ARTICLES

Financial vulnerability of mortgage-indebted households in New Zealand – evidence from the Household Economic Survey

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Aggregate household debt more than doubled between 2001 and 2008, alongside similarly rapid increases in house prices. Aggregate data, however, cannot tell us which types of households – by income and assets – have built up the most debt over the period, which is important for assessing their financial vulnerability. This article uses information from the Household Economic Surveys (HES) for 2001, 2004 and 2007 to provide some evidence on this issue. The survey evidence suggests that, overall, financial vulnerability in the household sector did not greatly increase over the period of strong house price rises this decade. Simple modelling suggests that some households would, however, be vulnerable to simultaneous large shocks to house values, interest rates and employment.

1 Introduction

The end of the housing boom has exposed the vulnerability of the household sector in several developed countries. In the US, where the housing slowdown has been most severe, it has led to a sharp rise in mortgage default rates, a slowdown in the economy, and billions of dollars of losses for banks.

Compared to the US, New Zealand had a faster build-up of household debt as well as a sharper increase in house prices (figures 1 and 2). However, the US sub-prime crisis was precipitated by three distinct trends that were not present in the New Zealand mortgage market. The first was a marked increase in lending to 'sub-prime' borrowers – those with poor credit histories or weak documentation of income, who were traditionally shunned by 'prime' lenders. The second was an increase in the use of securitisation, which allowed banks to originate mortgages to high-risk borrowers and then distribute the risk to a large number of investors, many of whom were unaware of the true risks of the assets they held. The third was a rapid deterioration in underwriting quality, because banks no longer had the same incentives to assess properly the credit risk of borrowers.

The question therefore arises: just how different would the response of the New Zealand household sector be to falling house prices, rising unemployment, and slowing economic growth? Could such circumstances generate losses to banks substantial enough to threaten financial stability?

Figure 1

Household debt-to-disposable income ratios in selected countries

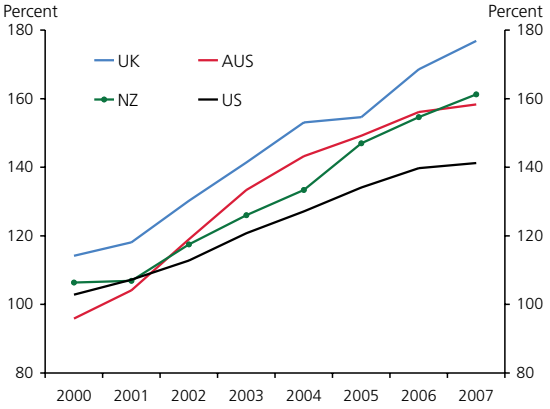
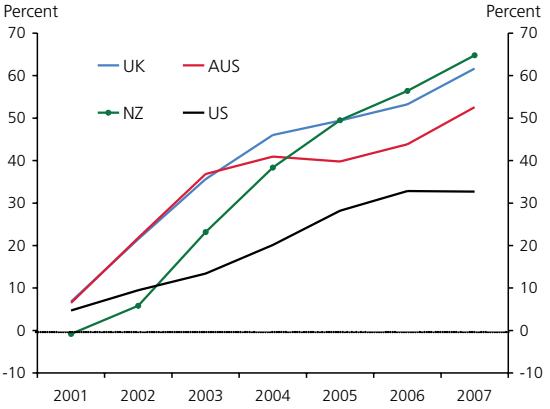


Figure 2

Cumulative growth in real house prices in selected countries



This article summarises findings from the Reserve Bank's ongoing studies of financial risks in the household sector using Statistics New Zealand's HES in 2001, 2004 and 2007. The survey allows analysis of the distribution across the population of the debt, assets, and debt-servicing capacity of individual households. Together with information on the demographic and socioeconomic characteristics of the households, the survey allows us to identify the profiles of typical mortgagors in New Zealand as well as where the financial pressures are concentrated. However, it is important to note that because the HES is not designed specifically for collecting information on households' balance sheets, it has some important gaps (summarised in box 1).

The findings from the HES suggest that financial vulnerability of New Zealand households did not greatly increase over the period from 2001 to 2007. Most households remain mortgage-free, and most debt is held by high-income households. Loan-to-value ratios on housing debt are generally quite manageable and debt-service ratios have actually fallen among lower-income households, who traditionally have high debt-service ratios (both in absolute terms and relative to other income groups).

