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- Does negative equity exist as a permanent feature in the Danish housing market?[12]

Abstract:
House and flat prices have been through a tremendous bust and boom cycle in Denmark. From 1986 to 1993 real prices for houses and flats dropped by one third on average, foreclosures accounted for around 1/6 of the house and flat turnovers in numbers, and in reality the market for owner-occupied houses and flats was in a crisis. Initiated by a strong interest rate drop and by an expansive finance policy, the market turned. From 1993H1 to 2004H1 real house prices increased 76% and real flat prices 128%. Moreover, Denmark has a leading position in the international household debt race and as in many other countries the fear of the consequences of a strong interest rate increase for the housing market is widespread. Therefore, in order to examine the financial stability among owner-occupiers, a sample of approx. 40,000 owner-occupier families with data at household level has been drawn from the tax statistics for each year from 1987 to 2003.
Through the analysis it is shown that the distributions of the owner-occupiers' capital structure, measured by the net liability/housing wealth ratios, have more or less been the same throughout the 16 years, even during the long-lasting steep house and flat price rise. Moreover, since 1994 the median value of the net liability/income ratio has increased by 71% for all owner-occupiers and by 54% for owner-occupiers between 30-39 years of age.

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[1] The data in the paper have been made available for this study by "Lovmodelsekretariatet" of the Danish Ministry of Finance, formerly in the Ministry of Economics. I am very grateful for these data as well as for the important personal support, willingness and enthusiasm I have met with from Martin Ulrik Jensen, who has provided me with the basic statistics. I have also received invaluable support from the head of the secretariat, Peter Bach Mortensen, who contributed with the basic statistics to earlier versions of the paper together with Sune Enevoldsen Pedersen. The views expressed here are those of the author.
[2] A preliminary version of the paper was presented at the ENHR conference in Cambridge in July 2004. I thank John Doling as well as the participants at the "Home Ownership and Risk" session for valuable comments.

Finally, one last, important aspect of the financial stability of owner-occupiers, namely, their capacity to service their debt has been analysed. The owner-occupiers' net interest expenditures/ income ratios before tax have been nearly halved from 1987 to 2003. Most of the drop happened during the years of the "housing market failure". From 1994 on the ratios were more slightly reduced and were in 2003 at 8.8% (median value) for all owner-occupiers and 12.2% for owner-occupiers between 30-39 years of age. However, if the reductions of the tax rates for deducting interest expenditures are taken into account, the 2003 after-tax-ratios are only about 2 percentage points below the 1987 after-tax ratios. At March 2005, a new challenge facing Danish owner-occupiers is that 50% of their mortgages carry interest adjustment.

Keywords: house prices, housing wealth, real estate wealth, housing debt, mortgage debt, personal wealth, personal finance, loan-to-value, debt-to-income, interest expenditures, interest-to-income, financial stability.
JEL classifications: D 14, E 44, G 21, R 20, R 31.

My personal motivation for writing this paper is in line with the views of Paul Krugman in his preface to "The Great Unravelling": *"…, I was always a stock market sceptic – though not, as you will see, sceptical enough. My focus on troubled economies abroad prepared me for the possibility that the United States would suffer serious economic difficulties once the bubble burst – though here again I initially understated the risks. What nobody realized was how thoroughly corrupted the U.S. corporate system had becomes; like everyone else, I played catch-up here."* (Krugman, 2003, p. xxviii).

1. Introduction: Denmark's leading position in the household debt race.

Household debt has increased considerably over the past decade in Denmark. Many countries have participated in this household debt race and Denmark is at the highest level among the analysed OECD countries, (Debelle, 2004). In the Danish central bank's report on financial stability for 2004, focus was placed on the increase in the debt-income ratio from below 150% in 1995 to slightly above 200% in 2003, a steeper rise on a higher level than in the other Nordic countries, (Danmarks Nationalbank, 2004). The denominator in this ratio is income after tax.

The debt increase seems to be a common European and even a worldwide trend. A recent article in Bank of England Quarterly Bulletin is motivated by the fact that the current amount of household debt outstanding is *"equivalent to around 140% of aggregate household income (compared with around 105% ten years ago)."* (Orla May et. al., 2004, p. 414).

Inside Europe at the end of 2003, the residential mortgage debt to GDP ratio was 87.5% in Denmark, only exceeded by the Dutch ratio of 99.9%. At the end of 1994 the ratios were much lower: 65.0 in Denmark as the largest, and 54.8% in Sweden as the second largest (EMF, 2004). In the U.S. the ratio was 71% in 2003 (Earley, 2004). However, in accordance with central bank statistics, the ratio for *all* mortgage claims to GDP for 2003 was 112.9 for Switzerland[3] (Swiss National Bank, 2004) and 99.7% for Denmark, where the owner-occupiers' outstanding mortgages counted for 77.0% of all residential mortgage debt (Danmarks Nationalbank, 2005).

A dilemma exists between having the macro economic advantages of an efficient financial system and high credit and market risk at the macro level, as noted by Earley: *"Denmark has the highest level of mortgage debt per capita. This is likely to be explained by the fact that it has a well developed and efficient housing finance market, a small population and one of the highest levels of GDP per capita in the EU15."* Per capita the mortgage debt was even higher in Denmark than in the U.S. (Earley, 2004, p. 6-7).

However, using the assets of the household sector instead as a scaling factor, the leverage of the sector had not increased "nearly as dramatically", as the increase is *"no more than 5 percentage points"*, (Debelle, 2004). The comparison does not include Denmark.

Mortgage and other housing debt account for the bulk of the household debt in Denmark. As can be seen in this paper, the median value for Danish owner-occupiers' debt-asset ratio, calculated as net liabilities in per cent of housing wealth, increased from 41% in 1987 to 52% in 1993, again to 56% in 1997, and then was levelled out at 51% since 2000 (see Table 6). A slightly stronger increase has been observed in the owner-occupiers' mortgage debt in the specialised mortgage banks, which came into favour through the deregulation of owner-occupiers' access to mortgage loans. This has increased the mortgage banks' share of the owner-occupiers' debt. The median value of the owner-occupiers' mortgage LTV (mortgage debt as a per cent of housing wealth) increased from 38% in 1987 to 53% in 1993, and increased further after the deregulation to 58% in 1995, dropping after 1998 to 51% in 2001 – and again a rise to 55% in 2003 (see Table 16).

Even though the interest rates have dropped since 1993 to an extremely low level in recent years, the households' interest burden (interest-income ratio) has increased from 4% in 1995, to over 6%

[3] Calculated as the mortgage claims for borrowers domiciled in Switzerland divided by GDP.

in 2001 and down to 5.5% in 2003, a level, which *"is not proportionally higher than in the other Nordic countries,"* (Danmarks Nationalbank, 2004).

Economists in many countries have become aware of the risk that a sharp interest rate increase and a tightening of the monetary policy may not be combined with a large addition to the economic growth rate in their nation. For example, the headline "*Are Home Prices The Next 'Bubble'?"* (McCarthy and Peach, 2004) reveals this fear. The fear seems widespread that the central banks' strong interest rate reductions and the resulting house price rises from 2001 on would be redressed by a sharp interest increase without accompanying economic growth and with falling house prices as a result. In such an economic recession, the risk of a housing market failure with many foreclosures and increased financial fragility caused by losses in terms of household debt, exists.

McCarthy and Peach's headline seems to be primarily an eye-catcher as their main conclusion is: *"A close analysis of the U.S. housing market in recent years, however, finds little basis for such concerns. The marked upturn in home prices is largely attributable to strong market fundamentals: Home prices have essentially moved in line with increases in family income and declines in nominal mortgage interest rates."* – Even though it is obvious that the development in house and flat prices could be reversed after a strong interest rate increase, they find that real home prices have fallen only moderately in periods of recession and high nominal interest rates. (McCarthy and Peach, 2004). Similar results and opinions seem to be widespread among conjuncture analysts and market participants in different countries.

During the low interest rate regime in recent years, the strong household debt rise in many countries has been monitored to avoid risk of financial distress. Even though many researchers and official spokesmen have made remarks on that issue, only two important examples will be mentioned here. Susan Bies argues that the stability of the households' and owner-occupiers' debt service ratios and the favourable developments on the asset side match the growth in household debt in recent years, and *"the sector as a whole appears to be in good shape"* (Bies, 2004). Alan Greenspan *"scarcely wishes to downplay the threats to the U.S. economy from increased debt leverage"* but through a more in-depth analysis he focuses on the same arguments as Susan Bies, and adds that household debt has increased faster than income for at least half a century and that homeowners' must move and live elsewhere as well as large transaction costs are important restraints on the development of price bubbles (Greenspan, 2004).

Owner-occupiers as well as other Danish debtors must recognize that concerns for their debt and solvency are not included in the target for the Danish central bank's interest policy. On the very first page of a book on Danish monetary policy Danmarks Nationalbank describes the bank's single policy target: *"Denmark maintains a fixed-exchange-rate policy vis-à-vis the euro. This means that the objective of monetary and foreign-exchange policy is to keep the krone stable against the euro. Other aspects than the exchange rate – e.g. cyclical developments in Denmark – are not considered in relation to monetary policy."* (Danmarks Nationalbank, 2003).

Probably the aggregate debt figures in the household sector cover a substantial variation across the individual households' debt. In a normal life cycle young families with their own home have a much greater debt than pensioned owner-occupiers. At a given aggregate debt level the natural assumption must be to expect that the degree of inequality in the capital structure between the families contributes to strengthening the macro economic consequences of an increase in the interest rates.

In order to estimate the macro economic, housing market and financial institutional consequences of larger interest changes, knowledge of the distribution of households according to indebtedness is important. *"Unfortunately, there is little data available on the change over time in the distribution of debt across households."* (Debelle, 2004, p. 54).

The central banks' studies on financial stability seem to have fostered great interest in households and especially owner-occupiers' debt status. In September 2004 the Bank of England commissioned a survey on household debt, interviewing 1,838 individuals (renters as well as owners) throughout Great Britain. The interviews contained 24 questions on debt and the value of housing assets. (May et al., 2004). It should be noted, however, that *"taken together, the unsecured and secured debt reported in the survey amounts to 72% of what one would expect on the basis of aggregate data"* (May et al, 2004, p. 416).

In this paper data on the distribution of the Danish owner-occupier families' housing wealth, debt and interest expenditures during the years 1987-2003 have been drawn from tax statistics and combined in ratios for the analysis. The high tax level in Denmark has probably contributed to making the tax statistics valid and reliable seen in an international context. For each year the sample contains approximately 40,000 families. Below, figures for distribution of debt (net liabilities), debt-asset ratios, debt-income ratios, interest expenditures and interest-income ratios for the individual Danish owner-occupier families are presented.

Especially wealth data seem reliable as the owner-occupiers' housing wealth (measured by the publicly assessed property values) is in principle assessed at a market price level by the tax authorities. As only a fraction of the properties are put on the market and sold to market prices during the year, the calculations must rely on assessed values. The public assessments are very precise on average, but individual properties may vary considerably from the average. This variance means that the study's net liability/housing wealth ratios are *indicators* of the true capital structure for owner-occupiers. This reservation does not apply to the debt/income and interest/income ratios. The most important financial assets and liabilities are calculated at market values and are reported by the financial institutions together with interest incomes and expenditures.

To examine the risk of financial stress among the Danish owner-occupiers and the financial stability in the household sector, debt/asset ratios express the security behind their debt, debt/income ratios express their ability to repay the debt, and interest/income ratios express their actual debt service burden. *The paper can be interpreted as an indicator of the house and flat markets' robustness in the face of potentially falling prices of owner-occupied dwellings and/or increasing interest rates.* The paper is therefore a contribution to the estimation of the owner-occupiers' price and interest rate risk and the mortgage and commercial banks' credit quality. However, the paper does not have any prognostic content. Data and ratios are presented for all owner-occupier families as well as for the younger group between 30 and 39 years of age, to indicate the capital structure and financial stress situation among owners who bought their first or second owner-occupied dwelling a few years earlier.

2. Danish market for owner-occupied houses and flats– an overview.

The Danish economy experienced a recession at the end of the 1980s. Among other negative factors, the tax value of the deductions of interest expenditures in the taxed income was reduced in

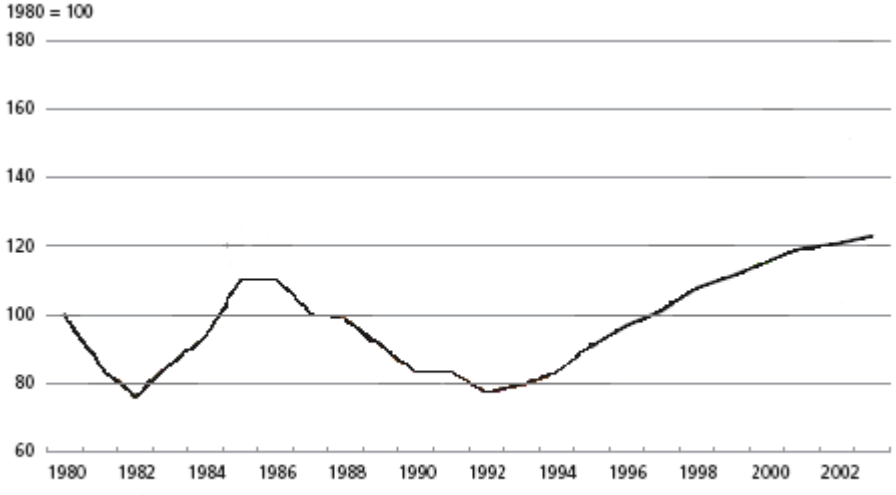
1987, an interest rate drop increased the market value of the mortgage debt, and the prices for houses and flats began to fall. The result was a "housing market failure" in the period 1987-1993. Negative equity and foreclosures were regular occurrences during these years.

The economy turned around in 1993-1994. A sharp interest rate drop was seen as result of the Edinburgh agreement and the elimination of speculations on a devaluation of the Danish currency. The prices for the callable mortgage bonds were close to price 100 and for many bond types above 100, and the falling interest rates could therefore not increase the market values of mortgage debt as much as on earlier occasions. A new government eased the finance policy to stimulate the economy and not least the housing market. The Danish economy returned to prosperity and has since then been seen as fundamentally "healthy" by most economists and politicians.

House prices began to increase sharply during subsequent years and indeed continue to do so. The number of foreclosures dropped to a stable, very low figure. During the first half year of 2004 house prices were 122% higher than during the first half year of 1993 (Told og Skat, 2004b). General inflation, measured by the consumer price index, was 26% in the same period. As result, the real house price rise for the 11 years was 76%. For owner-occupied flats the real price rise was 128% for the 11 years.

Earlier real house price rises had been seen during the 1960s and 1970s, interrupted by a drop under the first oil crisis. From 1980 on house price statistics were conceptually improved to express the development in the market prices. The development in real house prices is seen in Figure 1. The tax authority's price index for sold houses has been used and the index is based on the increase in the ratio of sale prices/publicly assessed property values. Again, the consumer price index was chosen to deflate the prices.

Figure 1.
Development in real prices for owner-occupied, one-family houses, 1980 – 2003.



Source: Told og Skat, Ejendomssalg (Customs and Tax, Property sales). (Here after (Erik Haller Pedersen, 2004)).

From 1980 on real house prices followed two waves with a drop of around 1/3 from top to bottom and then a return to the former level as shown in Figure 1. The first wave began in 1979, after the second oil crisis and did not result in large drops in nominal prices. After again having reached a maximum in 1986, real house prices dropped by 33% and nominal house prices by 20% in the

second wave, which lasted until 1993. Both crises were accompanied by high numbers of foreclosures, annually corresponding to around 1/6 of the turnovers of properties.

High volatility as well as boom and busts are obviously found in the Danish real house prices, but they are not an exceptional view in an international context. Similar or even stronger house price cycles are found for many OECD countries (Kennedy & Andersen, 1994; Sutton, 2002; ECB, 2003), and autocorrelation in the prices was also found for all these countries (Englund and Ioannides, 1997).

The first study of the Danish owner-occupiers capital structure for the years 1987-88 concluded that the share of owner-occupiers in (technical) insolvency had increased from 16% in 1987 to 23% in 1988 (Lunde, 1990). No statistics on household level with data on the owner-occupiers' wealth exists for earlier years. 1987 represented the start of the "housing market failure", partly combined with a financial crisis (the Nordic Banking Crisis)[4]. The falling interest rates lead to an increase in the market value of the debt, but house prices nevertheless reacted negatively and began to fall. The result of the next study, which indicated that the capital structure among owner-occupiers had not improved during the crisis years up to 1993, came as no surprise (see Lunde, 1999 b).

The common expectation that after the economy turned around in 1993, the capital structure among the owner-occupiers would improve, was disconfirmed. The figures for the years 1987-1996 showed that negative equity was as common as before (Lunde, 1999a and 1999b). Loan-to-values (LTVs) for mortgage loans worsened slightly in the years following 1993, primarily due to the interest rate drops increased the market values of fixed interest rate mortgage debt, to the deregulation and to the possibility for equity withdrawal by raising a mortgage loan using the proceeds to prepay bank loans and other loans.

Today the popular view is still that the owner-occupiers' solvency has improved considerably. Some mortgage banks have published calculations in the media showing major increases in the aggregate equity in owner-occupied dwellings. However, this reveals nothing about the outstanding debt and especially about the more indebted owner-occupiers. Data presented in the central bank's articles and reports on "Financial Stability" do not indicate that the capital structure of owner-occupiers has improved.

3. The mortgage system, falling interest rates and "natural" causes of mortgage debt increases and equity withdrawal.

Since the government announced in 1982 that Denmark no longer wanted to use devaluation of the exchange rate to depress internal inflation and to improve the balance of payments, the development in Danish interest rates have shadowed first the DM and subsequently the euro interest rates. For a number of years in the 1980s the spread of these interest rates became small. Even though Denmark chose not to join the euro in a referendum in 2000, the interest rate spread is still low.

