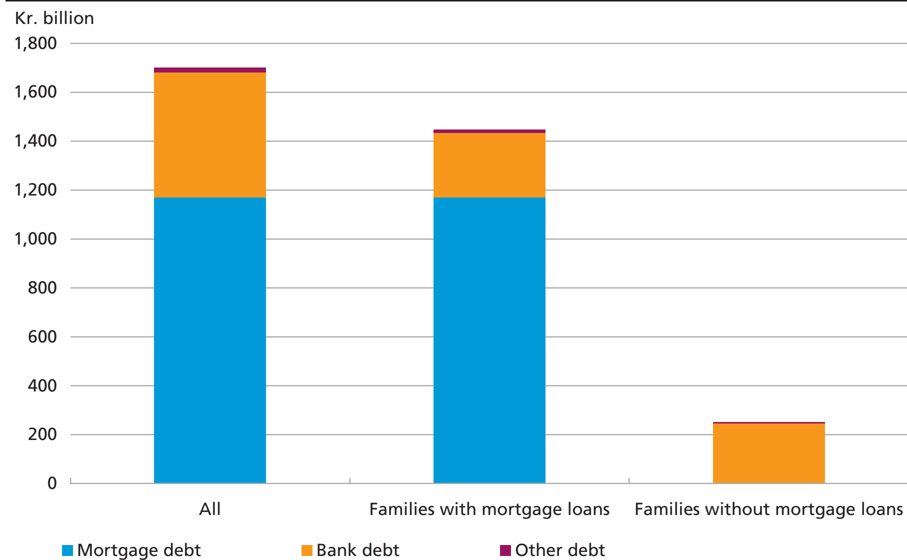
In the analysis, the special focus is on the types of mortgages raised by Danish families from the mortgage banks. No such previous analysis exists at a detailed level. Families who have raised mortgage loans with deferred amortisation tend to have had higher debt than other families before raising the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

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

Since mortgage banks have often granted loans with deferred amortisation up to the limit of 80 per cent of the assessed market value of a home, the falling house prices entail that for around half of these loans, the debt now exceeds 80 per cent of the market value.

Loans with deferred amortisation pose a serious problem in that they function smoothly only in periods of rising house prices. This is probably re-

TOTAL FAMILY 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.

flected 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 article is based on new, detailed data. Danish 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 and at individual level, this information has been pooled with e.g. income, tax and wealth data from Statistics Denmark and then aggregated, using the family as the economic unit. The analysis comprises all families with full tax liability in Denmark and income after tax of more than kr. 25,000 in 2010. Families whose main income results from self-employment are not included.[1]

See the article in Part 2 for further information on data and definitions.

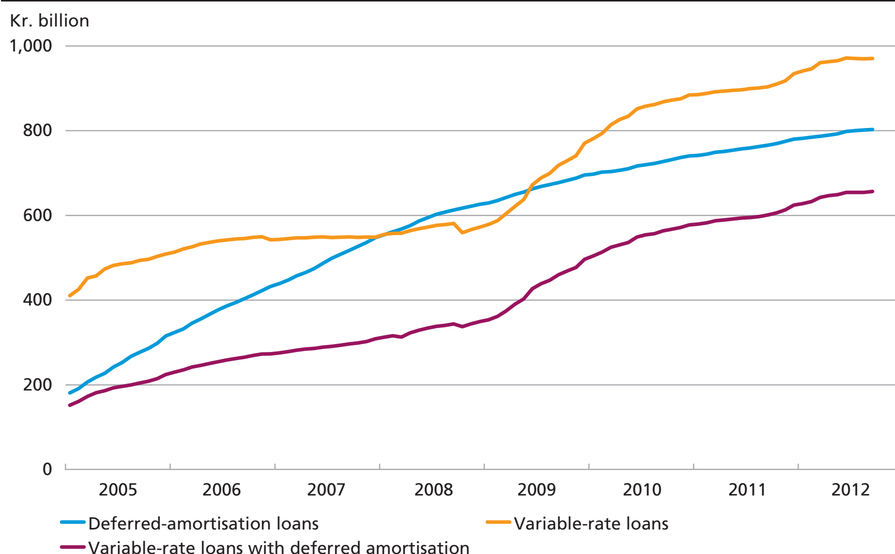
## DEBT STRUCTURE

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 survey, around 38 per cent had mortgage debt in 2010. These families account for 85 per cent of the families' total debt, cf. Chart 1.