Also, there is little overlap between the households most exposed to negative shocks to house prices (ie, those with high loan-to-value ratios) and the households most exposed to negative shocks to income or interest rates (ie, those with high debt-service to income ratios). This provides a further margin of comfort, by making it less likely that servicing capacity and collateral value will simultaneously become inadequate. However, there is a small minority of households who remain exposed to the combination of a housing market correction, a spell of unemployment, and an unexpected rise in interest rates. For most, debt remains manageable, but weaker economic growth and falling house prices would still require adjustments that, for some, would be painful.

The article is organised as follows. The remainder of this section briefly reviews related studies. Section 2 describes the distribution of mortgage debt among New Zealand households. Section 3 describes how household indebtedness and debt-servicing ability have evolved over the period from 2001 to 2007. Section 4 describes a simple exercise in which we tested the debt-servicing ability of mortgage-holding households under hypothetical stress scenarios. Section 5 summarises the key findings and concludes.

Related work

The Reserve Bank of New Zealand has previously published research on the financial position of households using household-level data. Smith (2006), for example, explores the importance of housing equity withdrawal – a process of turning housing equity into cash by selling properties or borrowing more – using both household-level and aggregate data. Smith (2007) uses the HES to illustrate different channels through which house prices can influence household consumption behaviour depending on their age, homeownership status, and other socioeconomic characteristics.

The work presented in this article most closely relates to the analysis presented in the Reserve Bank's *Financial Stability Report* in May 2006. That analysis examined the distribution of mortgage debt and debt-service ability of households in different income groups based on HES 2004. This article updates the earlier analysis by using data from HES 2007 and from HES 2001 so that we can see how household finances have evolved during the unprecedented build-up of household mortgage debt. This article also includes a simple model-based exercise to test the robustness of households' debt-servicing capacity to large shocks in house prices, unemployment and interest rates.[1]

2 Distribution of mortgage debt

Mortgage debt is unevenly distributed among New Zealand households. The majority (65 percent) do not have a mortgage on their homes, and among those who do, there

[1] Similar analyses were reported in the Swedish Riksbank's *Financial Stability Review* (June 2004) and the Bank of England's *Financial Stability Report* (October 2007). Hampton and Harrison (2006) describe similar work at the Reserve Bank of New Zealand to develop a model of credit loss for a representative bank, assuming a structure for the bank's mortgage book similar to the distribution of loan-to-value ratios and debt-service ratios in the economy (estimated using the HES 2004). The model used in this article is, however, more similar to the Bank of England's (October 2007).

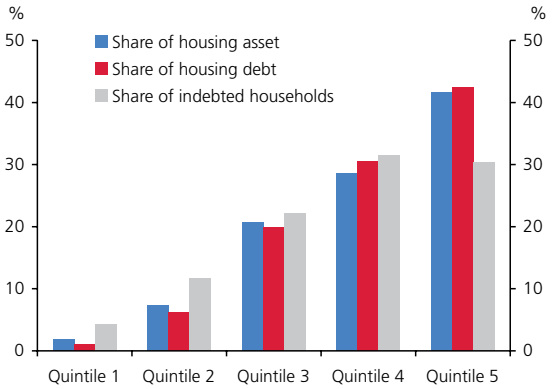
is a large variation in size.[2] Over 40 percent of outstanding mortgages are less than $100,000, and another 40 percent are between $100,000 and $200,000. Only about 4 percent are larger than $400,000.

The size distribution of mortgages has become more uneven since 2001 (figure 3). The proportion of small- to medium-sized mortgages has fallen, while the proportion of very large mortgages has risen. This result is consistent with the common observation that home ownership has become more expensive and new home buyers have had to take out larger mortgages.

Most debt is held by higher-income households (figure 4). Households in the top two income groups (quintiles 4 and 5) account for over 70 percent of total debt. Households in the lowest income group (quintile 1) account for only 1 percent of the debt, down from around 3 percent in 2001. Households in the middle income group (quintile 3) have had the largest increase in mortgage debt since 2001, followed by those in the higher income groups (quintiles 4 and 5, respectively).

Figure 3
Distribution of mortgages by size in 2001, 2004 and 2007

Figure 4
Distribution of housing debt, assets and indebted households in 2007



3 Indicators of mortgage stress

Two common indicators of mortgage repayment risk are the loan-to-value ratio (the size of the loan relative to the value of housing collateral) and the debt-service ratio (the size of mortgage repayments relative to household income). The higher these ratios, the higher the risk.