Since 1993 Danish interest rates have been "low" and have fallen nearly continuously, so that rates are now at an historical low level. The rate-of-return was 4.49% for the 4% 30-year mortgage bonds and 2.28% for 2 % 1-year mortgage bonds (used for adjustable-rate loans) (7 March 2005). In order

[4] However, the solvency among owner-occupiers was not at a favourable position in 1987 as the real prices for single family houses had dropped by 11% from the maximum in the first half year of 1986 to the second half year of 1987 and as the number of foreclosures had started to increase. During 1987 the interest rate level was relatively stable.

to calculate the debtor interest rates, approximately 0.5% in fees to the mortgage banks must be added to these figures.

Traditionally, Danish mortgages have had 20- and 30-year terms and have been fixed interest bond loans, mainly formed as annuity loans. In 1996 adjustable-rate mortgage loans were introduced and by 1999 they accounted for 5.7% of the outstanding mortgage loans. Since then, their market share has grown quickly and by the end of March 2005, they accounted for 50% of the owner-occupiers' mortgage loans and for 48% all mortgage loans (Danmarks Nationalbank, 2005).

Danish legislation on the specialised mortgage loans contains loan-to-value rules for the different categories of properties. For many years the maximum LTV for owner-occupiers has been 80%, i.e. the proceeds of the mortgage loan can be up to 80% of the property's market value as estimated by the mortgage lender. After loan raising, a price drop or an "automatic" increase in the debt value in the face of an interest rate reduction could bring the LTV up above the 80% without the debtor having to make extraordinary prepayments.

The falling interest rate contributes by itself to the increase in the owner-occupiers' debt as registered in tax statistics, in which the debt is measured in market values. As fixed interest mortgages can always be prepaid when buying the bonds on the capital market, the market value of the owner-occupiers' debt is equal to the market value of the bonds behind it. An interest rate drop increases the prices of the bonds and thereby the value of the debt (and vice versa in the case of an interest rate rise).

Fixed interest mortgages contain a prepayment option at price 100. The interest rate drops since 1993 have been accompanied by very high prepayment activity. In the years 1994 and 1998 early redemptions were close to 30% of the outstanding mortgage loans. The early redemptions of mortgages were also high in 1999, 2001, 2002, 2003 and 2004 but an important part of these redemptions were motivated by a change of loan type to adjustable-rate mortgages.[5]

Prepayment after an interest rate drop is realized as lower debt service, but at the same time is realized as an increase of the debt. Moreover, normally prepayment costs as well as loan raising costs are included in the new loan's proceed. This debt increase is allowed even if the debtor's LTV exceeds 80%.

At the time of purchase, the sale price of an owner-occupied dwelling is normally financed at the maximum LTV of 80% as a mortgage loan and a large part of the remaining buying value with bank loans or – especially earlier – purchase-money mortgages. In most cases down payments are rather low, especially for first-time buyers. The turnover of owner-occupied dwellings therefore implies an "automatic" withdrawal of equity and this represents an important macro economic advantage of a mortgage system. Undoubtedly, this is a broad channel for increasing the debt in the owner-occupied dwellings.

Owner-occupiers' maintenance, renovation and improvements of the house are also often financed through loans. Such activities do not only add to the debt but also to the value of the property. In

[5] Also, the introduction to owner-occupiers on 1 October 2003 of interest-only mortgage loans with a maximum period of 10 years of interest-only debt service, resulted in some prepayment activity. Interest-only mortgages had a market share of 20.6% of mortgage loans to owner-occupiers at the end of January 2005 (Danmarks Nationalbank, 2005).

practice the raising of mortgages, for whatever purpose, is often accompanied by a loan that is higher than necessary to finance the activity and thereby the equity withdrawal.

Certainly, some increase in owner-occupiers' debt after the strong price rises, i.e. some realisation of capital gains will have the character of equity withdrawal. No current estimates for equity withdrawal exist in Denmark as, for example, in the UK. The realisation of capital gains or drops in owner-occupied dwellings potentially has a minor effect on private consumption in the short run, but not in the long or even medium perspective, (Miles, 1994; Lunde, 1998).

The risks of financing the stock of owner-occupied dwellings at higher levels of debt are divided between the owner-occupiers themselves, the lenders (mortgage and commercial banks), and society (the state budget).

Unless the aggregate debt in owner-occupied dwellings has risen more or less than all values of the owner-occupied dwellings, the crucial question must be *whether there are relatively more owner-occupiers who are highly indebted* and therefore a greater risk for many foreclosures if property prices drop. This will increase the risk of losses and in the worst case activate a systemic risk. It is therefore important to analyse the development in the owner-occupiers' debt and equity at the individual family level. This is possible through the data presented starting in Section 6.

4. Method: The study, the statistic sources and the data.

The data in the tax statistics on Danish owner-occupier families' wealth and capital structure rely on the tax authorities' assessments of these families. The data have been made available for this study by "Lovmodelsekretariatet", formerly under the Danish Ministry of Economic and Business Affairs and now under the Ministry of Finance. The tax authorities have a relatively precise knowledge of the families' incomes and interests (capital income) besides on the assets and liabilities in connection with the owner-occupied dwellings.

The study's data come from a random sample of about 1/30 or approximately 40,000 owner-occupier families within the specific year. The results are multiplied by a factor of about 30, which varies a little from year to year. The numbers ensure the reliability of the results.[6]

The owner-occupier family's housing wealth includes the total value of properties owned solely for the purpose of meeting the family's own housing needs. A family's housing wealth can be placed in single family houses, owner-occupied flats, the owner's own flat in a residential multi-storey building, farmhouses and summer cottages and may comprise more than one dwelling, for example, both a house and a summer cottage. Also some families have bought another dwelling without having sold the old one during the year. The definition of an owner-occupied dwelling relies on the owner's taxation of imputed rent, and, after 2000, on paying property value tax. A dwelling the family owns and rents out (possibly to children), is not taxed with property value tax and is therefore not counted as owner-occupied.

Housing wealth figures must necessarily rely on assessed values and most obviously on the publicly assessed property values as of 1 January as estimated by a central tax authority in cooperation with

[6] An earlier study for 1987-88 was based on the total number (Lunde, 1990). A comparison (Lunde, 1999b) between the results in the sample and in the aggregate statistics for the two years only exposed quite small differences in the first decimal place.

the local authority. The publicly assessed property values are used as proxies for the market values of the properties, even though the market values are systematically underestimated, on average by around 10% (see Section 9 below), which is approximately equal to the transaction costs of selling the house or flat. Also, there is significant variance between assessed prices and market prices for the single houses and flats. From 2003 the assessment date was changed to 1 October.

The assessed property values are directly transmitted to the owners' tax assessment. Mortgage and commercial banks report interests and capital values at all securities (bonds, equities and others), deposits and loans directly to the tax authorities. The capital values for securities, deposits and loans in financial institutions are calculated for the year according to prices on 31 December. Assets and liabilities are thus calculated at market values. These data are precise.

The owner-occupiers' total net wealth has always been calculated on 31 December for the year. Unfortunately, before 2003 the publicly assessed property values are calculated on 1 January the same year. If the property prices have risen or dropped through the year, the wealth on 31 December underestimates or overestimates the properties' market values.

In 1987-1996, i.e. the first part of the study period, Danes were liable to wealth tax. Besides property value, financial assets and liabilities, the wealth included money (cash), cars, boats, furniture, diamonds, etc., the value of which tax payers were required to assess for the local tax authority. In most cases the value of these assets was relatively low compared to the owner-occupied properties and financial assets and liabilities. Therefore, the rather imprecise self-assessments of these physical assets had no important consequences for the wealth statistics.

The wealth tax was abolished after 1996, personal wealth is no longer self-assessed and a pure wealth statistic is no longer produced. Still the tax authorities assess property values in order to charge land tax and property value tax (before 2000, the tax on imputed rents on the owner-occupied dwellings). Banks still report interest, deposits and loans to the tax authorities. However, since 1997 the values of cash, cars, furniture and similar family assets are no longer assessed.

The wealth statistics used since 1997 are based on the reported assets and liabilities and comprise the owner-occupiers' most important assets: publicly assessed property values, deposits in financial institutions, securities (bonds, equities), and liabilities: debt in mortgage and commercial banks. Only few, less important types of financial assets, with the cash balance and cars as the most important, are not included. The wealth measure used gives a relatively precise estimate of the owners' wealth and capital structure. The following analyses confirm this view as the different methods can only be tracked in few cases.

Institutional savings for pension schemes have never been included in the wealth taxation, and these savings are therefore not registered in the personal tax assessments and in the data here. In aggregate, the institutional savings for pension purposes have approximately the same value as the owner-occupied dwellings (see next section). However, four causes explain why the ignoring of pension saving is of no great significance. First, such pension savings are taxed when they are paid out to citizens and are therefore only around half as valuable for the pensioners. Second, these savings are illiquid as they cannot be withdrawn without heavy taxation. Third, tenants also have pension savings. Fourth, the largest pension savings are found among persons and families who have been saving for many years, but these families have in general a lower debt.

Until 1996, the equity in privately owned firms such as farming, retail businesses, workshops and services, were included in the families' wealth. Starting in 1997, all privately owned commercial assets and liabilities were included in the self-employed families' wealth, i.e. the statistic was changed from a net to a gross concept. The aggregate and average asset and liability amounts are highly influenced by this change, while the influence on the different ratios is difficult to find.[7] In Section 5 the owner-occupiers' aggregate housing wealth, mortgage debt and net liabilities are presented for all owner-occupiers, as well as without the self-employed. In the last part of the paper figures are only presented for owner-occupiers, excluding the self-employed families.

The incomes in the study are derived from the tax statistics and are calculated with same precision as the taxable incomes. The incomes are defined in accordance with the Danish tax rules and as the sum of "personal income" and "positive net capital income". Until 2000 the imputed rent of own dwelling is included in the positive net capital incomes.

The family is the statistical unit in the study. From 1991 on the so-called D-family concept containing singles, married couples and couples living together, has been used. The definition of couples living together without common children is: being only 2 persons at the same address, over 16 years of age, of different sexes, and at an age difference below 15 years. For the years 1987-1990 another similar family concept has been used, where 2 adults of different sexes must have common children to be a family unit.

5. Aggregate owner-occupied housing wealth, mortgage debt and net liabilities –a macro view.

As mentioned above, the analysis of owner-occupiers' equity and debt in many countries has been restricted to a study of whether the debt on loans issued to owner-occupiers in the aggregate have increased more than property values. This method has been used by mortgage banks on several occasions and was the basis for the Association of Mortgage Banks' conclusion in their annual report in 2002: *""Loan-to-value" (LTV) calculations for Danish mortgage banks are low. For owner-occupied dwellings around 90% of the loan portfolio is placed below 60% of the value of the properties…"* (Realkreditrådet, 2003, p. 34). Therefore, the aggregate capital structure for owner-occupiers, expressed as the aggregate and thereby average LTV, is analysed below first.

Sometimes, owner-occupiers' debt is understood as mortgages from the specialised mortgage banks. Otherwise, the owners' debt is often seen as all types of loans with registered security in the property, which besides mortgages from specialised banks includes loans in commercial banks and purchase-money mortgages. Other loan sources are negligible.

However, the tax statistics give the opportunity to include *all* the owner-occupiers' assets and liabilities, combined in the expression *net liabilities* and compare these with their housing wealth (property values). The value of all financial assets and liabilities are calculated at market values. As the tax statistics also specify the owner-occupiers' mortgage debt, measured at market value, the development in mortgage debt can be analysed separately. When the financial system was deregulated in around 1992-93, the opportunities for owner-occupiers to raise mortgages were improved considerably.

[7] The implicit result is that the capital structures in small privately owned firms are about the same as among owner-occupiers.

Moreover, the owner-occupiers' net liabilities provide the best analytical basis, as the addition of all the owner-occupier family's assets and liabilities is the best expression of their capital structure and equity. The equity is an important contribution to the owners' possibility to raise more liquidity if necessary. Moreover, in accordance with Danish law a debtor is liable to the full extent of his assets. Therefore, owner-occupiers are not only liable to the value of their house or flats for mortgages and other secured loans, but if the proceeds from a foreclosure are not high enough to cover the registered debt, the debtor still owes the remaining debt.

All owner-occupiers' housing wealth (publicly assessed property values), mortgage debt and net liabilities for the years 1987-2003 are seen in Table 1, where the average mortgage loan-to-value and average net liability/housing wealth ratios are shown, too. Until 1996 the wealth statistic has been used. From 1997 on wealth is calculated from the financial institutions' reported assets and liabilities, which include privately owned commercial assets and liabilities. The consequences of this methodological shift are illustrated for the years 1995 and 1996, where the results from the wealth statistics (the "low" figures in Table 1 and 2 below) are compared with the reported figures, which include privately owned commercial properties, financial assets and liabilities.

The estimated average mortgage loan-to-values do only express a weak variation in the years 1988-1993 but are somewhat above the 1987 ratio. The owner-occupiers' aggregate mortgage debt varies only moderately, while the property values have been more volatile through these years.

Unfortunately, the mortgage debt values for 1994 do not exist in the tax statistics and could not be included in the analysis below. Otherwise, the removal of mortgage restrictions in 1992-93 might have had a direct influence on mortgage debt figures from 1994 already, as a considerably increase in the mortgage LTV up to below 70% appeared in 1995-1996. In the subsequent years the ratios are influenced by the fact that commercial assets and liabilities are included.

When the owner-occupiers' capital structure is measured by the net liability/housing wealth ratios, the ratios are for the most part at a lower level than their mortgage LTV, and their equity is correspondingly higher. Also the average net liability ratio varies only slightly through the years 1987-1996, even though the changes in the owner-occupiers' net liabilities and in the housing wealth do not correlate very well. From 1997 on, the ratio is nearly doubled. This remarkable change is methodologically based on the content of the data and recurs in the difference between the results when using the two different methods for estimating the owner-occupiers' ratios for 1995 and 1996. For 1997-2003 the net liability/housing wealth ratio contains an appreciable stability.

Table 1.
Aggregate housing wealth (publicly assessed property value), mortgage debt and net liabilities for all owner-occupiers (including the self-employed) and – after 1996 – including assets and liabilities in privately owned firms. 1987 – 2003.

	Owner-occupied housing wealth (publicly assessed property value) Bn. DKK	Owner-occupiers' aggregate mortgage debt Bn. DKK	Owner-occupiers aggregate net liabilities Bn. DKK	Average mortgage loan-to-value for owner-occupiers Per cent	Average net liability/housing wealth ratio for owner-occupiers Per cent
1987	763.2	322.1	151.1	42.2	19.8
1988	726.8	364.6	191.6	50.2	26.4
1989	763.6	368.6	196.1	48.3	25.7
1990	714.7	354.6	155.3	49.6	21.7
1991	676.8	369.3	172.4	54.6	25.5

1992	746.4	367.9	150.1	49.3	21.1
1993	745.4	393.1	154.1	52.7	20.7
1994	736.8	---	121.2	---	16.4
1995	779.7	545.3	155.2 / 314.7*	69.9	19.9 / 40.4*
1996	907.2	593.6	142.6 / 314.9*	65.4	15.7 / 34.7*
1997**	1163.6**	665.7	483.9	57.2	41.6
1998**	1297.0**	731.7	537.8	56.4	41.5
1999**	1436.0**	750.8	555.4	52.3	38.7
2000**	1581.9**	793.8	592.6	50.2	37.5
2001**	1731.3**	868.1	680.7	50.1	39.3
2002**	1847.4**	945.8	750.3	51.2	40.6
2003**	1940.3**	1023.0	768.1	52.7	39.6

* Reported assets and liabilities, including commercial assets and liabilities, excluding property wealth.
** Including privately owned commercial properties, financial assets and liabilities.

It is rather unsatisfactory that privately owned commercial assets and liabilities are included after 1996. Therefore, in Table 2 below as well as in the tables showing the distribution of debt across households and the ratios, only data for owner-occupier families not including the self-employed are presented.

As seen in Table 2 for the years 1987-1993, the average mortgage LTV is at the same level and expresses a similar variance as when the self-employed are included. The increase in the ratio is slightly weaker after 1993, when the self-employed not are included, but in both cases the increases fade slowly and starting in the year 2000 the owner-occupiers' average mortgage LTV is back at the same level as at the end of the 1980s. The fact that the average mortgage LTV has more or less have the same values roughly indicates that the owner-occupied houses and commercial properties have been mortgaged to the same degree. Similarly, the level and the variation in the owner-occupiers' net liability/housing wealth ratios are fairly uniform both with and without the self-employed. After the methodological shift in 1997 and onwards, the net liability/housing wealth ratios are slightly lower, when the self-employed are not included as seen in Table 2.

Table 2.
Aggregate housing wealth (publicly assessed property value), mortgage debt and net liabilities for all owner-occupiers (excluding the self-employed). 1987 – 2003.

	Owner-occupied housing wealth (publicly assessed property value) Bn. DKK	Owner-occupiers' aggregate mortgage debt Bn. DKK	Owner-occupiers aggregate net liabilities Bn. DKK	Average mortgage loan-to-value for owner-occupiers Per cent	Average net liability/housing wealth ratios for owner-occupiers Per cent
1987	652.2	280.5	155.0	43.0	23.8
1988	618.4	316.5	173.5	51.2	28.0
1989	655.1	320.1	174.2	48.9	26.6
1990	616.0	308.7	127.4	50.1	20.7
1991	612.6	340.0	146.3	55.5	23.9
1992	643.8	321.6	136.5	50.0	21.2
1993	649.6	349.0	148.5	53.7	22.9
1994	652.3	---	108.2	---	16.6
1995	694.6	404.1	153.4 / 291.9*	58.2	22.1 / 42.0*
1996	815.8	449.8	160.2 / 198.4*	55.1	19.6 / 24.3*
1997	927.6	509.6	327.3	54.9	35.3
1998	1026.4	557.7	362.7	54.3	35.3
1999	1156.7	583.9	394.9	50.5	34.1
2000	1286.1	623.2	413.6	48.5	32.2

2001	1385.9	667.7	456.1	48.1	32.9
2002	1502.4	740.5	534.4	49.3	35.6
2003	1597.3	808.6	550.8	50.6	34.5

* Reported assets and liabilities, excluding housing wealth.