[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 social pension benefits.

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 with amortisation.
Source: Danmarks Nationalbank.

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.

The new loan types have gained considerable ground in recent years, cf. Chart 2.

At end-2010, most families had only one type of mortgage loan, cf. Table 1.

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

Table 1

| 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.

## FAMILIES WITH MORTGAGE LOANS WITH DEFERRED AMORTISATION

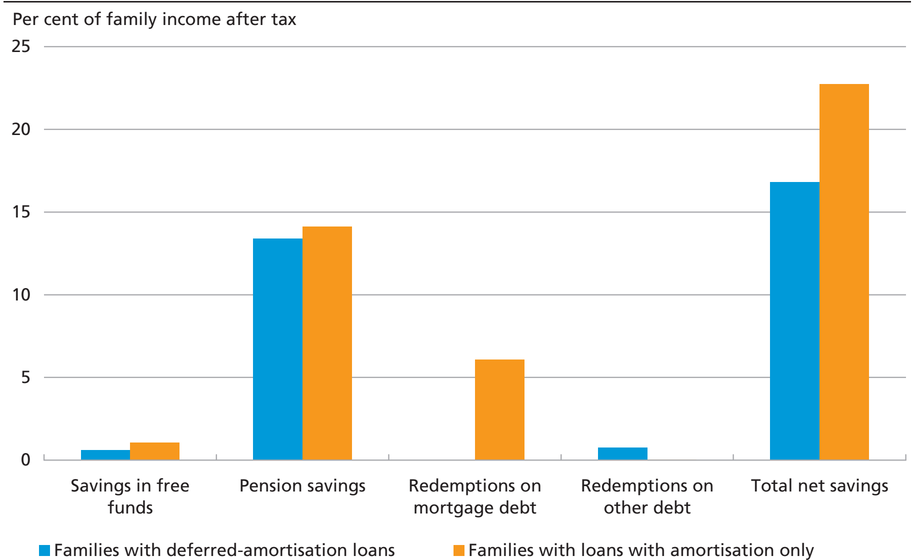
The age structure among families with deferred-amortisation mortgage loans differs from that of other families with mortgage debt. For families whose oldest member is less than 40 years old and families with members over 65 years, deferred-amortisation loans account for a larger share of total debt than for other families.

On average, the gross debt is higher for families with deferred-amortisation debt 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.

If family assets are also considered in the calculation, including the housing value but excluding pension savings, net debt is more frequently found among families with deferred-amortisation loans than among families with amortisation. Adjusting for differences in age, income and year of raising the loan, the detailed analysis in Part 2 shows that net debt is around kr. 300,000 higher on average for families with deferred amortisation than for other families.

It also turns out that in 2010, typical families with deferred-amortisation mortgage loans had lower savings than typical families with amortisation. Only relatively few families use the absence of redemptions on mortgage debt to repay other, often more expensive, debt, cf. Chart 3.

MEDIAN VALUES FOR SAVINGS AND REDEMPTION RATIOS, 2010 — Chart 3




Note: The Chart shows the median value in 2010 for each stated savings and redemption ratio among homeowner families who raised mortgage loans 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.

These results do not necessarily indicate a causal link from the option of raising deferred-amortisation loans to the savings ratio, but the access to deferred-amortisation mortgage loans has 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. This has been a main reason why variable-rate loans have gained considerable ground over a short period. The drawback of lower interest rates is the risk of interest-rate increases.

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. Variable-rate loans are more popular than fixed-rate loans in families whose oldest member is under 50 years old. This is a key factor explaining why families with variable-rate loans have higher incomes than families with fixed-rate loans only, but this income difference also applies in the individual age groups.

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. Families with variable-rate mortgage loans also tend to have higher net debt.

## FINANCIAL MARGIN

With a view to assessment of a family's financial robustness, a standardised budget method – the financial margin – is applied as a measure of 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.