Loan-to-value ratios

Most mortgage-holding households own housing with a value greater than their outstanding mortgage debt (figure 5).[3] The median loan-to-value ratio (LVR) has fallen since 2001 in all income groups, suggesting that the increase in housing values has more than offset the increase in the level of debt over this period.

[2] Of the 65 percent of households without mortgage on their homes, about half are renters and about half are mortgage-free owners.

[3] The loan-to-value ratio is defined here as the current estimated value of the outstanding mortgage to the current estimated value of the housing asset. The current value of outstanding mortgage is estimated using the information in the HES regarding the original value of the mortgage and the date of origination, the mortgage type, and the interest rate applying to the latest mortgage payment. The estimated mortgage balance will over- or under-estimate the actual principal outstanding depending on the level of interest rates compared to its average over the years for which the mortgage has existed. The current value of the housing asset is estimated by updating the reported property value using Quotable Value's quarterly house price index by territorial authority, from June of the year of latest valuation to the quarter and year in which the survey was completed.

The median LVR tends to rise with income. In other words, higher-income households tend to be more highly geared.[4] The distribution of LVR by income group (figure 6) also shows that highly geared households (LVRs above 80 percent) tend to have high incomes. The LVR indicator therefore suggests that high-income households are most exposed to risk from falling house prices.

Figure 5

Median LVRs in 2001 and 2007

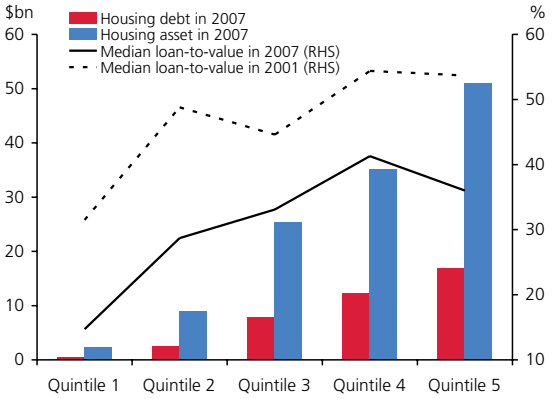
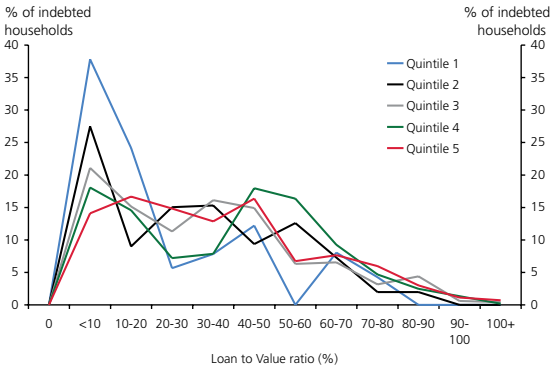


Figure 6

Distribution of LVRs within income quintile in 2007



Debt-service ratios

In contrast, the debt-service ratio (DSR) indicator suggests that lower-income indebted households are more vulnerable.[5] The median DSR falls as income rises (figure 7). The proportion of households with a DSR above 50 percent is highest among the lowest-income quartile and lowest among the highest-income quartile (figure 8). This pattern has not changed since 2001, despite large increases in debt among the higher-income groups.

Figure 7

Median DSRs in 2001 and 2007

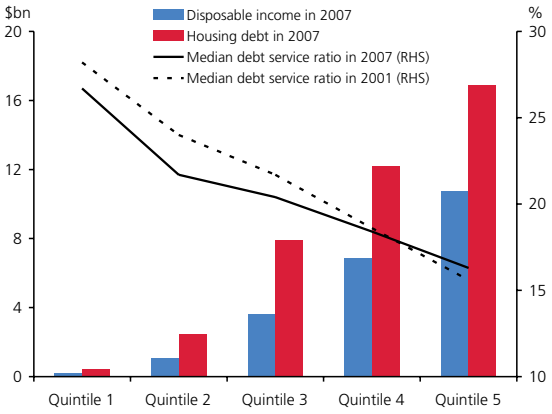
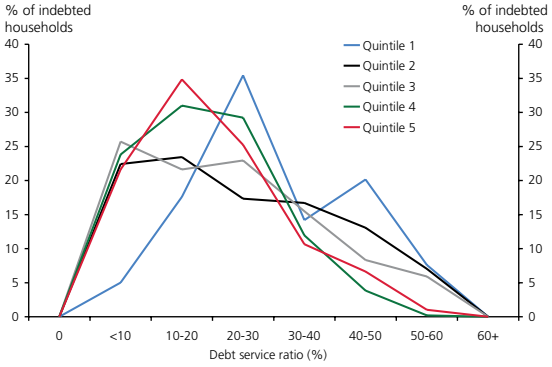