From this comparison of the average ratios it can be concluded that the methodological shift from the taxable wealth statistics to registered wealth statistics seems only to influence the ratios slightly. Moreover, the cash balance – one of the most important omitted parts – amounts to about 50 bn. DKK in 1996 or 6% of the housing wealth for that year.

The most commonly used method for calculating average mortgage LTV is shown in Table 3. In the official Danish macro economic model, ADAM, the stock of owner-occupied dwellings is estimated at market values and the time series for the stock is shown. The differences in the estimations of the owner-occupied housing wealth can be attributed to the different methodological content.

The debt on the mortgage banks' outstanding mortgages to owner-occupied dwellings are also shown in Table 3, but have only been published since 1992. The debt in this financial statistic is measured as the original proceed minus ordinary instalments, not at market values. The calculated mortgage LTVs are somewhat lower than was calculated from the data in Tables 1 and 2 until year 2000, when the difference changed signs.

Table 3.
Alternative calculation of aggregate housing wealth (publicly assessed property value), mortgage debt and mortgage LTV for all owner-occupiers (including the self-employed), based on the official macro economic model ADAM and financial statistics. 1987 – 2003.

	Owner-occupied housing wealth in ADAM. At market values, end of year. Bn. DKK	Owner-occupiers' aggregate mortgage debt, end of year. Bn. DKK	Average mortgage loan-to-value for owner-occupiers Per cent
1987	806.3	---	---
1988	820.7	---	---
1989	810.5	---	---
1990	744.7	---	---
1991	746.7	---	---
1992	712.2	---	---
1993	700.5	367.7	52.5
1994	784.6	389.5	49.6
1995	852.5	409.2	48.0
1996	953.1	445.0	46.7
1997	1063.1	495.0	46.6
1998	1170.5	539.9[1)]	46.1
1999	1258.6	596.1	47.4
2000	1348.2	628.6	46.6
2001	1427.9	697.2	48.8
2002	1485.1	757.1	51.0
2003	1545.6	826.2	53.5

[1)] End of September 1998.

The statistical content of Table 3 is also used to assess whether the research data are valid. Respecting the methodological and conceptual differences, the content of Table 3 and Table 2 is quite similar.

The Danes' total pension savings (in pension funds, life insurance companies and other institutional pension saving institutions) amounted to 1609.4 bn. DKK at the end of 2003, and 1507.1 bn. DKK at the end of 2002, which was similar to the 115.1% and 110.8% of GDP for the years (Skatteministeriet, 2004). This non-liquid institutional pensions savings and the owner-occupied dwellings are the households' most important assets. It should be noted when comparing the two types of savings that pensions are taxed as income when paid out to the savers, as the payments to the pension savings have been drawn on untaxed income. Therefore, approximately half of the total pension savings are deferred income taxes. However, the owner-occupied dwellings are security for mortgages, and the equity is therefore much lower than the value shown. Half of the pension savings in 2003 is 805 bn. DKK. This amount is quite similar to the equity in owner-occupied dwellings of 788 bn. DKK, when the mortgage debt of 809 bn. DKK has been withdrawn from the housing wealth of 1597 bn. DKK for owner-occupiers (excluding the self-employed) in 2003. If the net liabilities of 550 bn. DKK had been withdrawn instead, the owners equity is 1047 bn. DKK.

This comparison at macro level of the stability in the estimated ratios indicates

a) that the capital structure among the owner-occupiers has been and is relatively stable,
b) and that the owner-occupiers debt as well as equities have been rising steeply, as the house and flat prices and therefore the property values have been strongly rising since 1993.

However, analysing the financial stability in the owner-occupation sector through the development in the average LTV or other macro debt ratios is unsatisfactory in the light of the sharp price increases for owner-occupied properties. The aggregate capital structure and aggregate negative equity for owner-occupiers should not be estimated on the basis of aggregate data but rather by adding up the data for individual owner-occupiers. The distribution of debt among owner-occupier families needs to be analysed further in detail. Moreover, the owner-occupiers' payments must be observed.

6. The distribution and growth in the owner-occupiers' net liabilities

The analysis of the Danish owner-occupier families' financial stability and payment capacity starts in this section by looking at their nominal debt. Below, the owner-occupier families have been distributed according to the size of their nominal debt, i.e. without giving consideration to the size of their housing wealth as security or to their income as a measure of their payment capacity.

Debt is in this study expressed as the net liabilities, i.e. as financial liabilities minus financial assets. The net liabilities include debt on mortgage, bank and other loans minus deposits in banks, bonds, equities and other financial assets (excluding institutional pension savings). The value of the owner-occupier's property is not included in the net liability. The owner-occupiers are divided into deciles according to the size of their net liabilities at the end of each year in the years 1987-2003 in Table 4. The value of a decile expresses the value at the upper limit in the decile. For example, in 1999 60% of the owner-occupiers had a net liability of 524,000 DKK or below, while 40% had a larger debt.

Table 4.
Owner-occupiers divided into deciles according to the size of net liabilities in 1000 DKK. All owner-occupiers (excluding the self-employed). 1987 – 2003.

	1st decile	2nd decile	3rd decile	4th decile	5th decile	6th decile	7th decile	8th decile	9th decile	10th decile
1987	-204	-50	12	98	191	276	362	469	632	>632
1988	-219	-54	13	109	208	298	393	508	683	>683

1989	-223	-51	16	114	211	301	393	512	690	>690
1990	-249	-61	12	108	201	288	384	497	674	>674
1991	-284	-77	4	103	211	313	414	538	720	>720
1992	-293	-79	5	114	227	326	426	548	722	>722
1993	-305	-77	8	119	235	337	444	571	757	>757
1994	-316	-88	1	110	218	317	419	536	700	>700
1995	-335	-89	7	127	245	355	466	596	781	>781
1996	-343	-91	13	148	274	389	507	651	850	>850
1997	-326	-71	46	194	327	457	598	761	1005	>1005
1998	-348	-78	57	217	359	497	647	820	1079	>1079
1999	-358	-75	67	235	383	524	673	851	1114	>1114
2000	-377	-75	79	256	411	560	718	908	1198	>1198
2001	-398	-87	77	260	423	585	754	961	1265	>1265
2002	-398	-77	100	296	473	640	816	1032	1357	>1357
2003	-427	-84	107	313	495	671	863	1.085	1416	>1416

Negative values in the table represent owner-occupiers with positive financial net savings besides their properties. For example, in 1988 20% of the owner-occupiers had net savings of 54,000 DKK or more in addition to the value of their owner-occupied property. Through the period more than 20% of the owner-occupier families have had a net savings position, but since 1994 a weak tendency can be observed towards fewer owners having positive net savings. However, the lowest decile value of the net savings doubled, while the consumer price index increased 55% in the period.

In the deciles in which owner-occupiers have the largest net liabilities, the net debt had more than doubled. Moreover, the percentage debt rise has been largest in the 3rd and 4th deciles, where owner-occupiers (with debt) have lowest debt. Obviously the debt has risen in real terms. It should be noted that the growth in the net liabilities only increased to higher rates from 1994 on, and the debt increase is thus concentrated on the last part of the period.

Potential shifts in the debt structure are covered within the group of owner-occupiers in Table 4. The age variable is a rather important determinant for the debt structure as shown previously (see Lunde, 1990, 1999b) and for the net liability/housing wealth ratio in Table 7 below. It seems reasonable to use a life cycle analysis for the buying and financing of a house or flat. In Table 5 this view forms the basis for focusing on the net liabilities for the younger owner-occupiers between 30-39 years of age.

Table 5.
Owner-occupiers divided into deciles according to the size of net liabilities in 1000 DKK. Owner-occupiers (excluding the self-employed) between 30-39 years of age. 1989 – 2003.

	1st decile	2nd decile	3rd decile	4th decile	5th decile	6th decile	7th decile	8th decile	9th decile	10th decile
1987	102	203	278	340	403	467	544	638	776	>776
1988	111	224	303	373	441	509	590	688	848	>848
1989	109	225	304	372	441	514	594	695	840	>840
1990	108	217	294	362	428	493	575	677	833	>833
1991	125	246	329	393	464	532	611	710	876	>876
1992	156	268	349	416	481	551	626	723	871	>871
1993	151	270	355	425	497	575	655	756	928	>928
1994	134	252	330	401	469	535	608	703	840	>840
1995	156	282	373	449	525	598	684	789	942	>942
1996	155	301	400	486	565	651	743	858	1035	>1035

1997	214	363	476	574	669	764	865	997	1224	>1224
1998	226	388	514	619	724	820	937	1081	1307	>1307
1999	259	423	542	651	756	856	970	1124	1357	>1357
2000	273	447	583	699	812	925	1049	1206	1458	>1458
2001	261	458	600	720	840	966	1097	1264	1519	>1519
2002	298	505	654	782	899	1026	1173	1358	1655	>1655
2003	310	521	676	818	946	1.077	1.222	1.399	1.706	>1706

The debt increase has been rather similar among owner-occupiers between 30-39-years of age, as their net liabilities have been nearly doubled in all deciles, except the first one. Not surprisingly, the debt changes seem more uniform within this age group than for all the owner-occupiers. However, it is remarkable that the more serious debt increase started in 1994. A similar development towards increasing indebtedness is found for owner-occupiers below 30 years and 40-49 years of age. For older owners the development within the age group is more differentiated.[8]

Nevertheless, knowledge about the size of the debt is of limited value when the comparison includes neither the most important asset, the owner-occupied dwelling nor the income base for repaying the debt. Interest payments as part of the debt services are also lacking, but should be included. Therefore the ratios: net liability/housing wealth, net liability/income and net interest expenditures/income are presented below.

7. Owner-occupiers' net liabilities compared to housing wealth

The advantage of using the owner-occupiers' housing wealth as a scaling factor in order to analyze their indebtedness, is utilised in Table 6, where the owner-occupiers are distributed in deciles according to the size of their net liability/housing wealth ratio, i.e. their net liabilities as a per cent of their housing wealth in their own houses, flats and summer cottages. For example in 1992, the net liabilities for 70% of the owners were less than 89% of their housing wealth, while 30% were more indebted. Negative net liability /housing wealth ratios mean that the owners have positive net savings in addition to their housing wealth.

Table 6.
All owner-occupiers (excluding the self-employed) divided into deciles by size of net liabilities as a per cent of housing wealth. 1987-2003.

Year	1st decile	2nd decile	3rd decile	4th decile	5th decile	6th decile	7th decile	8th decile	9th decile	10th decile
1987	-46	-12	3	21	41	59	78	95	118	> 118
1988	-53	-14	3	24	48	71	91	111	137	> 137
1989	-50	-12	4	24	46	67	85	104	128	> 128
1990	-58	-15	3	24	47	68	86	105	130	> 130
1991	-67	-19	1	23	48	72	91	112	140	> 140
1992	-66	-18	1	25	49	71	89	106	128	> 128
1993	-68	-18	2	26	52	73	91	109	132	> 132
1994	-69	-20	0	24	49	69	86	103	125	> 125
1995	-71	-19	2	27	53	74	91	109	133	> 133
1996	-64	-17	3	28	51	70	87	104	128	> 128
1997	-55	-13	8	34	56	75	92	111	137	> 137
1998	-54	-13	9	34	56	75	93	112	139	> 139

[8] These results are not presented in the paper.

1999	-50	-11	9	33	53	70	87	105	129	> 129
2000	-46	-10	10	32	51	68	84	101	124	> 124
2001	-45	-11	9	30	49	66	82	99	123	> 123
2002	-44	-9	11	33	51	68	84	101	125	> 125
2003	-43	-9	11	32	51	68	84	101	125	> 125

After a worsening of the owner-occupiers' capital structure against higher indebtedness in the deciles with the highest debt from 1987 to 1988, the capital structure has been stabilized at the same level for many years. Obviously the strong debt increase since 1994 must have been matched by a similar strong increase in the value of the owner-occupied properties, as the decile ratios are relatively stable. From 1996 to 1997 a minor worsening is met, due in part to an increase in the mortgage debt of about 4 percentage points in the higher deciles. The slight remaining decline could, possibly, be explained by the removal of the wealth tax and thereby the quality reduction of the wealth statistic by the exclusion of physical assets like cars, boats, furniture, diamonds etc. If this is correct, the weak decrease in the values for the higher deciles after 1998 can be seen as a slight improvement of these owners' indebtedness.

With regard to the strong increase in prices for houses and flats since 1993, it seems rather surprising that solvency has not been improved to any great extent up to now. In all the years after 1987 30% of the owner-occupiers have had net liabilities above 80% of their housing wealth. Even the 20% most indebted owners have had net liabilities above this assessment value and owners in the highest deciles have had a debt that exceeds the value of the property by more than 25-30%. However, even though the owner-occupiers' "true" capital structure is not depicted in Table 6, as the assessed property value is only a proxy for the "true" market values, the remarkable feature is that the *indicators* for the capital structure have more or less have been the same throughout the years with steep price rises since 1994 as they were during the "housing market failure" in 1987-1993.

For the years prior to 1987 no statistics on the distributions of debt across owner-occupier households are available in order to estimate whether the owner-occupiers' capital structure expresses "normal" debt/equity ratios, or whether the structure is characterised by less equity than before. The study's data from 1987 on are the first to be made available. House prices increased sharply for a few years up to 1986 (see Figure 1) and the interest dropped significantly. However, it would be incorrect to surmise that 1987 was an exceptional year with higher equity ratios as the real house prices dropped by 11% from 1986H1 to 1987H1, and as the interest level was relatively stable. On the other hand, besides the lower interest rates, the financial deregulation of the 1980s, which led to the removal of restrictions on ordinary bank loans and on mortgages for owner-occupiers had improved owner-occupiers' access to raising more debt. An increase in the debt amounts is the only logical effect of the removal of such restrictions. Therefore, the assumption is that 1987 marked a transition to larger debt and debt-ratios for the owner-occupiers than before.

However, the stability in the Danish net liability/housing wealth ratio can be compared with other nations' household debt/asset ratios. As mentioned above, Debelle (2004, p. 53) indicates that leverage ratios have generally risen for a few important countries. On the basis of this comparison the stability in the Danish ratios is less dramatic.

8. Owner-occupiers' net liabilities compared to housing wealth, by age.

Just as in the matter of debt size a strong variation according to age exists in the net liability/housing wealth ratio. This structural variation is shown for 2003 in Table 7 but is quite similar in the other years.

Table 7.
Owner-occupiers (excluding the self-employed) divided into deciles by size of net liabilities as a per cent of housing wealth, by age. 2003.

Age – years	1000 families	1st decile	2nd decile	3rd decile	4th decile	5th decile	6th decile	7th decile	8th decile	9th decile	10th decil
< 30	62.3	45	72	83	92	101	109	117	130	150	> 150
30-39	217.6	37	59	73	84	93	103	113	127	149	> 149
40-49	257.9	9	35	51	64	75	86	98	112	135	> 135
50-59	285.7	-25	1	20	35	49	61	75	91	115	> 115
60-69	211.1	-67	-31	-13	0	13	26	40	57	79	> 79
> 70	211.3	-120	-68	-42	-25	-13	-5	4	19	41	> 41
All	1.246.0	-43	-9	11	32	51	68	84	101	125	> 125

Obviously, the variation in capital structure between the age groups is an argument for analysing each age group's housing wealth, net liabilities and interest expenditures. The particular interest in young families' access to the housing market and to owner-occupation in housing policy as well as the interest in the financial stability of the groups with the lowest equity and highest debt as well as highest debt services are behind the focus on the owner-occupiers between 30-39 years of age in the paper.

In this age group 48.1% of the families (excluding the self-employed) were owner-occupiers in 2003 as compared with 15.5% in the age groups below 30 years. Since most owners in the age group 30-39 years are likely have bought their property only a few years before the year selected, owners in this age group may be assumed to have much in common with first time buyers in an economic sense, and must be expected to have the highest net liability/housing wealth ratios. They have not been able to reduce the debt through ordinary instalments and for the most part, they have not acquired very large capital gains. Finally, a considerable proportion of people in the age group 30-39 years have moved into a family house and have possibly sold their first small owned flat. Below, the net liability /housing wealth ratios for owner-occupiers between 30-39 years of age are shown in Table 8.

Table 8.
Owner-occupiers divided into deciles by size of net liabilities as a per cent of housing wealth. Owner-occupiers (excluding the self-employed) between 30-39 years of age. 1987-2003.

Year	1st decile	2nd decile	3rd decile	4th decile	5th decile	6th decile	7th decile	8th decile	9th decile	10th decile
1987	25	46	60	71	81	91	101	115	138	> 138
1988	30	56	73	85	96	107	119	134	160	> 160
1989	29	53	69	81	91	100	112	125	148	> 148
1990	29	57	72	84	94	105	116	131	154	> 154
1991	34	63	79	91	102	113	126	141	166	> 166
1992	39	65	79	90	99	108	118	129	150	> 150
1993	40	67	82	92	102	111	121	134	157	> 157
1994	37	64	77	86	95	104	114	126	147	> 147
1995	38	67	81	92	101	111	121	135	160	> 160
1996	36	63	76	87	96	105	116	129	153	> 153
1997	44	68	82	93	102	113	124	138	163	> 163

1998	44	68	82	92	102	112	124	138	163	> 163
1999	42	63	76	87	96	106	116	130	153	> 153
2000	41	61	73	84	93	102	113	126	147	> 147
2001	37	59	72	82	92	101	110	123	145	> 145
2002	40	62	74	85	94	103	114	127	148	> 148
2003	37	59	73	84	93	103	113	127	149	> 149

Throughout the period 1988-2003, 40-50% of the owner-occupiers between 30-39 years of age had a negative equity as their net liabilities had been larger than their housing wealth. Already at the limit between the 2nd and 3rd deciles owners in this age group have a net debt around 60% of the housing wealth. And in the two highest deciles the debt lies around 30% or more above the housing wealth. Even though the measured capital structure only acts as an indicator for the "true" structure, there is no doubt that most 30-39 year-old owner-occupiers are as indebted as first time buyers are.