The applied data contains detailed information on the individual 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.

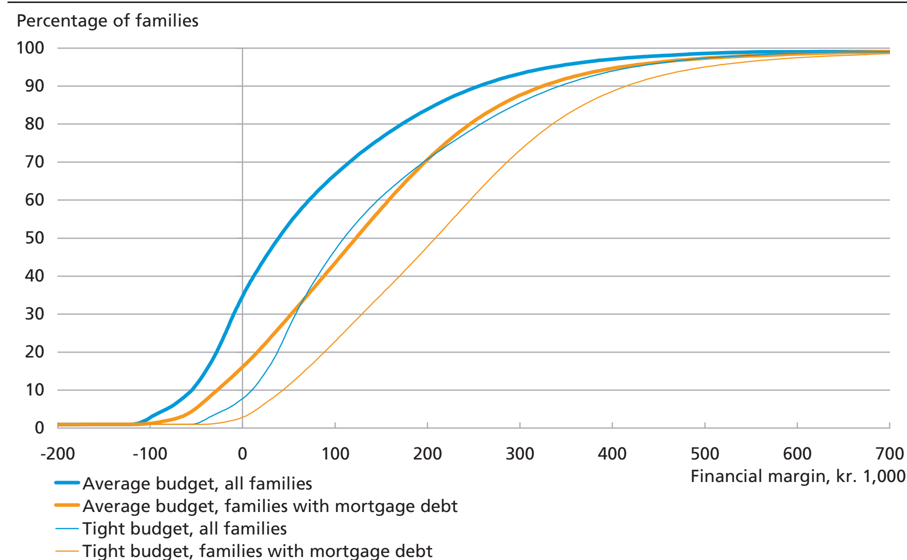
Two budgets are applied: an average budget reflecting the consumption pattern of the average families and a tight budget reflecting the consumption of families in the lowest income group. It should be noted that the tight budget cannot be regarded as a poverty limit, but that it reflects the actual consumption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

Chart 4 shows the breakdown of the financial margin by all families and families with mortgage debt. 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 current income relative to the budgets is considerably smaller for families with mortgage debt than for all families.

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 the current income provides a substantially different picture. The share of all families with a negative financial mar-

BREAKDOWN OF FINANCIAL MARGIN, 2010 — Chart 4



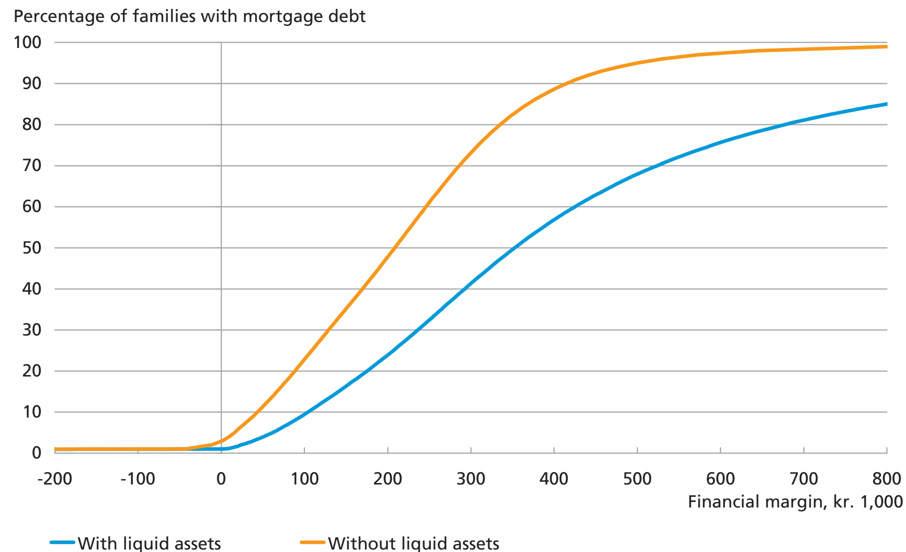

Note: "All families" cover families both with and without mortgage debt.
Source: Mortgage banks, Statistics Denmark and own calculations.

gin 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. 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.

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 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. 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.