Figure 8

Distribution of DSRs by income quintile in 2007



Households with both high LVR and high DSR

There appears to be very little overlap between the segment of households most exposed to negative shocks to house prices (those with high LVRs, who tend to have high income) and the segment most exposed to negative shocks to income or interest rates (those with high DSRs, who tend to have lower income). Relatively few households fall into both the high-LVR and high-DSR camps. Households with high LVRs (over 80 percent) and high DSRs (over 55 percent) represent just 0.1 percent of mortgage-holding households and about

[4] The evidence may also reflect the fact that households who have been active in the housing market in recent years (including new entrants to the housing market) tended to be in the high income segment of the household sector.

[5] The debt-service ratio is defined here as annual mortgage payments (interest and principal) to annual household disposable income.

0.2 percent of total debt.[6] It should be noted that, because the size of the underlying sample for this sub-group is small, the estimate is subject to a large margin of error.[7]

The limited overlap between high-LVR and high-DSR households means there is only a small chance of both debt-servicing capacity and collateral value becoming simultaneously inadequate for households, lowering the default risk for the banks, as well as for the household sector as a whole.

4 The impact of macroeconomic shocks on the proportion of vulnerable households

The relatively benign picture emerging from the HES evidence may reflect the favourable economic conditions prevailing at the time of the 2007 survey. In order to get an idea of households' vulnerability to adverse changes in macroeconomic conditions, we studied the impact of shocks to house prices, unemployment and interest rates on households' DSRs and LVRs.[8] Specifically, we calculated the proportion of indebted households who will be 'vulnerable' – characterised by LVR above 80 percent and DSR above 55 percent – after large but plausible shocks to house prices, unemployment and interest rates.[9] Box 2 briefly explains the model used for this exercise.

When shocks are considered individually, our analysis shows that the proportion of vulnerable households would remain relatively small – below 1 percent of indebted households (table 1). This is explained by the small overlap between the segment of households most exposed to negative shocks to house prices (ie, high LVR) and the segment most exposed to negative shocks to income or interest rates (ie, high DSR). House price shocks would increase the number of households with little or no equity in their homes, but those affected most by the shocks tend to have a comfortable income buffer. Similarly, shocks to unemployment or interest rates would increase the number of households with high debt-service burden, but those who become more stressed in this respect would tend to have a large equity buffer in their homes. Consequently, there is only a marginal increase in the number of households that will become 'vulnerable' from both collateral-value and debt-servicing perspectives, in the scenarios with individual shocks.

Table 1

Proportion of indebted households with both LVR over 80% and DSR over 55% after assumed shocks in house prices, unemployment and interest rates

	Pre-shock	House price shock		Unemployment shock		Interest rate shock		Combination of shocks	
		-15%	*-30%*	*6%*	*9%*	*+100bpts*	*+300bpts*	*smaller*	*larger*
Percent of indebted households	0.1	0.1	0.5	0.2	0.3	0.5	0.7	0.9	3.6
Percent of debt	0.2	0.2	0.7	0.6	0.7	0.8	1.3	1.8	6.9

6 The DSR of 55 percent as a ratio of disposable income roughly corresponds to the DSR of 38.5 percent as a ratio of gross income for households with disposable income of around $65,000. The average disposable income of the sample of indebted households in the 2007 survey was about $68,000 and the median was about $63,000. The wedge between gross and disposable income, of course, varies by income.

7 Less than five respondents in the 2007 survey are found in the sub-sample of mortgage-holding households with LVR over 80 percent and DSR over 55 percent.

8 A similar exercise was performed in the Bank of England *Financial Stability Report* (October 2007) and Riksbank *Financial Stability Review* (June 2004). An appendix in the data file available online outlines the framework used.

9 Although these ratios are chosen somewhat arbitrarily, households that fall simultaneously into both of these categories will tend to be more likely to experience financial distress, and to be more susceptible to default on servicing their loan in the event of a shock to income or interest costs. Moreover, in the event of default, it would be more likely that the lender would not be able to fully recover the value of the loan for these households (given the high LVR).