For owner-occupiers between 30-39 years of age the capital structure has not been improved in the direction of a better equity ratio or on the contrary worsened as a higher debt ratio over the 15 years after 1987. Most of the worsening of the capital structure from 1996 to the higher ratios in 1997 can be explained by the increase in mortgage debt of about 5 percentage points in the single deciles as seen in Table 17 below. Only a minor residual of the worsening may be due to the change in statistical sources.

The result that the age group containing most first time buyers has not improved its equity ratio is no surprise as many owners must have bought their property after the steep price rises and must have financed their purchase by raising loans. Buyers with some savings beforehand must have been hit by the strong increase in house prices, so that their savings covered less of the price than earlier. This problem was reduced for buyers who "traded up", realising some capital gains on the former owner-occupied dwelling and thereby being able to make a larger down payment or to buy a more expensive house. The last group seems to account for a minority of owners in the 30-39 years age group.

The capital structures for owner-occupiers in the other age groups are presented in Appendix A. An inspection of data gives the impression that also among the other age groups below 60 years the capital structure remains mostly unchanged over the years. In contrast, owner-occupiers between 60-69 years of age have been more indebted as the capital structure had worsened for owners with positive net savings and for owners with very low debt. In general, the stability of the single age groups' capital structure harmonises with the fact that the "average" capital structure for all owners has not been changed through the period, see Table 6.

The conclusion must be that negative equity seems to exist as a rather permanent feature among owner-occupiers in the Danish house and flat markets.

9. Publicly assessed property value as a proxy for owner-occupied house and flat market prices.

The use of the publicly assessed property values of 1 January for the same year as proxies for the markets prices at the end of the year of owner-occupied houses, flats, farm houses and summer cottages has been necessary as most houses and flats are not put on the market each year. Therefore, the data for the owner-occupiers' capital structure act as *indicators* of the correct capital structure. In fact, no one knows if the publicly assessed property price captures the market price for a property at the assessment time. Moreover, price rises or falls during the year can influence the ratios for the

capital structure as the net liabilities for taxation purposes are calculated at the end of the year (see the next section).

The tax authorities assess the value of houses, flats and summer cottages by multiple regression analysis, in which the value of a number of characteristics is determined by properties sold. These values are used for the assessment of each flat and house. The appraised values are adjusted for the last year's property price change on 1 January each year. In accordance with Danish law, the publicly assessed values must be set at market prices.

Over the decades, houses have been sold around the assessment times at average prices about 10% above the publicly assessed property value in accordance with the sale price statistics. However, the variation is considerable from house to house. An inspection of the sale price statistics confirms the fact that the market prices for houses sold during the first half year are on average about 10% above the publicly assessed property values, as seen in Table 9. Of course, the average of the differences can only be estimated for the years when the property values on 1 January of the same year have been used. Some of the variation in the annual averages can be explained by changes in the assessment policy and by property price rises or falls during the first half year.

The average 10% spread between the market prices for sold houses and their publicly assessed property values can be compared with the seller's transaction costs, typically 7-8% of the sale price. On average the publicly assessed property value is closer to the seller's proceeds than the market price.

Table 9.
The average spread between the market prices for sold houses and their publicly assessed property value. 1st half year 1987-2002.

1st half year	Market price average percentage above publicly assessed property value	Year for public assessment on 1 January	1st half year	Market price average percentage above publicly assessed property value	Year for public assessment on 1 January
1987	4%	1986	1995	18%	1992
1988	4%	1986	1996	11%	1996
1989	6%	1986	1997	21%	1996
1990	- 2%	1986	1998	14%	1998
1991	- 2%	1986	1999	15%	1999
1992	5%	1992	2000	6%	2000
1993	- 2%	1992	2001	11%	2001
1994	13%	1992	2002	9%	2002

Source: Told og Skat, Ejendomssalg (Customs and Tax, Property sales).

In the 2nd half year, 2003, houses were traded at a price that was on average 9% above the publicly assessed property value for 1 October 2003 according to the property price statistics.

In the 1st half year, 2002 and 2nd half year 2003, the market prices for owner-occupied flats were 19% and 14% respectively above their publicly assessed property value. A major part of the explanation for these higher differences in values could be the rather strong price rises for owner-occupied flats during the later years, which makes more precise assessments difficult. Also, some owner-occupied flats that have formerly been private rented dwellings have been rented out and assessed at a much lower property price level as rented property. Flats, farmhouses and summer cottages cover only a minor part of the stock of owner-occupied dwellings.

The exactness of the publicly assessed property values is regarded with suspicion in the market. Most real estate agents find the assessed values too low and argue that they do not take market conditions sufficiently into account. However, it is difficult to look away from the statistical averages in Table 9 and from the fact that public assessments are based on a much larger set of market data than any specific property assessment in the market. No documentation exists to support the notion that the "market's valuation" - i.e. often a real estate agent's valuation - should be more precise than the public assessment. Similarly, the mortgage banks' estimates of property values when a loan is accepted cannot be proved on the market.

No matter how well the publicly assessed property value on average captures the market value, the variance in the relative difference from sale to sale is substantial. A consequence must be that many houses and flats are sold at prices well above the publicly assessed property value, just as many are sold at prices close to the assessed value or – rarely – even below the assessed value. This view is confirmed by a certain variation in the average difference between sale prices and publicly assessed property values according to both municipal location and property value group.

Therefore, in conclusion it may be stated that a) the publicly assessed property values are the only possible measure for the market values of the stock of owner-occupied dwellings, b) the publicly assessed property values are really good *indicators* of the market values, and c) the relative differences between market values and publicly assessed property values seem to have been stable for an even longer period than 1987-2003 and the – high – variances seem to have been stable, too. Therefore, *the publicly assessed property value may have the same quality as an indicator of the net liability/housing wealth ratios throughout the period of this study.*

10. Corrections of the owner-occupiers' net liabilities/ housing wealth ratios to the development over the years.

The calculation of the owner-occupiers' capital structure based on tax data implies that the net liabilities at the end of the year are compared with the value of owner-occupied properties at the beginning of the year. The owner-occupiers' solvency – with regard to the size of the equity – thereby becomes too good in years when property prices are falling. In contrast, the solvency becomes too poor in years when the property prices increase during the year. In Table 10 a simple correction for the price development through the year has been done by deflating the ratio with the price indices for single-family house prices from 2nd half year to the 2nd half year for the years 1987-2002 (Told og Skat, 2004a).

Table 10.
Owner-occupiers divided into deciles according to the size of net liabilities as a per cent of housing wealth. Owner-occupiers (excluding the self-employed) between 30-39 years of age. 1987-2003. Corrected decile limits with the rise in single-family house prices for 2nd half year – 2nd half year.

Year	1st decile	2nd decile	3rd decile	4th decile	5th decile	6th decile	7th decile	8th decile	9th decile	10th decile
1987	27	49	64	75	86	97	107	122	147	> 147
1988	29	54	71	82	93	104	115	130	155	> 155
1989	30	55	71	84	94	104	115	129	153	> 153
1990	31	61	77	89	100	112	124	140	164	> 164
1991	33	62	77	89	99	111	123	138	162	> 162
1992	41	69	83	95	105	114	125	136	158	> 158
1993	38	64	78	88	98	106	116	128	150	> 150

1994	35	60	72	81	89	98	107	118	138	> 138
1995	34	60	73	83	91	100	109	122	144	> 144
1996	33	57	70	79	88	96	106	118	140	> 140
1997	41	63	76	86	94	104	115	128	151	> 151
1998	39	60	73	82	91	99	110	122	145	> 145
1999	38	57	69	79	87	96	105	118	139	> 139
2000	39	57	69	79	88	96	107	119	139	> 139
2001	35	56	68	78	87	95	104	116	137	> 137
2002	38	59	71	81	90	99	109	121	142	> 142
2003*	37	59	73	84	93	103	113	127	149	> 149

* The 2003 values are not corrected at the public property assessment was set through at 1 October 2003.

The correction for the price development implies that the limits for the four highest deciles with technical insolvency represent to a large extent the weakening prices from 1987 to 1993 and the sharp price rise afterwards. As negative equity existed in the 6th decile, too, the corrected values imply that negative equity was somewhat more widespread among owner-occupiers between 30-39 years of age through the "housing market failure" 1987-1993 than in the years after. Therefore, the corrected ratios seem to be in better harmony with the cycles in the Danish economy and housing market than the non-corrected values. Although changes in capital structure between the years can be seen in the first period, negative equity is the situation faced by more than 30% of the families in the age group in the price rise period.

Even though the correction's influence on the net liability/housing wealth ratios must be kept in mind, such corrections have not been realised in general. Methodologically the correction is dubious, as the statistics in the paper cover individual owner-occupiers, whose price rise for the single house or flat is influenced by regional, local and individual factors, so that the individual price rise could be far above or far below the average rate. Also, the variability in individual property price growth rates is much higher than for average growth rates.

11. The variation in owner-occupiers' capital structure, by income.

It may be expected that the owner-occupiers' capital structure varies with income. The assumption could be that owner-occupiers with lower incomes have less savings before buying and have to take out additional loans in order to continue to hold the dwelling. Or the assumption might on the contrary be that families with higher incomes can more easily raise mortgages to finance the buying, and that their debt-asset ratios are therefore higher than for families with lower incomes. The variation by income in the net liability/housing wealth ratio – or rather lack of variation – is seen in Table 11 for owner-occupiers between 30-39 years of age.

The income definition used is the sum of "personal income" plus "positive capital income" and represents gross incomes without any deductions. Earlier, for 1988, results for a net income concept after taxable deductions had been presented, but especially the right to deduct interest expenses made some figure difficult to explain (Lunde, 1990). Obviously, the size of the owner-occupier's debt influence the size of interest expenditures, and by this the net income. If net incomes had been used in Table 11, the most indebted owners would have been allocated to the rows with lower incomes.

A distribution of *all* owner-occupiers according to income is not included here as it would be difficult to interpret without considering the age of the owners.[9] Therefore, the variation in the owner-occupiers' capital structures after income have only been shown for owners between 30-39 years of age in Table 11.

Table 11.
30-39 year-old owner-occupiers (excluding the self-employed) divided into size of net liabilities as a per cent of housing wealth, by income. 2003.

Income DKK	Pct of all owners	1st decile	2nd decile	3rd decile	4th decile	5th decile	6th decile	7th decile	8th decile	9th decile	10th decile
<100,000	0.2	-33	9	40	56	70	82	94	114	139	> 139
100,000-149,999	0.2	0	31	48	65	77	89	102	120	147	> 147
150,000-199,999	0.4	0	45	61	76	84	90	100	112	140	> 140
200,000-249,999	0.7	11	42	57	69	79	90	102	113	139	> 139
250,000-299,999	1.0	18	43	57	69	79	87	98	113	131	> 131
300,000-349,999	1.0	25	50	65	79	89	100	110	122	150	> 150
350,000-399,999	1.0	34	60	76	86	95	107	117	128	151	> 151
400,000-499,999	1.5	36	64	78	88	97	107	116	130	154	> 154
450,000-599,999	6.3	46	66	80	90	99	109	119	133	156	> 156
>600,000	5.1	41	60	73	82	91	100	110	124	145	> 145
Total	17.5	37	59	73	84	93	103	113	127	149	> 149

A high degree of uniformity among the owner-occupiers' capital structure is met at the single income levels. The few owner-occupiers in the groups with lower incomes mean that the connection should be interpreted with care. However, owner-occupiers with incomes below 350,000 DKK have lower net liability/housing wealth ratio than the average for the age group. In contrast, the two large groups of owner-occupiers with incomes between 400,000-600,000 DKK have higher than average ratios and the owners in the highest income group have a slightly lower than average debt ratio.

The owners between 30 and 39 years of age account for 17.5% of all owner-occupiers. Two thirds of the age group are situated in the three highest income groups, which indicates that a large proportion of the families in this age group must have incomes from two persons or – probably rarely – one high income from one member. However the few owners in the lowest income deciles make the distribution according to income in Table 11 unsatisfactory. Instead, the 30-39 year-old owner-occupier families are divided below into deciles according to gross income in Table 12 for 1990 and in Table 13 for 2003. This method can help make a comparison of the distribution between years more meaningful.

Table 12.
Net liabilities as a per cent of housing wealth within the specific deciles, divided according to gross income deciles. 30-39 year-old owner-occupiers (excluding the self-employed). 1990.

	1st	2nd	3rd	4th	5th	6th	7the	8th	9th	10th

[9] Distributions of all owner-occupiers after income and capital structure have been presented earlier (Lunde, 1990, 1999b).

	decile	decile	decil	decil	decile	decile	decile	decile	decile	decile
1. income decile	1	34	57	71	83	95	109	123	148	> 148
2. income decile	20	42	65	76	86	95	103	117	144	> 144
3. income decile	15	47	63	79	89	102	114	130	155	> 155
4. income decile	21	56	71	82	91	103	115	134	155	> 155
5. income decile	33	61	74	84	94	105	114	129	152	> 152
6. income decile	33	59	75	86	96	105	116	128	150	> 150
7. income decile	41	63	76	86	97	106	116	130	150	> 150
8. income decile	40	65	78	90	99	110	121	134	152	> 152
9. income decile	45	66	81	90	99	107	118	134	155	> 155
10. income decile	40	68	82	93	106	115	129	146	174	> 174
All 30-39 year-old owner-occupiers	29	57	72	84	94	105	116	131	154	> 154

For 1990 and 2003 as well as for all the other years studied in the paper, the distribution of the net liability/housing wealth ratios in the deciles is close to identical for all the income deciles. In other words, the size of the owner-occupier family's income has no significant influence on the family's solvency, but of course the income influences the property value the family can afford to buy. In terms of methodology it must be remembered that the data are based upon samples, which intuitively seems to be the best explanation of the small differences in the structures. However, the ratios – but not the distribution – vary a little more between the years as already seen in Table 8.

The data indicate that income size is of little importance for the net liability ratio during recent years as "normal" income groups seem to be a little more indebted that the others (see Lunde 1990 and 1999 b). Also these connections indicate that many owner-occupiers buy their first house or flat without any substantial saving in the years before and that the down payment percentage seem to be independent of the income size. Moreover, the connection indicate a partial confirmation of the point typically raised by real estate agents that "people buy what they can afford to buy", i.e. they buy just as expensive a house or flat as they can pay for on the basis of their income. Also, banks tell their customers on request how expensive an owner-occupied flat or house the family can afford to buy and get financed. When evaluating the debtor's economy, the banks rely quite heavily on the family income.

Table 13.
Net liabilities as a per cent of housing wealth within the specific deciles, divided according to gross income deciles. 30-39 year-old owner-occupiers (excluding the self-employed). 2003.

	1st decile	2nd decile	3rd decil	4th decil	5th decile	6th decile	7the decile	8th decile	9th decile	10th decile
1. income decile	3	41	57	70	80	90	101	114	140	> 140
2. income decile	21	46	60	71	84	94	104	116	141	> 141
3. income decile	33	59	75	86	95	107	116	127	148	> 148
4. income decile	44	67	80	90	101	110	119	136	161	> 161
5. income decile	46	65	79	89	100	110	120	132	161	> 161
6. income decile	47	70	82	92	99	112	122	136	157	> 157
7. income decile	48	66	79	88	97	105	117	131	150	> 150
8. income decile	46	64	75	84	94	104	114	127	146	> 146
9. income decile	41	65	75	84	93	101	112	125	146	> 146
10. income decile	34	54	68	78	86	94	103	119	141	> 141
All 30-39 year-old owner-occupiers	37	59	73	84	93	103	113	127	149	> 149

As the distribution of the owner-occupiers according to net liability/housing wealth ratio is nearly identical in the income deciles, the conclusion that differences in income do not result in differences in the capital structure is strengthened – and is a surprising result of this study.

12. The variation in owner-occupiers' capital structure, by (publicly assessed) property value. Even though the owner-occupiers' capital structure did not vary with income in the younger age groups, the expectation may be that their capital structure varies with housing wealth, which acts as a security for the mortgage since the lender can acquire the property at a foreclosure if the owner does not service the debt. Therefore, the property value could have some affect on whether the owner-occupier has raised and can raise loans. Also, more high income owner-occupiers as well as more wealthy owner-occupiers could be expected to borrow less compared to the property value. However at buying, nearly everyone raises mortgage up to the maximum within the limits of the current LTV rule of 80% for loan raising. Afterwards, the same LTV rule is the effective maximum for the new mortgage loan to be raised.

In Tables 14 and 15 below owner-occupiers between 30-39 years of age and 40-49 years of age respectively have been divided into deciles according to their housing wealth (the value of their owner-occupied dwellings) and have been distributed according to their net liability/housing wealth ratio.

Table 14.
Net liabilities as a per cent of housing wealth within the specific deciles and divided into deciles by the size of housing wealth (property value).30-39 year-old owner-occupiers (excluding the self-employed). 2003.