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 share with a negative financial margin is thus brought down to 1 per cent one year ahead when the tight budget is applied to the calculations, cf. Chart 5.

BREAKDOWN OF FINANCIAL MARGIN ADJUSTED FOR LIQUID ASSETS, FAMILIES WITH MORTGAGE DEBT, TIGHT BUDGET, 2010 — Chart 5




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.

Basically, most families with mortgage debt are able to meet their expenses, and families with tight finances account for a limited share of the total debt. In addition, the LTV ratios for 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. Credit institutions suffered only marginal losses on private 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 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.

## EFFECT OF AN INTEREST-RATE SHOCK

An analysis of the consequences to families' finances of an interest-rate increase is performed in order to assess their financial robustness. Table 2 shows the decline in families' financial margin after an interest-rate shock of 5 percentage points lasting one year. After the interest-rate shock, almost 240,000 families with mortgage debt 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.

In an interview-based survey from the Association of Danish Mortgage Banks (2012), borrowers with F1 loans assessed that, on average, 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, and that the pain threshold was kr. 4,200.

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 respondents stated, asked directly, that they would experience increases in repayments of a size they would find difficult to manage.

[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.

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

Table 2

| 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.

Among families with variable-rate mortgage loans there is substantial variation in the effect of an interest-rate shock between families with and without deferred amortisation, respectively. The combination of deferred amortisation and variable-rate loans means that an interest-rate increase will be fully passed through to repayments on the loan. If redemptions are paid on a variable-rate annuity loan, the redemptions will fall if interest rates rise.

After an interest-rate shock, families with tight finances account for a larger share of the debt burden than previously. 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. These families account for 1 per cent of total mortgage debt and just over 1 per cent of total bank debt. Whether this debt leads to losses for the credit institutions initially depends on the 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 collateral with the credit institutions. Mortgage loans will always be based on real property as collateral.

## 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 repay-

ments. 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. Part 2 contains a detailed explanation of the analysis.

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

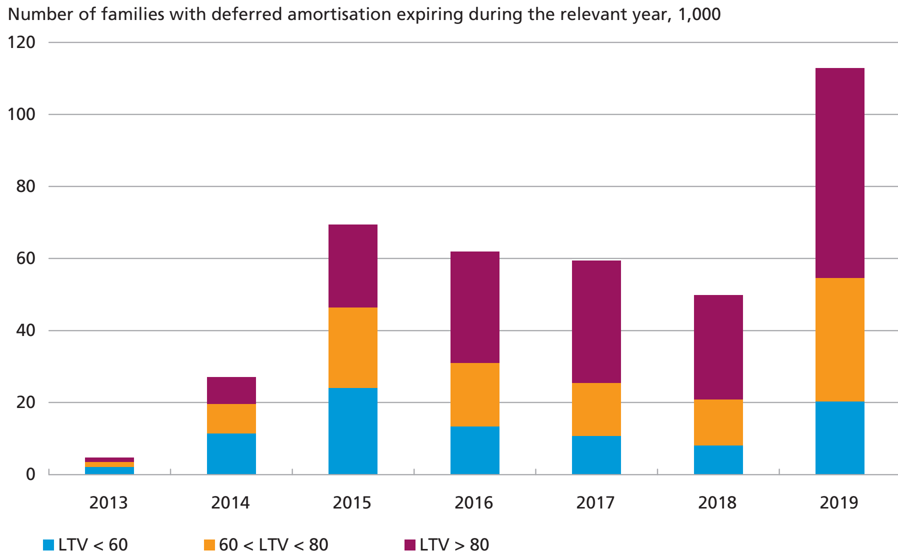
For the largest share by far of deferred-amortisation loans, the duration of the deferred-amortisation period is 10 years.[1] Since the first deferred-amortisation loans were issued in 2003, deferred-amortisation periods will begin to expire in 2013, cf. Chart 6.
When the deferred-amortisation period 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 accommodate this, if the tight budget is applied to the calculations.

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

[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 6




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.

deferred-amortisation loans now exceeds 80 per cent of the market value, cf. Chart 6. 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 median family with deferred-amortisation loans and an LTV ratio of more than 80 per cent, this funding requirement is around kr. 144,000.

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