However, if multiple shocks hit the household sector simultaneously, the model suggests that the proportion of vulnerable households and the banks' exposures to these households would rise quickly. We considered two scenarios, one with simultaneous small shocks and one with simultaneous large shocks. Under the combination of simultaneous smaller shocks (a fall in house prices of 15 percent, a rise in interest rate of 100 basis points, and a rise in unemployment to 6 percent), the proportion of vulnerable households increased to 0.9 percent (representing 1.8 percent of total debt).[10] Under the combination of simultaneous larger shocks (a fall in house prices of 30 percent, a rise in interest rate of 300 basis points, and a rise in unemployment to 9 percent), the proportion of vulnerable households increased to 3.6 percent (representing 6.9 percent of total debt).[11]

5 Conclusion

This simple analysis suggests that the overall conclusion from the survey evidence remains fairly robust to adverse changes in macroeconomic conditions. A relatively small proportion of mortgage-holding households is currently close to a stressed position. Independent shocks to house prices, unemployment or interest rates, even if they are large, would not result in a large proportion of indebted households becoming vulnerable. Only under a severe stress scenario – when three large shocks occur at the same time – would we expect to see a substantial proportion of households become vulnerable.

However, more work is needed to gain a fuller picture of the vulnerability of the household sector and the risk it might pose to financial stability. First, the survey does not cover the full extent of the increase in mortgage debt. Household debt in the HES primarily relates to owner-occupied dwellings. Debt secured on other property, including investment property, is not systematically captured by the survey. Second, the credit quality of mortgage loans issued recently could have deteriorated in more subtle ways than are revealed by loan-to-value and debt-service ratios. For example, increases in second-lien mortgages or mortgages with non-traditional amortisation schedules (eg interest-only loans) can signal greater credit risk for a given level of gearing.[12] We will continue to analyse available data and explore new sources of information to better gauge the state of household finances and the risk it poses to the financial system and economy in New Zealand.

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Families Commission and Retirement Commission (2008) 'Beyond reasonable debt: A background report on the indebtedness of New Zealand families', Families Commission *Research Report* No 8/08, December.

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[10] **How likely are these combined shocks? The smaller of the assumed shocks in house prices and unemployment were similar to the troughs projected for the 2009-11 horizons in the RBNZ's September 2008 *Monetary Policy Statement*, although the latter projected a gradual fall in interest rates. The larger of the assumed shocks (considered below) were double the projected fall in house price and more than double the projected rise in unemployment rate. Note that the shocks have been defined relative to the situation prevailing in early 2007 – at the time of the survey. Since then, house prices have already fallen by 5 percent (or 8 percent relative to the peak in early 2008) and unemployment has risen to 4.6 percent. Conversely, mortgage interest rates have fallen by 200 basis points. The expected continued reduction in interest rates should also help ease pressure on many homeowners.**

[11] **Note that the proportion of debt held by vulnerable households is not the same as the expected default rate. Models for estimating the probability of mortgage default require not only information on LVR and DSR but a number of other factors such as age of the mortgage ('seasoning'), origination date ('vintage'), personal characteristics of borrowers (eg, age, occupation, marital status), and credit and financial history of borrowers (eg, personal bankruptcy record, ownership of financial assets).**

[12] **See Gerardi *et al*. (2008).**

Riksbank (2004) 'Swedish households' debt-servicing ability 2000-02', *Financial Stability Report* 2004 (2), pp. 33-35.

Smith, M (2006) 'What do we know about equity withdrawal by households in New Zealand?', paper prepared for Reserve Bank of New Zealand workshop entitled Housing, Savings, and the Household Balance Sheet, Wellington, 14 November.

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Box 1

Household debt covered in the HES

The HES is a rich source of information about income and expenditure patterns of households in New Zealand. But because the survey is not designed to collect information on household balance sheets, it has some important gaps.

First, it does not collect information on unsecured debt. There are more households with unsecured debt than secured debt, although in terms of dollar amounts, secured debt constitutes the bulk of total household debt. By focusing on those households with mortgages on owner-occupied dwellings, we are focusing on a relatively small, albeit the most indebted, segment of the New Zealand household sector.[13]

Second, the HES does not capture systematically the information on the mortgages relating to second or holiday homes (so-called "other property").[14] Although some debt associated with the purchase of these properties is covered, the value of these properties is not recorded in the survey. We are therefore unable to examine the balance-sheet implications of this portion of debt and it is excluded from the analysis in this paper. In the HES 2007, less than one-fifth of total reported debt was secured on second or holiday homes, with four-fifths secured on owner-occupied homes.