Publicly assessed property value, 1000 DKK	1st deci	2nd decile	3rd decile	4th decile	5th decile	6th decile	7th decile	8th decile	9th decile	10th decile
1. < 490	11	57	79	96	114	127	144	167	219	> 219
2. 490 - 640	35	66	86	97	111	122	140	159	185	> 185
3. 640 - 770	43	66	84	96	107	116	128	143	164	> 164
4. 770 - 890	43	65	83	93	101	111	121	131	152	> 152
5. 890 - 1,000	43	64	78	89	101	110	118	128	142	> 142
6. 1,000 - 1,150	47	67	79	87	95	103	111	122	136	> 136
7. 1,150 - 1,400	44	61	73	84	92	99	107	116	133	> 133
8. 1,400 - 1,650	43	60	70	78	84	92	98	106	119	> 119
9. 1,650 – 2,150	31	51	64	72	78	84	91	100	114	> 114
10. > 2,150	20	37	50	59	68	77	85	93	106	> 106

Table 15.
Net liabilities as a per cent of housing wealth within the specific deciles and divided into deciles by the size of housing wealth (property value).40-49 year-old owner-occupiers (excluding the self-employed). 2003.

Publicly assessed property value, 1000 DKK	1st deci	2nd decile	3rd decile	4th decile	5th decile	6th decile	7th decile	8th decile	9th decile	10th decile
1. < 490	-18	22	53	76	94	109	127	153	188	> 188
2. 490 - 640	3	39	62	83	95	107	120	138	166	> 166
3. 640 - 770	16	39	63	77	90	103	117	131	153	> 153

4. 770 - 890	17	47	63	76	88	100	112	125	141	> 141
5. 890 – 1,000	10	38	53	68	79	90	100	114	131	> 131
6. 1,000 – 1,150	18	45	58	68	78	88	98	109	128	> 128
7. 1,150 – 1,400	14	38	54	65	75	85	95	108	122	> 122
8. 1,400 – 1,650	12	36	49	59	68	77	86	95	109	> 109
9. 1,650 - 2,150	18	34	46	54	62	70	78	88	103	> 103
10. > 2,150	2	24	37	47	56	64	73	83	99	> 99

In Table 7 it was shown that the net liability/housing wealth ratio falls with increasing age and here, too, the ratio is remarkably lower for owner-occupiers between 40-49 years of age in Table 15 than for owners between 30-39 years of age in Table 14.

Rather interestingly for both age groups is that the net liability/housing wealth ratio decreases strongly with increasing property value. The strong dependency is simply not trustworthy. In fact, it seems impossible to argue that the size of housing wealth really has a strong influence on the net liability/housing wealth ratio. Such a dependency would be overshadowed by the suggestion that the result mostly expresses the fact that the limitation included in the study, i.e. the use of publicly assessed property values as values for the owner-occupied properties instead of “true” market values. Where the spread between these two value concepts seem low on average (see Table 9), the variance in the spread between the single families’ values can be rather high. The influence of the “wrong” assessments on the content of Tables 14 and 15 becomes apparent in two ways: a) a property with a “too low” property value will be placed in “too low” deciles, and b) a “too low” publicly assessed property value lowers the denominator in the ratio found and thereby increases the ratio.

A consequence of this methodological restriction is that the property market value’s possible, “true” influence on the net liability/housing wealth ratio cannot be identified. However, as the income does not influence the owner-occupiers’ capital structure, the hypothesis must be that the value of the owners’ properties do not influence their distribution after capital structure.

13. Owner-occupiers’ mortgage debt compared to housing wealth

The owner-occupiers’ mortgage debt is the most important single item, besides the housing wealth, in their capital structure. The owners-occupiers’ mortgage debt is close to three times as big in the aggregate as the debt on their loans in commercial banks – both inclusive and exclusive the self-employed owners. Other loan sources are quantitatively unimportant.

The tax statistics are of the owner-occupiers’ mortgage debt at market values. Figures do not exist for the year 1994. As all mortgages for owner-occupied dwellings carried fixed interest rate from 1987 to 1996 and even totally dominated up to 2000, the size of the debt has in general increased considerably as a consequence of the falling interest rates through the period, as described in Section 3. The personal wealth tax was written on net wealth, calculated at market values, and mortgage debt at market prices is therefore found in the tax statistics up to 1996 and in the register data for the following years.

When a loan is raised, the maximum LTV for mortgage loans to owner-occupied dwellings has been determined by law to be 80% during the years of the study. The mortgage banks are allowed to estimate the market value of the property as part of their credit valuation. In practice, the property price at the time of the turnover is accepted as the market value when the mortgage is taken out, while the

mortgage banks' estimation of market price is more restrictive when the loan raising resembles an equity withdrawal.

In Table 16 below, all the owner-occupiers have been divided into deciles according to the size of their mortgage debt/housing wealth ratio, which can be regarded as a mortgage LTV for the outstanding mortgages.

Table 16.
Owner-occupiers divided into deciles according to the size of their mortgage debt as a per cent of housing wealth.
All owner-occupiers (excluding the self-employed). 1987 – 2003.

Year	1st decile	2nd decile	3rd decile	4th decile	5th decile	6th decile	7th decile	8th decile	9th decile	10th decile
1987	0	2	14	25	38	52	65	76	91	> 91
1988	0	4	17	30	46	63	77	89	107	> 107
1989	0	4	17	29	44	60	73	84	100	> 100
1990	0	5	17	30	46	62	74	85	101	> 101
1991	0	5	17	31	50	67	80	92	109	> 109
1992	0	4	16	31	49	64	74	84	95	> 95
1993	0	4	16	34	53	68	78	88	101	> 101
1994	---	---	---	---	---	---	---	---	---	---
1995	0	3	17	40	58	70	79	89	104	> 104
1996	0	3	18	40	55	67	76	86	100	> 100
1997	0	3	20	42	58	70	80	90	104	> 104
1998	0	3	22	43	58	70	81	91	105	> 105
1999	0	2	22	41	55	66	75	84	96	> 96
2000	0	2	22	40	52	63	72	81	92	> 92
2001	0	1	21	38	51	62	72	82	94	> 94
2002	0	1	22	40	53	65	75	84	95	> 95
2003	0	1	24	41	55	67	77	86	97	> 97

The mortgage debt/housing wealth ratios – the mortgage LTV structure – in Table 16 reveals that about 20% of the owner-occupiers have no mortgage debt and – at the other end of the scale – another 20% have a mortgage LTV above 80% of the publicly assessed property value. Obviously enough, no rules exist and no mortgage bank demands that an owner-occupier must reduce the outstanding mortgage balance after a house price drop or an interest change, because the debtor's LTV de facto increases above 80%. When considering the LTVs it must be remembered that the estimated LTVs are based on the publicly assessed property values, not the market values. It should also be emphasised that nothing indicates that the mortgage banks are breaking the legal maximum LTV of 80% when lending even though they face tough competition.

The increase in the mortgage LTV from 1987 to 1988 was caused by an increase in the market value of the debt as interest rates dropped by around 2-3 percentage points, and by a house price fall of 5-6% during 1987. The relative stability in general in mortgage LTVs in subsequent years is rather remarkable. First, during the "housing market failure" up to 1993, the long interest rates went up and down and the nominal house prices dropped in some years - and by 20% on the whole from 1987 to 1993. However, the distribution of the owner-occupiers according to mortgage LTVs remained more or less unchanged.

Since 1993 the owner-occupiers' nominal mortgage debt has risen, as seen in Tables 1 and 2, because of the debt increase on fixed interest mortgages following interest rate drops, because of the liberalisation of the access for owner-occupiers to raise a mortgage, and because the huge prepayments in 1993-1994 were often combined with a minor extra loan proceed when financing the prepayment. However, the resulting mortgage LTVs in the higher decile numbers remained unchanged until 1998, when the LTV values were reduced remarkably. In the 3rd-5th deciles, the mortgage LTVs have been increased somehow since 1993, which possibly could be partly explained by the deregulation in 1992-1993, when families who were owner-occupiers already were allowed to raised new mortgages.

Several factors may have contributed to the stability in the mortgage LTVs as the mortgages have been expanded to follow the increasing house prices and property values. First, financing of housing turnovers at still higher prices works against higher mortgage debt. Second, over time the lowering interest rates were seen as creating a higher market value for the fixed interest mortgages that had been prepaid at price 100 to lower future debt service, and the higher debt value had been increased further as the transaction costs on repayment and at the time the loan was raised were added to the new mortgage debt.[10] Third, mass refinancing of fixed interest loans to adjustable-rate mortgages with lower debt services has been in effect especially from 2000 on and often such refinancing is supplemented with some equity withdrawal. Fourth, after the deregulation in 1992-93, owner-occupiers refinanced commercial bank loans, purchase-money mortgages and non-organised consumer credit to the mortgage loans. And fifth, equity withdrawal by owner-occupiers in order to raise money for consumer purposes, which were formerly financed by the other and more expensive financial sources should not be overlooked.

Table 17.
Owner-occupiers divided into deciles according to the size of their mortgage debt as a per cent of housing wealth.
Owner-occupiers (excluding the self-employed) between 30-39 years of age. 1987 – 2003.

Year	1st decile	2nd decile	3rd decile	4th decile	5th decile	6th decile	7th decile	8th decile	9th decile	10th decile
1987	19	36	49	58	66	72	79	88	103	> 103
1988	26	46	61	71	79	86	94	104	123	> 123
1989	26	46	59	68	75	81	88	98	115	> 115
1990	29	50	62	71	77	83	90	100	117	> 117
1991	34	58	70	77	84	90	98	109	127	> 127
1992	37	58	67	74	79	84	89	96	107	> 107
1993	43	61	71	78	83	88	94	102	114	> 114
1994	---	---	---	---	---	---	---	---	---	---
1995	47	63	71	77	82	88	94	103	118	> 118
1996	44	60	67	74	79	85	91	98	113	> 113
1997	47	63	72	79	85	90	96	104	118	> 118
1998	47	64	73	79	85	90	96	104	118	> 118
1999	47	60	68	74	79	84	89	96	108	> 108
2000	44	57	65	71	76	81	86	93	104	> 104
2001	41	57	65	72	77	82	88	94	107	> 107
2002	43	59	68	75	80	84	90	97	110	> 110
2003	42	59	70	76	81	86	91	98	111	> 111

[10] For new and refinanced loans this effect was reduced by the mortgage banks had started only to accept new mortgage loans, raised at prices close below 100, just in order to lower the possible increase in debt at further interest rate drops.

Of course, mortgage LTVs also vary considerably with age. In Table 17 the ratios are seen for owner-occupiers between 30-39-years of age and naturally seen in a lifetime-perspective, these ratios are somehow higher than for all the owner-occupiers as seen in Table 16. Furthermore, Table 17 exposes the fact that it is very unusual for young owner-occupier families to not have mortgages. Even the first decile limit was 42% in 2003. In the same year half of the owners in the age group had a mortgage LTV above 80% and nearly 20% had a ratio above 100%. In general, the distribution of ratios over the years seems to have been rather similar but at slightly reduced LTVs after 1998. However, the direction of change in the mortgage LTVs has been reversed in 2002 and 2003.[11]

The level and distribution of mortgage LTVs among owner-occupiers below 30 years of age is quite similar to the ratios in Table 17,[12] indicating that these mortgage LTVs can express the situation for first time buyers. The mortgage LTVs are on a markedly lower level for owner-occupiers in the older age groups, not only for the highest deciles but also for the rest. Especially the deregulation made it possible to offer mortgage loans to families who were owner-occupiers already, as a form of equity withdrawal loan. The effect can be seen to a minor degree in the ratios for owner-occupiers between 40-49 and 50-59 years of age and more pronouncedly for owners in the age group 60-69 years of age, but not for the oldest owners.

14. Owner-occupiers' net liabilities compared to their gross income.

Above, the changes and distributions of owner-occupiers' debt have been combined with the value of their properties. This results in a crucial ratio for the owner-occupier, who can release his/her debt by selling the property and buying or renting another home for the family. An owner with negative equity following a sale will have an unsecured debt, which will reduce or even obstruct the access to raise new loans to finance the purchase of a new house. For the lender, the property acts as a security for the loan as the lender can appropriate the property through a foreclosure if the borrower does not pay on time. An owner-occupier family's repayment of loans by selling and moving from their home in order to "trade down" to a cheaper house or rent, is a high-price option for the family.

Below, the owner-occupiers' debt is compared with their income, which forms the basis for paying the debt services on the loans. After this section the owner-occupiers' interest expenditures are analysed and are directly compared with their incomes.

Obviously the family's preferred alternative of continuing to pay the ordinary debt services is based on their income. For the family and the lender, the family income is the most important factor in the decision to accept to raise a loan and for the loan size – and for servicing the debt in subsequent years. Therefore, the distribution and development in the owner-occupiers' net liability/income ratio is presented in Tables 18 and 19 below. Still, the income is the family's gross income, defined as the sum of "personal income" and "positive net capital income".

[11] None of the data for 2004 indicate that mortgage-LTV should have been changed. On the contrary, the continued low interest rate level, the refinancing activity and not least the mortgage loan statistics indicate that the size of the LTV has been maintained.

[12] The mortgage LTVs for the other age groups are not presented in this paper. The research plan is to write a paper: "Mortgage Loan-to-Values at Market Prices for Danish Owner-Occupiers during the Bust and Boom Period 1987-2003" in which these mortgage LTVs will be analysed separately.

The net liability/income ratio together with the housing wealth/income form the net liability/housing wealth ratio, which was presented above as

(net liability/housing wealth) = (net liability/income) · (income / housing wealth)

As real prices for houses dropped through the years 1987 to 1993 and have increased since, the housing wealth/income ratios may have followed a similar trend. Therefore with stable distributions of the net liability/housing wealth ratios from year to year, the expectation must be that the housing wealth/income ratios more or less have followed the same paths as the net liability/income ratios below.[13]

Table 18.
All owner-occupiers (excluding the self-employed) divided into deciles by size of net liabilities as a per cent of gross income. 1987-2003.

Year	1st decile	2nd decile	3rd decile	4th decile	5th decile	6th decile	7th decile	8th decile	9th decile	10th decile
1987	-147	-37	7	45	79	111	143	178	229	> 229
1988	-149	-38	8	48	84	116	148	184	238	> 238
1989	-141	-35	9	47	81	113	143	177	228	> 228
1990	-150	-39	6	44	77	106	134	166	216	> 216
1991	-165	-44	2	39	72	100	129	160	207	> 207
1992	-172	-42	3	42	75	103	129	159	203	> 203
1993	-170	-42	4	43	77	106	133	164	211	> 211
1994	-159	-43	1	38	70	96	121	147	186	> 186
1995	-159	-41	3	43	77	104	132	160	204	> 204
1996	-161	-41	6	48	83	113	140	172	216	> 216
1997	-153	-33	17	61	96	127	157	192	242	> 242
1998	-154	-33	20	66	103	135	165	201	253	> 253
1999	-152	-31	22	69	105	137	168	202	254	> 254
2000	-155	-30	25	72	109	140	172	208	263	> 263
2001	-156	-33	23	71	108	140	172	208	263	> 263
2002	-152	-28	29	78	116	149	181	220	280	> 280
2003	-157	-30	32	81	119	152	185	224	287	> 287

The distribution of all the owner-occupiers according to their net liability/income ratio for the years 1987-2003 is seen in Table 18. For 2003 the median value was 119, i.e. the median owner-occupier family had a debt (net liability), which amounted to 119% of their income in 2003. More than a fifth of the owners had positive savings (negative net liabilities in the table) besides their housing wealth. The 30% most indebted owner-occupiers had net liabilities of at least twice their annual income. Owner-occupiers in the two highest deciles had a ratio at 224 or above. And for the most indebted 10% of their net liabilities were at least nearly three times as high than their income.

The development through the years demands close attention. Not much has changed for the 20% with positive savings besides their housing wealth. For the 3rd decile, the increasing ratio expresses that a still greater share of the owner-occupiers have debts. For the owner-occupiers with debt – especially those in the deciles with the highest ratios – the value of the ratios dropped remarkably from 1988 to 1991, and these drops continued at a lower rate until 1994. In subsequent years the net liability/income ratios among the indebted owners increased much more than the incomes, and by 2003 they were at a

[13] In fact, this is the case. The housing wealth/income ratios are presented in (Lunde, 2005).

much higher level than in 1987. The median value increased by 51% from 1987 to 2003, the net result of a decrease from 1987 to the low in 1994 of 11% and an increase from 1994 to 2003 of 70%.

Furthermore, it has been convincingly argued that the housing wealth/income ratios have reached an all-time-high level at the entrance to 2005 (Lunde, 2005). If the stability in the net liability/housing wealth ratios found in this paper has continued, the net liability/income ratios must rely on an all-time-high at the entrance to 2005, too.

Moreover, the net liability/income ratio varies with owner age. Again, the ratios for owners between 30-39 years of age are shown in Table 19.

Table 19.
Owner-occupiers divided into deciles by size of net liabilities as a per cent of gross income. Owner-occupiers (excluding the self-employed) between 30-39 years of age. 1987-2003.

Year	1st decile	2nd decile	3rd decile	4th decile	5th decile	6th decile	7th decile	8th decile	9th decile	10th decile
1987	41	79	104	124	143	162	183	210	255	> 255
1988	43	84	110	130	150	169	191	219	267	> 267
1989	41	80	105	126	145	163	184	211	257	> 257
1990	39	80	102	120	136	153	172	197	244	> 244
1991	39	76	98	117	133	150	170	194	237	> 237
1992	49	82	103	119	135	151	168	191	226	> 226
1993	49	83	107	124	140	157	175	199	242	> 242
1994	42	78	96	112	126	141	157	176	211	> 211
1995	48	83	104	122	139	155	173	196	232	> 232
1996	45	87	111	130	148	166	186	208	245	> 245
1997	65	101	126	147	165	185	206	231	273	> 273
1998	65	107	131	152	172	192	213	240	286	> 286
1999	69	107	133	155	174	193	216	241	286	> 286
2000	69	110	138	159	179	199	219	247	293	> 293
2001	66	110	137	158	179	198	219	248	291	> 291
2002	74	117	145	167	188	209	232	259	312	> 312
2003	72	121	149	170	190	211	234	267	319	> 319

In general 30-39 year-old owner-occupiers have somehow higher net liability/income ratios than all owner-occupiers and few are without debt. In this age group too, the net liability/income ratio was lowered in nearly all of the years from 1988 to 1994. After 1994, the net liabilities increased more than the 30-39 years old owner-occupiers' incomes. The ratios have thereby grown to a markedly higher level in all deciles. In 2003 half of the 30-39 year-old owner-occupiers had a debt of nearly twice their family income. More than 10% had a debt of at least at three times the income. In 1994 more than 80% of the owner-occupiers in the age group had a net liability/income below the median ratio for 2003. Mortgages form the largest part of the owner-occupiers' gross and net liabilities. For half of the 30-39 year-old owner-occupiers in 2003 the mortgage debt was above 163% of their income and 20% had a ratio of 227% or above.[14]

For the median owner-occupier between 30-39 years of age, the net liability/income ratio increased by 33%, of which the net result of the decrease from 1987 to 1994 was at 12% and the following increase from 1994 to 2003 at 51%.