Third, the HES does not collect information on mortgages relating to investment properties. Mortgages relating to investment properties appear to have contributed substantially to the growth in household demand for mortgages in recent years. There is no formal estimate of mortgages relating to investment property. Informal estimates for 2007 suggest that as much as a third of aggregate household mortgage debt might be related to investment properties. Evidence from other countries suggests that mortgages relating to investment properties could be potentially associated with riskier forms of mortgage finance such as interest-only or no-deposit loans. By relying on the HES for information on household balance sheets, we are excluding this potentially sizeable and important portion of household debt from our analysis.

[13] According to the Families Commission and Retirement Commission (2008), 64 percent of single- and 82 percent of couple-households had unsecured debt, compared to 26 percent and 55 percent, respectively, for secured debt. However, in terms of dollar amount, secured debt accounted for 69 and 82 percent of total debt owed by the single- and couple-households, respectively. The corresponding figures for the household sector as a whole (ie single- and couple-households combined) were not discussed in the report.

[14] HES defines "other property" as "any property (such as a holiday bach) that is owned by and used by the household, but that is occasionally rented out by the household to others. Also include properties not used by this household but for which rates, insurance or mortgage repayments are paid by a member of this household on behalf of the occupants of the other properties. An example is an ex-husband in this household who pays one or more of those items for the property occupied by his ex-wife. Do not include properties used for mainly business or investment purposes" (http://www.stats.govt.nz/NR/rdonlyres/C292868E-108F-4BC7-8B49-4A05CE5288FE/0/ExpenditureQuestionnaireHES200304.pdf).

Box 2

Model for analysing potential impact of macroeconomic shocks on the proportion of vulnerable households[15]

We use a simple framework to determine the proportion of households who would fall into the vulnerable pool (LVR>80 percent and DSR>55 percent) after hypothetical shocks.

House price shocks

Negative shocks to house prices would raise the LVR of households with debt secured on housing. The growth rate of house prices is defined at the national level (-15 percent and -30 percent as the two scenarios). The effect of the national house price scenario on each household depends on random regional variation in house prices, which is modelled as a draw from a normal distribution as follows.

$$LVR_i = \frac{D_i}{(1+hp_i)\times V_i}$$

$$hp_i \sim N(hp_t, \sigma_R^2)$$

D_i outstanding mortgage of household i
V_i value of house of household i
hp_i house price shock for household i (in annual percentage change)
hp_t economy-wide house price shock (in annual percentage change)
σ_R^2 variance in house price growth rate from economy-wide growth rate for region R (average, 1991-2007)

Unemployment shocks

Negative shocks to unemployment would raise the DSR of all indebted households. The rate of unemployment is defined at the national level (6 percent and 9 percent as the two scenarios). Each household in the survey is assigned an equal chance of falling into unemployment, and if the head of the household becomes unemployed the household's disposable income is assumed to fall to a fraction of pre-shock household income. For the results reported here, we set to 0.5.

$$DSR_i = \frac{R_t \times D_i}{Y_i}$$

$$Y_i = (1 - I_U \cdot \alpha) Y_i \quad \text{where}$$

$$I_U = 1 \quad if \quad u_i > (1 - u_t) \text{ and } u_i \sim U(0,1)$$

R_t economy-wide mortgage interest rate
Y_i disposable income of household i
I_U indicator variable which takes values 1 or 0, and = 1if household is unemployed
u_i household i's draw of unemployment
u_t economy-wide unemployment rate

Interest rate shocks

Negative shocks to interest rates would raise the DSR of all indebted households. The interest rate shock is defined at the national level (+100 basis points and +300 basis points as the two scenarios).

$$\Delta DSR_i = \frac{\Delta R_t \times D_i}{Y_i}$$

This way of calculating the impact of interest rate changes on DSRs implies that mortgage payments are affected by interest rate changes in the same manner as credit card payments. It exaggerates the impact on DSR for table mortgages (which represents about 50 percent of all mortgages in the sample) if the remaining life of the mortgage is greater than one year, and the bias is larger the longer the remaining life of the mortgage.

[15] **Further detail on the model and assumptions used to generate the results reported in Table 1 is available from the author upon request.**