[14] The mortgage debt/income ratios are not presented in this paper.

For owner-occupiers in the other age groups the development in the net liability/income ratios have shared similar features over the years. The net liability/income level is somehow higher in 2003 than in 1987 for all groups. Of course, the levels of the ratios fall with age. For owner-occupiers between 50-59 and 60-69 years of age, the fall in the net liability/income ratios was less pronounced up to 1994, and after this year the increase in the ratios has been stronger than for other age groups.

In general it can be concluded that the owner-occupiers have become more indebted in relation to their incomes since the middle of the 1980s and of course, especially since the housing market cycle turned in 1993-1994. Presumably, the owner-occupiers are more indebted now than ever before. This can be interpreted as showing that the owner-occupation sector – an important part of the Danish economy – has been influenced by a higher degree of financial fragility. However, income must be used to service the debt and even though the debt – shown in the net liability/income ratios – has increased, the debt service burden has been lightened during the last 10 years' continuous interest rate drops. The question to be answered below is whether the drop in the interest rates have been so strong and the interest payments have been reduced so sharply that the owner-occupiers' debt services do not require a greater share of their incomes. In the next sections, the interest payments and the interest/income ratios are analysed.

15. Owner-occupiers' interest incomes and expenditures.

The analysis of the owner-occupiers' capital structure as well as other LTV measures above do not take interest rates into account. The standard argument is in accordance with McCarthy and Peach's belief that interest rates should matter *"because they influence home ownership affordability and because they represent the yield on a competing asset in a household's portfolio"* (2004, p. 5).

Statistics on the Danes' debt services do not exist, but their interest incomes and expenditures are registered as a by-product of the taxation. Internationally, statistics on owner-occupiers' debt services seem rare. However, the Federal Reserve Board publishes quarterly data for the households' debt-service ratio, measured as the required payments on mortgage and consumer debt as a share of after-tax personal income. This ratio showed a weak drop from 12.13% in 1987Q1 to 10.79% in 1993Q4. Subsequently, the ratio began a continuous increase to 13.37% in 2002Q4 and stabilised at that level up to 2004Q3. Another and broader ratio for homeowners includes auto leases, insurance, and property taxes. This ratio has followed a similar development but with rather weak changes, reached the period's maximum at 16.23% in 2002Q4 and fell to 15.83% in 2004Q3. (Federal Reserve Board, 2004). These figures can only in their first version be compared with – as is done below – the Danish net interest/income ratios. The Danish data are based on incomes before tax and both the US debt service rates and the Danish interest expenditures are presented before tax.

Falling interest rates have reduced interest payments by themselves. At a given loan debt and term the owner-occupiers' debt services are also reduced. Another result presented above was that the shift in the debt structure against a slightly higher mortgage share after the financial deregulation represented a change to lower interest rates, which reduced the interest payments. Moreover, debt services were lowered by much longer terms on mortgages than on commercial bank loans. As a third factor, the move in the choice of mortgage type from fixed interest rate loans to adjustable-rate mortgages reduced interest payments further, because of the "normal" increasing yield curve throughout nearly the whole period since 1996. At the end of March 2005 the adjustable-rate mortgages' market share was at 50% of the owner-occupiers' mortgages (Danmarks Nationalbank, 2005). As the interest-only mortgages were introduced in October 2003, they do not influence the

data in the paper and moreover as only interest payments and not debt services are shown, interest-only loans cannot have influenced the results. However, in a wider financial security context it seems of relevance that interest-only mortgages cover 23% of the owner-occupiers' outstanding mortgages at the end of March 2005.

The mentioned factors work against lower interest payments at a loan of given size. However, the influence of interest rate drops on property value and debt size must be recognised, too. The lowering of interest rates is part of the "fundamentals" and has had a strong influence on the growth in real house and flat prices that has been observed since 1993 (Haller Pedersen, 2004; McCarthy and Peach, 2004). At the same time the interest rate drops have increased the market values of the debt on fixed interest mortgages. *Already therefore, it cannot be taken for granted that interest payments have dropped even though the interest rate has dropped.*

The owner-occupiers' interest incomes and expenditures are included in the study, based on data from the tax statistics, as interest incomes and expenditures are included in the personal capital incomes. The aggregate interest incomes and expenditures for the years 1987-2003 are shown in Table 20.[15] The tax statistic on interest incomes has not been influenced by the change in the wealth definition from 1997 on, because the assets removed do not carry interest.

Table 20.
Aggregate interest income and expenditures. All owner-occupiers (excluding the self-employed). 1987 – 2003. Million DKK.

Year	Interest income, commercial banks	Other interest income	Interest expenditures, mortgage	Interest expenditures, commercial banks	Other interest expenditures	Net interest expenditures
1987	4225	1980	31462	10069	6869	42196
1988	4455	1871	32935	10437	6844	43890
1989	4635	1572	33763	10828	6512	44896
1990	5554	1629	33423	11913	6378	44530
1991	5406	1535	33867	11993	5843	44762
1992	12470*	751	33748	13351	5222	39101
1993	11863	535	35223	11940	3997	38762
1994	9.689	663	32.755	11860	991	35254
1995	9921	581	35564	11999	995	35056
1996	9173	0 [1)]	34899	11163	765	37654
1997	8167	524	36648	11236	731	39924
1998	8057	412	37516	11753	676	41475
1999	6780	410	36708	11389	670	41577
2000	8865	375	38005	13463	681	42910
2001	9704	387	40263	13688	820	44680
2002	9367	355	40709	12612	704	44304
2003	8208	312	40039	11484	607	43610

* The owner-occupiers' interest income of deposits etc. in commercial banks increases too much in 1992. It must be supposed the figures for the years before are too low.

[1)] In 1996 "other interest incomes" are included in "interest income in commercial banks.

[15] The interest incomes in Table 20 and the following tables do not include the imputed rent of the owner-occupier's dwelling, even though this income was regarded as a capital income until the removal of the imputed rent tax in 2000.

Table 20 contains aggregate numbers. The net interest expenditures dropped from 1991 to 1995. Unfortunately part of the drop could possibly be explained by an incredibly high increase in the interest incomes from 1991 to 1992 of 7 bn. DKK. In contrast, from 1995 to 2003 net interest expenditures rose again by 24%, while the increase in the consumer price index through the period only was 19%, i.e. even with the reduced interest rates the owners' aggregate *real* net interest expenditures have shown an increase through most of the period of strong house price increases. All interest figures in Table 20, as in the tables below, are before tax. However, an obvious change is to include taxation when considering Table 20. In this case the net interest expenditures after tax have increased, as debtors could deduct interest expenditures at a tax rate of 50% in 1987 compared with 33% in 2003.

Besides the interest rate drops, since 1992 the owner-occupiers' interest expenditures have been influenced by the change from commercial bank loans to mortgages. The deregulation and the strong competition in the mortgage and commercial bank sector have removed most of the basis for purchase-money mortgages and for the non-bank consumer credit. Therefore, the owner-occupiers no longer have any significant debt services on loans other than mortgages and bank loans. Since 1993 interest expenditures on mortgages have increased slowly and with variable speed. So the interest rate drops in general and the change from commercial bank loans to mortgages have been more than offset by the raising of larger loans. Surprisingly, the owners' interest expenditures on ordinary bank loans did not drop unless slightly after 2001.

Calculations of aggregates at the macro level of interest income and expenditures might be criticised for giving an unsatisfying picture. First, an obvious correction is to calculate the interest incomes and expenditures for the "average" owner-occupier as shown in Table 21. Of course, this change mostly exposes the need of further decompositions. Although it could be noted that the owner-occupiers in 2003 on average paid higher nominal interests on mortgages as well as on commercial bank loans than in 1987, the average net interest expenditure had dropped slightly.

Table 21.
Average interest incomes and expenditures. All owner-occupiers (excluding the self-employed). 1987-2003. DKK.

Year	Interest income, commercial banks	Other interest income	Interest expenditures, mortgage	Interest expenditures, commercial banks	Other interest expenditures	Net interest expenditures
1987	3698	1733	27535	8812	6012	36929
1988	3835	1611	28349	8984	5891	37778
1989	4001	1357	29145	9347	5621	38755
1990	4817	1413	28991	10333	5532	38626
1991	4880	1385	30569	10825	5274	40403
1992	11011	663	29801	11790	4611	34527
1993	10398	469	30873	10466	3503	33975
1994	8391	574	28369	10272	858	30534
1995	8568	501	28124	10363	860	30277
1996	7702	0[1)]	29300	9372	642	31613
1997	6806	437	30543	9364	609	33273
1998	6631	339	30877	9673	556	34136
1999	5536	335	29974	9300	547	33950
2000	7215	305	30933	10958	554	34925
2001	7905	315	32798	11150	668	36396
2002	7519	285	32680	10125	565	35565
2003	6601	251	32202	9236	488	35074

[1)] In 1996 "other interest income" is included in "interest income in commercial banks".

16 The variation in owner-occupiers' interest income and expenditures, by income.
Only the *net* interest expenditures in the owner-occupier families are analysed in this and in the next section. Primarily the economic and financial stability conditions are attached to the net and not to the gross interest expenditures, as of course some interest expenditures can be matched by interest incomes. Analogically, the net and not the gross liabilities were analysed above.

The owner-occupiers have been distributed in deciles according to the size of their gross income for each year in Table 22. For each single decile the average net interest expenditure has been calculated and is shown. Not surprisingly, the nominal average net interest expenditure increases with the income in the single year. Seen through the 17 years, the median value for the annual net interest expenditures have been rather similar. Some distributional changes are found as the nominal net interest expenditures have been slightly reduced in the high income deciles but slightly increased in the first 7 income deciles. A partial explanation seems to be that owners with higher incomes into a higher degree raise adjustable-rate mortgages with low interest payments at the increasing yield curve.

Table 22
Average net interest expenditures for all owner-occupiers (excluding the self-employed), divided into deciles by size of their income. 1987-2003. DKK.

Income deciles / Year	1st decile	2nd decile	3rd decile	4th decile	5th decile	6th decile	7th decile	8th decile	9th decile	10th decile
1987	18682	23782	26533	29473	34391	36960	39949	45385	50849	63313
1988	20186	25033	27926	30767	34895	37934	40280	45200	52260	63322
1989	19883	24808	30056	31397	35864	38681	41899	46729	52821	65441
1990	21935	24658	28607	31520	36231	37924	41509	47618	51548	64747
1991	21887	27091	30602	33815	37866	40073	44037	47560	52012	69114
1992	19156	23350	27356	29302	35049	37564	38453	41474	44929	48658
1993	18755	23375	26913	29289	34713	36263	39336	41597	44129	45398
1994	16990	21825	24973	28150	30817	33261	34788	36713	40575	37259
1995	16181	21860	25050	28087	31596	33202	35284	37758	41125	32633
1996	16886	22200	24346	29149	32184	34367	36096	38705	41455	40758
1997	17515	22716	26259	30432	34231	35684	38679	41236	44773	41222
1998	17781	22218	27547	31361	34439	36565	39168	41761	46214	44316
1999	18455	23225	27653	31350	34868	35857	38377	41148	44667	43913
2000	19284	23644	28202	32618	35478	37319	39466	42360	45980	44917
2001	19277	23606	29161	33975	36170	38339	42693	42796	47290	50667
2002	19792	24605	28607	33187	36684	37890	40593	43430	44919	45965
2003	19099	24010	27980	31892	35581	37254	40287	41832	46124	46692

A rather more interesting structure is found when the net interest expenditures are compared with the owners' gross incomes in net interest expenditure/income ratios. The average ratios in the single deciles are shown in Table 23. Two general features can be remarked. First, the average net interest expenditure/income ratios drop somewhat with increasing income in each year. Second, the average ratio for all owners has been nearly halved from 1987 to 2003. The degree of reduction is increasing with the decile number. Third, the average ratios decreased most through the "housing market failure" years in all deciles. Since 1993 the net interest expenditure/income ratios have dropped

slightly in each decile as a combined result of the falling interest rates, steeply rising house and flat prices, large debt increases and use of adjustable-rate mortgages.

Table 23.
Average net interest expenditures as a per cent of gross income for all owner-occupiers (excluding the self-employed), divided into deciles by size of their income. 1987-2003

Income deciles / Year	1st decile	2nd decile	3rd decile	4th decile	5th decile	6th decile	7th de-cile	8th decile	9th de-cile	10th decile	All
1987	21.1	17.4	15.8	14.9	15.2	14.8	14.5	14.6	14.1	12.6	14.7
1988	21.6	17.6	16.1	14.9	14.7	14.5	13.9	13.8	13.8	11.9	14.3
1989	20.1	16.7	16.4	14.4	14.5	14.1	13.8	13.7	13.3	11.8	14.0
1990	22.1	16.2	15.2	14.0	14.2	13.5	13.3	13.5	12.6	11.2	13.5
1991	19.9	15.8	14.2	13.5	13.4	12.9	12.9	12.5	11.9	11.4	13.0
1992	17.4	13.5	12.6	11.5	12.2	11.9	11.1	10.7	10.1	7.8	10.9
1993	16.8	13.3	12.2	11.3	11.9	11.3	11.1	10.5	9.7	7.1	10.5
1994	13.4	11.6	10.7	10.3	10.2	10.0	9.5	9.0	8.6	5.6	9.1
1995	12.6	11.3	10.4	10.0	10.1	9.7	9.3	9.0	8.5	4.8	8.7
1996	12.8	11.4	10.0	10.2	10.1	9.8	9.3	8.9	8.3	5.8	8.9
1997	13.2	11.3	10.4	10.3	10.3	9.8	9.6	9.2	8.6	5.6	9.0
1998	12.9	10.7	10.5	10.2	10.0	9.7	9.4	9.0	8.6	5.8	8.9
1999	13.2	10.9	10.2	9.8	9.8	9.1	8.9	8.5	8.0	5.5	8.6
2000	13.6	10.7	10.1	9.9	9.6	9.2	8.8	8.4	7.9	5.3	8.4
2001	12.7	10.2	9.9	9.9	9.4	9.0	9.1	8.2	7.8	5.7	8.4
2002	12.9	10.4	9.5	9.4	9.3	8.6	8.4	8.0	7.2	5.1	8.0
2003	12.5	9.9	9.0	8.8	8.8	8.3	8.1	7.6	7.2	5.0	7.7

Even though the net interest expenditure/income ratios in Table 23 have been stabilised to a high degree after 1993, the use of average figures for all owner-occupiers can hide a lot of differences, for example between the age groups and between regions. Moreover, it must be emphasised that each number in the single deciles in Table 23 has been found as an average that covers a distribution of ratios in each decile. With the exception of the age variable, these distributional factors are not further analysed in this paper.

17. The variation in owner-occupiers' interest income and expenditures, by age – and for owner-occupiers between 30-39 years of age.

Age is a rather important determinant of the owner-occupiers' capital structure and interest payments. In reality, the age of the family, defined as the age of the oldest member, might be seen as a proxy for the family's actual placement in the life cycle. In Table 7 above it was shown that the owner-occupiers' net liability/housing wealth ratios decrease with age in all deciles. This may make it tempting to draw the conclusion that interest expenditures also decrease with the owner-occupier's age. However based on the same statistical source it has been found that the housing wealth/income ratios do not vary to any substantial degree between the age groups of owner-occupiers below 50 years of age (Lunde, 2005).

The fact is that owner-occupiers below 30 years of age on average have less gross and net interest expenditures and incomes than in the next age group. The owner-occupiers between 30-39 years of age have on average the largest gross and net interest expenditures, as shown in Table 24. Above this age interest incomes increase and the interest expenditures decrease with increasing age.

However, if the variation in the net interest expenditure/income ratios were compared, the ratios were decreasing with age and therefore highest for owner-occupiers below 30 years of age but only slightly higher than for the next age group.

Table 24.
Average interest income and expenditures.
Owner-occupiers (excluding the self-employed), by age. 2003. DKK.

Age – years	Interest income, commercial banks	Other interest incomes	Interest expenditures, mortgage	Interest expenditures, commercial banks	Other interest expenditures	Net interest expenditures
< 30	1511	20	32349	12938	530	44286
30-39	2904	63	45843	14242	1032	58149
40-49	2964	200	44120	12387	556	53899
50-59	5421	303	34906	10104	420	39705
60-69	8869	354	22421	5252	153	18602
> 70	15676	402	9691	1956	260	-4171
All	6601	251	32202	9236	488	35074

Owner-occupiers between 30-39 years of age have been in focus in this paper because they represent most of the intake of new households to owner-occupation, because 50.8% of the families in this age group are owners (compared with 17.7% in families below 30 years of age), and because these two youngest age groups have the highest net liability/housing wealth ratios. As the fact that this age group moreover has the largest net interest expenditures is one more important reason to focus at the age group, whose net interest expenditures are analysed in more depth in the rest of the paper.

First, the nominal average interest incomes and expenditures for owner-occupiers between 30 – 39 years of age, again for the years 1987-2003, are presented in Table 25. To illustrate the magnitude of the owner-occupiers' average interest incomes and expenditures in Tables 21 and 25 below it can be mentioned that the average income (before tax) for a person 30-34 years old in Denmark in 2002 was 261,400 DKK and the average family income for a couple with children was 556,600 DKK (Statistic Denmark, 2004).

Table 25.
Average interest income and expenditures of owner-occupiers (excluding the self-employed) between 30-39 years of age. 1987-2003. DKK.

Year	Interest income, commercial banks	Other interest income	Interest expenditures, mortgage	Interest expenditures, commercial banks	Other interest expenditures	Net interest expenditures
1987	1846	807	42181	12540	9025	61094
1988	1726	714	43243	12901	9317	63021
1989	1834	498	44090	12815	8486	63059
1990	1980	405	43731	14229	7634	63209
1991	2158	592	45918	14534	8642	66343
1992	3675	225	45252	15460	6988	63800
1993	3514	115	46304	15531	5725	63931
1994	2180	131	41353	14687	1652	55381
1995	1844	133	40941	15038	1710	55712
1996	2034	0[1)]	42710	14112	1139	55927
1997	1531	128	44850	14321	1094	58605

1998	2027	100	45504	14887	1023	59287
1999	1796	89	44265	14934	980	58294
2000	1899	88	45598	16905	988	61504
2001	2759	72	49036	17372	1251	64830
2002	2277	159	47835	15955	1019	62372
2003	2904	63	45843	12242	1032	58149

[1)] In 1996 "other interest income" is included in "interest income in commercial banks"

The owner-occupiers between 30-39 years of age have on average had rather low and unchanged nominal interest incomes in the period. The average nominal interest payments on mortgage and bank loans have increased a little, while the interest payments on purchase-money mortgages and non-bank loans have been reduced by close to a tenth. The average net interest expenditures in 2001-2002 were only slightly higher and in 2003 lower than in 1987-1988 for the owner-occupiers between 30-39 years of age. However, a rather striking result for these owners and thereby for first time buyers, was that their net interest expenditures were rather stable from 1987 to 1993 and then – obviously as result of the strong interest rate drop in 1993-1994 – their net interest expenditures dropped in 1994, while from 1995 to 2001 their net interest expenditures increased again. Their net interest expenditures had dropped since, partly as a consequence of refinancing with adjustable-rate mortgages.

However, Table 25 shows the development in average conditions, and the distributional aspect within the age group is thus lost. Therefore, more profound distributional analyses must be performed. In Table 26 the net interest expenditures for owner-occupiers in the same age group as above are divided into deciles according to the size of their incomes.

Table 26
Average net interest expenditures for owner-occupiers (excluding the self-employed) between 30-39 years of age, divided into deciles by size of income 1987-2003 DKK

Income deciles / Year	1st decile	2nd decile	3rd decile	4th decile	5th decile	6th decile	7th decile	8th decile	9th decile	10th decile
1987	31661	38463	44688	52554	57428	63391	68026	73571	80621	100542
1988	33321	43579	47112	52986	59365	64183	68174	75190	84827	101515
1989	32135	39504	48152	54953	60416	63802	70606	74698	85035	101288
1990	33302	39383	47694	55811	58641	64054	69543	75019	83910	104782
1991	35401	45164	51993	60331	61834	66553	71131	75028	82976	113073
1992	34590	43495	50142	56748	61972	65471	70072	73194	80921	101430
1993	32237	43166	50221	56704	61470	63724	70677	72676	80726	107751
1994	27216	37765	45411	51221	53872	58217	61513	62924	70659	85051
1995	29233	37171	44655	50697	55922	58150	61031	65517	70782	83999
1996	27977	38601	46120	50698	54887	59191	62546	64191	72370	82723
1997	29769	37505	46901	53591	58050	61492	64781	68723	75832	89442
1998	28489	37486	48515	55327	58962	63530	66573	68897	76040	89070
1999	30835	39045	48414	53476	58997	61720	65051	68019	73845	83572
2000	30746	39768	49711	55595	61868	66287	67698	73652	80123	89628
2001	31192	40382	51652	59519	62498	68078	74554	75622	85405	99396
2002	33363	41843	50944	58639	62536	64977	68334	72176	77964	92984
2003	31495	38171	48371	54220	59913	62838	66300	71075	72923	76188

Clearly the net interest expenditures increase with the income through the deciles. While the average net interest expenditures for all owner-occupiers between 30-39 years of age reached a minimum in 1994, in a couple of deciles the minimum value was reached in 1995, and in the 10th

decile it was reached in 1996. Afterwards the average net interest expenditure increased in all deciles until 2001-2002. As the drop from then on increases with income, it could be tempting to put forth the hypothesis that the frequency of that year's refinancing from fixed to adjustable interest rate mortgages increased with income[16].

However, analysing nominal interest expenditures is less convincing unless consideration is given to inflation and income growth. Therefore, the owner-occupiers' net interest/income ratios have been estimated for the single owner-occupier's family and are shown in Table 27. Once again, the owner-occupiers have been distributed according to the size of their income in the single year and the estimated ratio is an average for the owners within a particular decile.

Table 27
Average net interest expenditures in per cent of gross income for owner-occupiers (excluding the self-employed) between 30-39 years of age, divided into deciles by size of income 1987-2003.

Income deciles / Year	1st decile	2nd decile	3rd decile	4th decile	5th decile	6th decile	7th decile	8th decile	9th decile	10th decile	All
1987	24.9	21.9	21.0	20.4	19.8	20.2	20.2	20.2	19.9	19.2	20.3
1988	25.8	23.9	21.7	19.9	19.6	19.5	19.2	19.6	20.0	18.5	20.1
1989	24.8	21.2	21.1	19.8	19.4	18.8	19.3	18.8	19.2	17.6	19.4
1990	25.2	20.5	20.5	19.7	18.3	18.5	18.7	18.6	18.6	17.8	19.0
1991	23.7	20.0	18.0	18.5	17.5	17.7	17.8	17.4	17.2	18.1	18.1
1992	22.6	18.9	17.0	17.0	17.1	16.9	16.9	16.4	16.4	16.0	17.0
1993	21.0	18.8	17.1	17.0	17.0	16.4	17.1	16.3	16.3	16.9	17.0
1994	16.7	15.7	14.9	14.8	14.5	14.6	14.5	13.7	13.9	12.7	14.3
1995	17.7	15.0	14.3	14.4	14.7	14.3	14.0	14.0	13.6	12.5	14.1
1996	16.6	15.4	14.6	14.1	14.1	14.2	14.0	13.3	13.5	11.7	13.7
1997	17.1	14.6	14.4	14.4	14.4	14.3	14.0	13.8	13.6	12.2	13.9
1998	16.0	14.0	14.3	14.3	14.1	14.2	13.9	13.3	13.2	11.4	13.5
1999	17.3	14.2	13.7	13.3	13.6	13.3	13.0	12.5	12.1	9.9	12.7
2000	16.4	14.0	13.6	13.3	13.7	13.6	13.0	12.9	12.4	10.1	12.8
2001	16.2	13.7	13.8	13.9	13.3	13.5	13.6	12.7	12.6	10.4	12.9
2002	17.4	13.9	13.4	13.4	13.1	12.6	12.3	11.9	11.3	9.9	12.3
2003	16.8	12.6	12.4	12.0	12.2	11.9	11.6	11.4	10.4	7.9	11.1

As seen in Table 27, the average net interest expenditure/income ratio in the deciles decreases with increasing income for all the years. This relation indicates that housing consumption as a part of the owner families' consumption decreases with increasing incomes.

Second, an important factor in the owner-occupiers' risk exposure and in a financial stability context is the fact that the owners between 30-39 years of age had a net interest expenditure/income ratio of 20% (median value) in 1987, i.e. interest payments took up a relatively large share of the families' incomes before tax. As the interest could be deducted at a 50% tax rate from 1987 on, the median ratio for the net interest expenditures after tax would have been about 10% of the gross income. However, as the average income tax rate could easily have been 50%, the level for the net interest expenditure/income ratio after tax would still be around 20%. Moreover, the owner-

[16] Another additional financial explanation could be that as the loan size increases with income, the prepayment of fixed interest rate mortgages become more profitable as the income increases.

occupiers had to include imputed rent tax, land tax, expenditures for maintenance etc. in their housing expenditures.

These ratios dropped through the years 1987-1993 to a level of 14% in 1994 and had been reduced to 11% in average since. In the lowest income decile, the ratio has been stable since 1994, while the ratios have dropped – 2-3 percentage points – in the following seven deciles and with even more in the two highest income deciles. Seen from an after-tax perspective the drop in the net interest expenditure/income ratios are less convincing as the tax rate for deducting interest expenditures has been reduced to 33%. Therefore the after-tax ratio for the median owner-occupier in 2003 must have been around 8.2% and thus somehow less below the net interest expenditure/income ratio after tax in 1987. Also the reduction in the net interest expenditure/income ratio after tax must have been strongest in the two deciles with highest incomes.

A positive observation of the examination of the owner-occupiers' risk exposure and of the financial stability in the owner-occupation sector is that the net interest expenditure/income ratios are nearly halved and therefore at a somehow lower level than in 1987 at the start of the "housing market failure". However, the change is less convincing in an after-tax comparison, as the net interest expenditure/income ratios after tax are less reduced than the ratios before tax. Moreover, the owner-occupiers are obviously on average in a position of higher risk than in 1987 if there are strong interest increases, because 50% of the owner-occupiers' mortgage debt carry adjustable-rate mortgages (March 2005). An interest rate increase of a few percentage points would bring this part of the owner-occupiers' net interest expenditure/income ratios after tax back to the 1987 level.

18 Conclusions and consequences: Possible reactions to an interest increase

Denmark has a specialised, efficient and secure mortgage system, which allows owner-occupied properties to be financed with mortgages of up to 80% of the market value. Above this LTV, commercial banks yield secured bank loans. Moreover, Denmark has a leading position in the international household debt race and has the highest mortgage debt per capita. Only Switzerland and the Netherlands have higher residential mortgage debt to GDP ratios.

In general and especially during a period of steep rising house and flat prices like the present one, an important economic policy object is to examine the risk of financial stress among the Danish owner-occupiers and the financial stability of the owner-occupied household sector. This theme for the paper has primarily been pursued by estimating

a. net liability/housing wealth ratios to express the security behind the owner-occupiers' debt,
b. net liability/income ratios to express the owners' ability to repay the debt, and
c. net interest expenditure/income ratios to express their actual debt service burden.

The tax statistics contain information about the owner-occupied dwellings' publicly assessed property values, financial assets and liabilities, interest incomes and expenditures, incomes and household characteristics at household level. For this analysis of the financial stability among Danish owner-occupiers from 1987 to 2003, a representative sample at around 40,000 owner-occupier families (excluding the self-employed) has been drawn for each year. The financial institutions and tax authorities have reported these data to the register, thereby ensuring the precision of the data. The large representative samples of individual households have made it possible to make a more detailed analysis of the financial stability in the owner-occupation sector than can be found for any other country.

And now to the results of the study.

The debt (net liabilities) has been rising in general for owner-occupiers in all age groups. The growth in net liabilities took off in 1994, and the debt of young owner-occupiers more than doubled, obviously representing a rise in real terms.

The owner-occupier's net liabilities have been compared with the value of their owner-occupied properties, i.e. their housing wealth in ratios. In general the distribution of the owner-occupiers according to the size of their net liability/housing wealth ratios has been nearly the same through all the years of the study.

The net liability/housing wealth ratios strongly decrease with increasing age. However, within the younger age groups the capital structure has neither been improved in the direction of a better equity ratio nor worsened through the 16 years after 1987 in the study. Through 1988-2003 between 40 and 50% of the owner-occupiers between 30-39 years of age were technically insolvent, i.e. they had negative equity as their net liabilities were larger than their housing wealth. Also, it is shown that the older owner-occupiers experienced a slight debt rise.

Somewhat surprising is the fact that a high degree of uniformity among the owner-occupiers' capital structure is seen at the single income levels. This result indicates that buyers of houses and flats more or less can present the same percentage down payment when purchasing, as the net liability/housing wealth ratio does not increase with income, which could stimulate the assumption that in general buyers accept to buy as expensive a house or flat as they can obtain financing for through loans.

Another remarkable result is that within the age groups the owner-occupiers' net liability/housing wealth ratios decreases with increasing property value. This strong dependency is not trustworthy and draws attention to the fact that publicly assessed property values for the owner-occupied properties have been used instead of "true" market values. Of course, no one knows what the "true" market values are as the vast majority of houses and flats have not been on the market for years. On average the assessed property values underestimate the prices for sold houses by one tenth but with some variance in the single sale observations. This methodological problem means that the *estimated* net liability/housing wealth ratios can only be seen as *indicators* of the true ratios. As this problem has been the same throughout the years of the study, the conclusions presented on the net liability/housing wealth ratios are not affected.

A minor methodological problem is that the housing wealth (publicly assessed property value) has been estimated at the start of the year and the net liabilities at the end. A correction using the changes in a general house price indices gives slightly better results as the capital structure is improved slightly against higher equity in the years with steeply rising house prices and worsened in the "housing market failure" years.

Similar methodological reservations do not exist in relation to the owner-occupiers' net liabilities, interest incomes and expenditures.

As the family's income forms the basis for paying debt services on the loans, the owner-occupier families' net liability/income ratios have been analysed. In 2003 the median value for all owner-

occupiers was 119, i.e. the median owner-occupier family had a net liability that amounted to 119% of their gross income in 2003. For the most indebted 10%, the net liability was at least 287% of their income. Half of the owners between 30-39 years of age had net liabilities of more 190% of their income and the most indebted 10% had a ratio above 319.

Since 1994 the owner-occupiers' net liabilities have increased much more than their incomes, as the median value of the net liability /income ratio for all the owner-occupiers has increased by 70% and for owner-occupiers between 30-39 years of age, by 54%. Presumably the owner-occupiers are more indebted than ever before. This can be seen as evidence of the owner-occupation sector – an important part of the Danish economy – having been influenced by a high degree of financial fragility.

Finally, the owner-occupiers' interest incomes and expenditures have been analysed. The most striking result is that the net interest expenditure/income ratio dropped during the "housing market failure" from 1987 to 1993. Since 1994 the ratios have only been slightly reduced from 10.2% to 8.8% in 2003 as the median value for all owner-occupiers and from 14.5% to 12.2% for owner-occupiers between 30-39 years of age. The net interest expenditure/income ratios are decreasing slightly with income in each individual years. However, it must be remembered that the ratios are estimated at before tax values. The relevant tax rate for deducting interest expenditures was reduced to 50% in 1987 and further to 33% in 2001. For the median owner-occupier between 30-39 years of age in 1987 the net interest expenditure/income ratio at 20.2% before tax would have been reduced to 10% after tax, while in 2003 the 12.2% before tax would have been 8.2% after tax.

A positive result of the examination of the financial stability in the owner-occupation sector is that the net interest expenditure/income ratios are somewhat lower than in 1987 at the start of the "housing market failure". However, owner-occupiers are obviously on average in a position of higher risk than in 1987 if there are strong interest increases as 50% of the owner-occupiers' mortgage debt is adjustable-rate mortgages (March 2005). An interest rate increase of few percentage points would bring this part of the owner-occupiers' net interest expenditure/income after-tax ratios back to the 1987-level.

During the "housing market failure" in 1987-1993, around 20-25% of the owner-occupiers were technically insolvent. One aspect of the failure was mass foreclosures. Possibly the most surprising aspect in terms of the development of the owner-occupiers' capital structure as shown above was that the frequency of technical insolvency was nearly as high in the years after 1993 as through the "housing market failure". A conclusion of the paper is therefore that negative equity exists as a permanent feature of the Danish house market. Another conclusion must be that one or more "trigger factors" must be active to release new crises in the market for owner-occupied houses and flats. *A widespread existence of technical insolvency cannot by itself be the cause of a new crisis.*

This analysis must not be seen as a forecast of the appearance of a new crisis in the Danish markets for owner-occupied houses and flats in the near future. However, since the paper does reveal that the Danish owner-occupation market is not strong enough to hinder a new crisis that could lead to mass foreclosures the analysis in the paper is an attempt to contribute to *crisis prevention.*

The potential causes of a new "housing market failure" are rather difficult to describe beforehand. Ex post no difficulties exist in identifying the causes that released or contributed to the crisis. Quite

similarly, the causes of financial crises and the theories about their appearance constitute a tangled web, (see e.g. Davis, 1995; Eichengreen, 2002).

As mentioned in the introduction the fear of *an interest increase* lies behind the very widespread interest in the solidity at the owner-occupation markets and in their robustness in the face an interest increase.

The influence ex ante on the house prices of an interest rate increase might in the short run depend on the current economic ”fundamentals” and economic-political conditions. Rising interest rates may be expected to have less effect on the house prices if the increase is moderate and appears as part of a balanced and increased economic growth. The effect could be much stronger if the interest rate rise is sharp and appears as a reaction to a monetary policy collapse or as a form of protection against speculation in the exchange rates.

In the Danish housing market – as in other housing markets with easy access to raising mortgage and other loans – the liquidity, i.e. the debt services on the loans and other parts of the housing expenditures, has great influence on house prices, because many buyers decide on how much of their income, they are willing and able to pay for housing. Increasing interest rates would raise the costs of debt service and will therefore tend to lower house prices. This effect is relatively strong, and general economic prosperity must be widespread, high and expected to be long lasting if the liquidity effect is to be pushed down. A doubling of the short interest rate, for example, from 3% to 6%, means a 100% increase in the interest payments, while an addition to economic growth of 3% only increases production and incomes by 3%.

In the Danish market the effect on debtors of an interest rate rise will differ a lot depending on whether the owner-occupiers’ loans carry fixed interest rates or variable interest rates (adjustable rates).

For owner-occupiers with long fixed interest rate loans, the value of the debt will drop considerably. These owner-occupiers are unlikely to have any significant problems with negative equity following an interest rate increase.

Even at ordinary interest rises owner-occupiers with adjustable interest rate mortgages will experience an increase in payments. For example, an increase in the loan’s interest rate from 3% to 4% increases the interest payments by 33%, albeit with a smaller increase in debt service, and this will put pressure on these debtors’ liquidity. Moreover, many owner-occupiers raise bank loans above the 80% mortgage when financing their purchase and such loans normally carry a variable interest rate. In contrast, the debt on the adjustable-rate mortgage will hardly be affected by an interest increase. If the prices for houses and flats drop markedly, highly indebted owner-occupiers with adjustable-rate mortgages will quickly be faced with solvency problems following an interest rate rise.

At the end of March 2005 50% of the mortgage banks’ outstanding loans to owner-occupiers carried interest adjustment. No information exists about which owner-occupiers have raised adjustable-rate mortgages, and it is impossible to link the debt data in the tax statistics with the type of mortgage. However, nothing indicates that highly indebted young owner-occupiers and first time buyers have fewer adjustable-rate mortgages than other owner-occupiers.

The fact that adjustable-rate mortgages comprise a large part of owner-occupiers' and other debtor groups' mortgages implies a change in the kind of interest rate risk and liquidity risk owner-occupiers may experience as well as an increase in interest sensitivity. The interest rate reductions in 2001, which were motivated in the interest of monetary policy, may have been a driving force behind house and flat price rises and seem to indicate that interest policy has a strong and perhaps increasing effect on society. Denmark has never experienced the opposite reactions coming into effect in the face of an interest rate increase, as adjustable-rate mortgages were introduced during years with still falling interest rates, but international experiences exist: *"Thus, in countries where mortgages are predominantly variable rate, the rise in household indebtedness is likely to have increased the potency of monetary policy. The effect may well be broadly symmetrical. However, the extent of the increase in potency will be diminished by the degree to which households regard variable mortgage as effectively fixed over the interest rate cycle."* (Debelle, 2004, p 60). As late as March 2005, the Danish central bank has repeated that only considerations for the exchange rate determine the monetary policy.

A closer analysis has shown that house prices in Denmark as in the U.S. and surely in many other countries can be explained by the changes in "fundamentals". In an analysis of Danish house prices, Haller Pedersen concludes: *"Notwithstanding the high level, the increase in real property prices is by and large attributable to the underlying pattern of the households' disposable incomes, interest rates, and supply factors"* (Haller Pedersen, 2004). The conclusion for the U.S. situation is similar. But this also means that in the face of sharper increases in interest rates – after a quick monetary political liquidation of the low interest rate regime or after a real monetary policy collapse – changes in "fundamentals" will result in a certain fall in the house prices. The interest rate is an important factor among these "fundamentals".

If a sharp interest rate rise results in a remarkable fall in property prices, this set off well-known self-perpetuating forces and result in a severe decline in property prices and many foreclosures once more. A new collapse in house prices and a new housing market failure could begin.

14 Literature

Bies, Susan Schmidt (2004): *Developments in Financial Markets and Financial Management"*. The Federal Reserve Board Remarks by Governor Bies at the Bond Market Association's Regional Bond Traders and Sale Managers Roundtable, Irving, Texas, September 30.

Danmarks Nationalbank (2003): *"Monetary policy in Denmark"*. June.

Danmarks Nationalbank (2004): *"Finansial Stability 2004"*. Copenhagen.

Danmarks Nationalbank (2005): " Financial statistics - MFI sector ". Monthly. Copenhagen.

Davis, E Philip (1995): *"Debt, Financial Fragility and Systemic Risk"*. Oxford. (Second edition).

Debelle, Guy (2004): "Household debt and the macroeconomy". *BIS Quarterly Review*, March, pp. 51-64.

Earley, Fionnuala (2004): "The Housing And Mortgage Markets in 2003", pp. 4-13 in: European Mortgage Federation (2004).

Eichengreen, Barry (2002): *"Financial Crises - and what to do about them"*. Oxford.

Englund, Peter and Yannis M Ioannides (1997): "House Price Dynamics: An International Empirical Perspective". *Journal of Housing Economics.* Vol. 6, issue 2, pp 119-136.

European Central Bank (2003): *"Structural Factors in the EU Housing Markets"*. March.

European Mortgage Federation (2004): *"Hypostat 2003 – European Housing Finance Review"*. Brussels. September.

Federal Reserve Board (2004): *"Household Debt Service and Financial Obligations Ratios"*. (.www.federalreserve.gov/releases/housedebt/default.htm 09.12.2004).

Greenspan, Alan (2004): *"The mortgage market and consumer debt"*. The Federal Reserve Board. Remarks by Chairman Alan Greenspan at America's Community Bankers Annual Convention, Washington, D.C. October 19.

IMF (2004): *"World Economic Outlook"*. September.

Kennedy, Neale and Palle Andersen (1994): *"Household saving and real house prices: An international perspective"*. Bank for International Settlements. Basle. January.

Krugman, Paul (2003): *"The Great Unravelling Losing Our Way in the New Century"*. New York · London.

Lunde, Jens (1990): *"Boligejernes Formuesituation – En empirisk undersøgelse"*. Institut for Finansiering. Handelshøjskolen i København. Working Paper 90·10. ["The Owner-Occupiers' Capital Structure – an empirical survey."]

Lunde, Jens (1998): *"Ejerboligprisernes stigning og det private forbrug: Den falske sammenhæng". ("Owner-occupied property prices and private consumption: The false relation").* Working Paper. WP 98-4. Department of Finance. Copenhagen Business School.

Lunde, Jens (1999 a): "Danish Owner-Occupiers' Capital Structure and Negative Equity, 1987-1996." *European Mortgage Review.* No 22, September, pp. 13-20.

Lunde, Jens (1999 b): *"The Development in the Danish owner-occupiers' property value, debt and equity 1987-1996."* Paper for AREUEA/ArRES 1999 Maui Conference.

Lunde, Jens (2005): *"Structural Changes in the Danish Market for Owner-Occupation"* Chapter xx in: Peter Boelhouwer, John Doling and Marja Elsinga (editors): *"Home ownership: getting in, getting from and getting out"*. Delft University Press. (Forthcoming).

May, Orla, Merxe Tudela and Garry Young (2004): "British household indebtedness and financial stress: a household-level picture". *Bank of England Quarterly Bulletin,* Winter, pp. 414-428.

McCarthy, Jonathan and Richard W Peach (2004): "Are Home Prices The Next "Bubble"?" *Federal Reserve Bank of New York Economic Policy Review,* Vol. 10, Number 3, December. 17 pages.

Miles, David (1994): *"Housing, Financial Markets and the Wider Economy"*. Wiley.

Skatteministeriet (2004): *"Pensionsformuen"*. (www.skat.dk/tal_statistik/) (1.11.2004) [Ministry of Taxation (2004): *"Pensions Saving Wealth"*.]

Pedersen, Erik Haller (2004): "The Development in Cash Prices of Owner-Occupied Housing". *Monetary Review 1st Quarter.* Danmarks Nationalbank.

Realkreditrådet (2003): "*Beretning 2002"*. ["Annual Report 2002."]

Told og Skat (2004a): "Salgsstatistik 2 halvår 2003", Version: Juni 2004. (www.Told-skat.dk) [Customs and Tax: "Property sales 2 half year 2003".]

Told og Skat, (2004b): "Salgsstatistik 1 halvår 2004", Version: November 2004. (www.Told-skat.dk) [Customs and Tax: "Property sales 1 half year 2004".]

Statistics Denmark (2004): *"Statistical ten-year review 2004"*.

Sutton (2002): "Explaining changes in house prices." *BIS Quarterly Review, September.*

Swiss National Bank, (2004): "Monthly Statistical Bulletin", Volume79.

Terrones, Marco (2004): "The Global House Price Boom", pp 71-89 in: IMF: *"World Economic Outlook"*. September.

Appendix A

Table A1.
Owner-occupiers divided into deciles by size of net liabilities as a per cent of housing wealth.
Owner-occupiers (excluding the self-employed) below 30 years of age. 1987-2003.

Year	1st decile	2nd decile	3rd decile	4th decile	5th decile	6th decile	7th decile	8th decile	9th decile	10th decile
1987	43	69	81	90	98	106	115	128	149	>149
1988	59	83	95	105	114	124	135	149	175	> 175
1989	52	75	87	96	104	113	123	138	165	> 165
1990	50	72	84	93	102	111	122	134	158	> 158
1991	54	76	89	99	108	118	129	144	170	> 170
1992	55	74	86	95	103	110	118	130	151	> 151
1993	53	74	86	95	103	112	120	132	152	> 152
1994	47	69	80	90	98	106	116	128	148	> 148
1995	48	71	84	94	104	113	123	135	159	> 159
1996	51	74	87	96	105	113	123	135	158	> 158
1997	48	74	88	100	109	119	131	145	171	> 171
1998	59	80	95	107	117	127	139	155	182	> 182
1999	55	76	89	99	109	118	128	142	165	> 165
2000	50	73	85	96	104	113	122	135	158	> 158
2001	48	72	85	93	102	111	121	134	157	> 157
2002	49	71	85	95	105	113	123	134	154	> 154
2003	45	72	83	92	101	109	117	130	150	> 150

Table A2.
Owner-occupiers divided into deciles by size of net liabilities as a per cent of housing wealth.
Owner-occupiers (excluding the self-employed) between 30-39 years of age. 1987-2003.

Year	1st decile	2nd decile	3rd decile	4th decile	5th decile	6th decile	7th decile	8th decile	9th decile	10th decile
1987	25	46	60	71	81	91	101	115	138	> 138
1988	30	56	73	85	96	107	119	134	160	> 160
1989	29	53	69	81	91	100	112	125	148	> 148
1990	29	57	72	84	94	105	116	131	154	> 154
1991	34	63	79	91	102	113	126	141	166	> 166
1992	39	65	79	90	99	108	118	129	150	> 150
1993	40	67	82	92	102	111	121	134	157	> 157
1994	37	64	77	86	95	104	114	126	147	> 147
1995	38	67	81	92	101	111	121	135	160	> 160
1996	36	63	76	87	96	105	116	129	153	> 153
1997	44	68	82	93	102	113	124	138	163	> 163
1998	44	68	82	92	102	112	124	138	163	> 163
1999	42	63	76	87	96	106	116	130	153	> 153
2000	41	61	73	84	93	102	113	126	147	> 147
2001	37	59	72	82	92	101	110	123	145	> 145
2002	40	62	74	85	94	103	114	127	148	> 148
2003	37	59	73	84	93	103	113	127	149	> 149

Table A3.
Owner-occupiers divided into deciles by size of net liabilities as a per cent of housing wealth.
Owner-occupiers (excluding the self-employed) between 40-49 years of age. 1987-2003.

Year	1st decile	2nd decile	3rd decile	4th decile	5th decile	6th decile	7th decile	8th decile	9th decile	10th decile
1987	-8	16	30	41	53	64	77	92	114	>114
1988	-9	18	35	50	63	77	91	109	135	> 135
1989	-7	18	34	48	60	73	87	104	129	> 129
1990	-8	19	35	49	64	77	91	107	132	> 132
1991	-10	21	41	58	73	87	102	119	148	> 148
1992	-6	25	44	59	73	86	98	112	135	> 135
1993	-6	26	46	61	75	87	100	116	141	> 141
1994	-7	26	46	62	73	85	98	112	133	> 133
1995	-10	25	48	64	78	90	102	118	142	> 142
1996	-3	29	48	63	75	87	98	113	136	> 136
1997	9	38	55	69	81	92	105	120	146	> 146
1998	8	37	55	69	81	93	105	121	146	> 146
1999	8	37	53	65	77	88	100	113	137	> 137
2000	8	35	50	62	73	83	95	109	132	> 132
2001	10	35	50	62	73	84	96	111	133	> 133
2002	10	35	51	63	74	85	96	110	134	> 134
2003	9	35	51	64	75	86	98	112	135	> 135

Table A4.
Owner-occupiers divided into deciles by size of net liabilities as a per cent of housing wealth.
Owner-occupiers (excluding the self-employed) between 50-59 years of age. 1987-2002.

Year	1st decile	2nd decile	3rd decile	4th decile	5th decile	6th decile	7th decile	8th decile	9th decile	10th decile
1987	-35	-8	4	14	25	36	50	66	91	> 91
1988	-44	-9	6	19	31	44	61	80	108	> 108
1989	-40	-8	7	19	31	44	59	77	105	> 105
1990	-47	-11	6	20	33	47	62	81	107	> 107
1991	-46	-9	9	22	36	51	71	92	119	> 119
1992	-42	-7	12	27	41	56	72	90	112	> 112
1993	-45	-9	10	26	42	58	75	93	119	> 119
1994	-51	-10	10	27	42	58	74	91	114	> 114
1995	-51	-9	11	30	45	61	77	95	119	> 119
1996	-41	-6	13	30	45	60	75	91	115	> 115
1997	-31	0	18	35	51	65	80	97	124	> 124
1998	-28	0	20	34	49	64	78	96	122	> 122
1999	-25	2	19	34	48	61	75	91	115	> 115
2000	-25	1	19	33	46	58	72	88	112	> 112
2001	-27	0	18	32	46	59	72	87	111	> 111
2002	-25	2	19	33	47	60	74	89	112	> 112
2003	-25	1	20	35	49	61	75	91	115	> 115

Table A5.
Owner-occupiers divided into deciles by size of net liabilities as a per cent of housing wealth.
Owner-occupiers (excluding the self-employed) between 60-69 years of age. 1987-2003.

Year	1st decile	2nd decile	3rd decile	4th decile	5th decile	6th decile	7th decile	8th decile	9th decile	10th decile
1987	-96	-51	-28	-15	-5	2	11	24	48	> 48
1988	-114	-57	-32	-16	-5	3	14	31	57	> 57
1989	-103	-52	-29	-13	-4	5	16	33	59	> 59
1990	-111	-60	-32	-16	-5	5	17	35	63	> 63
1991	-121	-62	-34	-14	-3	8	21	41	71	> 71
1992	-115	-56	-29	-13	-2	9	23	43	70	> 70
1993	-117	-58	-29	-12	-1	11	27	49	79	> 79
1994	-114	-53	-27	-11	0	12	27	46	72	> 72
1995	-109	-53	-26	-9	2	15	33	54	81	> 81
1996	-106	-48	-24	-9	3	17	34	52	77	> 77
1997	-93	-43	-20	-6	6	20	38	58	82	> 82
1998	-96	-44	-20	-6	7	23	39	58	85	> 85
1999	-83	-39	-18	-4	7	22	38	54	79	> 79
2000	-74	-36	-17	-4	8	22	37	54	75	> 75
2001	-72	-33	-15	-3	9	23	37	52	74	> 74
2002	-73	-33	-14	-2	10	25	40	56	78	> 78
2003	-67	-31	-13	0	13	26	40	57	79	> 79

Table A6.
Owner-occupiers divided into deciles by size of net liabilities as a per cent of housing wealth.
Owner-occupiers (excluding the self-employed) 70 years of age and above. 1987-2003.

Year	1st decile	2nd decile	3rd decile	4th decile	5th decile	6th decile	7th decile	8th decile	9th decile	10th decile
1987	-116	-66	-42	-26	-15	-9	-3	2	14	> 14
1988	-137	-73	-46	-28	-16	-8	-3	3	18	> 18
1989	-134	-73	-44	-28	-15	-8	-3	3	16	> 16
1990	-146	-82	-51	-33	-19	-10	-4	3	19	> 19
1991	-166	-94	-59	-38	-22	-11	-4	3	21	> 21
1992	-180	-97	-59	-38	-22	-10	-4	3	20	> 20
1993	-173	-98	-60	-37	-22	-11	-3	4	23	> 23
1994	-176	-96	-58	-37	-21	-11	-3	5	27	> 27
1995	-180	-98	-61	-38	-21	-10	-3	6	30	> 30
1996	-164	-91	-57	-34	-19	-9	-3	7	31	> 31
1997	-158	-89	-55	-34	-19	-9	-2	10	36	> 36
1998	-160	-85	-53	-33	-18	-8	-2	11	36	> 36
1999	-141	-77	-49	-29	-17	-7	-1	13	36	> 36
2000	-139	-77	-46	-28	-15	-6	0	14	36	> 36
2001	-131	-72	-45	-28	-15	-7	0	15	35	> 35
2002	-133	-72	-44	-26	-14	-5	2	17	39	> 39
2003	-120	-68	-42	-25	-13	-5	4	19	41	> 41

Table A7.
All owner-occupiers (excluding the self-employed) divided into deciles by size of net liabilities as a per cent of housing wealth. 1987-2003.

Year	1st decile	2nd decile	3rd decile	4th decile	5th decile	6th decile	7th decile	8th decile	9th decile	10th decile
1987	-46	-12	3	21	41	59	78	95	118	> 118
1988	-53	-14	3	24	48	71	91	111	137	> 137
1989	-50	-12	4	24	46	67	85	104	128	> 128
1990	-58	-15	3	24	47	68	86	105	130	> 130
1991	-67	-19	1	23	48	72	91	112	140	> 140
1992	-66	-18	1	25	49	71	89	106	128	> 128
1993	-68	-18	2	26	52	73	91	109	132	> 132
1994	-69	-20	0	24	49	69	86	103	125	> 125
1995	-71	-19	2	27	53	74	91	109	133	> 133
1996	-64	-17	3	28	51	70	87	104	128	> 128
1997	-55	-13	8	34	56	75	92	111	137	> 137
1998	-54	-13	9	34	56	75	93	112	139	> 139
1999	-50	-11	9	33	53	70	87	105	129	> 129
2000	-46	-10	10	32	51	68	84	101	124	> 124
2001	-45	-11	9	30	49	66	82	99	123	> 123
2002	-44	-9	11	33	51	68	84	101	125	> 125
2003	-43	-9	11	32	51	68	84	101	125	> 125

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