Fixed versus floating rate - borrower characteristics and mortgage choice in Australia[*]

Paul Blacklow[%], Mardi Dungey[%&+], Graeme Wells[%+]

[%]School of Economics and Finance,University of Tasmania
[&]CFAP, University of Cambridge
[+]CAMA, Australian National University

PRELIMINARY   NOT FOR QUOTATION

March 2010

Abstract

This paper investigates the role of borrower characteristics in determining the choice between fixed and flexible-rate mortgages in Australia. The dataset comprises individual loan application records for a large Australian bank between 2006 and 2009. Indicators of income and capital risk are significant determinants of choice, but there appear to be only minor differences between the behaviour of first home buyers and repeat purchasers, and men and women. 'Price' variables, represented by interest rates, are significant but difficult to interpret.

Keywords: Mortgages, borrower characteristics

JEL Classification: G11, G21

---

1 Introduction

Housing investment is typically a small fraction of real GDP — in Australia between 5 and 8 % — but for the representative owner-occupier, housing equity comprises some 60% of total assets. Over the long run, rising real house prices are a major source of increasing household wealth, and hence in determining future consumption decisions. Lending for housing is the lifeblood of Australian banks. Excluding securitisations, 37% of all bank lending in Australia is for owner-occupied housing, and 16% is for investors in housing. Clearly, well-functioning mortgage markets are an important prerequisite for efficient household portfolio allocation and macroeconomic stability.

This paper exploits a unique Australian mortgage application database to analyse the determinants of the choice between ARM and FRM contracts by Australian households. This is relevant to macroeconomic management because it has been argued that whether agents employ primarily fixed rate or adjustable rate contracts (FRM or ARM) has an impact on the speed of transmission of monetary policy changes; see for example Calza *et al.*(2009), Debelle (2004).Two aspects of the ARM/FRM choice are examined; the behaviour of first home buyers and the role of gender.

In earlier work based on a panel of Australian States, Blacklow *et al.* (2009) found that first home buyers are twice as sensitive to the difference in interest rates between the ARM and FRM contracts than repeat borrowers. Thus, incentives created by policies such as First Home Buyer Schemes offered by Australian federal and state governments may impact the ARM/FRM choice, and hence be important for the speed of monetary policy transmission. Although first home buyers may have the same preferences as repeat purchasers, their characteristics may make them more attracted to the insurance provided by an FRM. To investigate this question, the current paper examines in more detail the determinants of ARM and FRM choices by first home buyers, in particular whether the differences evident in the aggregate data are related to socioeconomic characteristics of the typical first home buyer.

There may also be gender differences in risk-taking behaviour by male and female mortgage applicants. Crosnon and Gneezy's (2009) survey suggests that women have a greater degree of risk aversion than men when making financial allocation decisions, although this conclusion has been contested by some who argue that the evidence is more nuanced when due consideration is given to the contextual framework of the

choice between risky outcomes. Others have argued that empirical evidence from financial markets often does not take sufficient account of differences in opportunity sets faced by men and women. Other factors may also come into play when reporting gender differences in financial-market behaviour, Australian surveys of adult financial literacy (ANZ, 2003, 2005, 2008), for instance, indicate that women are likely to be less financially literate than men, although the manner in which the survey results are reported makes it unclear whether this is simply a reflection of age, education, income and childrearing responsibilities. The household-based analysis of this paper directly addresses the question of whether demographic and socioeconomic variables can resolve the observed gap in financial risk behaviour observed between male and female headed households.

The database comprises application records for owner-occupied housing loans from a major Australian bank, providing detailed information on the demographic, socioeconomic and financial status of the applicant households. Importantly, unlike survey based data, the financial status of the applicants is likely to be accurate as well as complete, as the bank requires substantial documentation of income and wealth in its application process.

The results of the paper show that indicators of income and capital risk are significant determinants of ARM/FRM choice, but there appear to be only minor differences between the behaviour of first home buyers and repeat purchasers, and between men and women. 'Price' variables, represented by interest rates are, as in related studies in the US and Europe, significant. The results reported here, however, are difficult to interpret. In future work we plan to extend the sample to cover periods of greater interest-rate variablity so as to more clearly identify the role of interest rates.

The paper proceeds as follows. Section 2 briefly reviews the literature on mortgage choice, which is used to motivate the formal hypotheses set out in Section 3. The new household mortgage applications dataset is described in Section 4. The empirical modelling framework given in Section 5 and the results from the application are presented and discussed in Section 6. Section 7 concludes.

2　Households and mortgage choice

There has been relatively little work on the determinants of household choice between ARM and FRM contracts. For US examples see Dhillon *et al.* (1987), Sa-Aadu and Sirmans (1995), Campbell and Cocco (2003), Campbell (2006) and Vickrey (2006). Leece (2000) and Miles (2003) analyse mortgage markets in the UK, while Paiella and Pozzolo (2007) provide an Italian perspective. Some of these studies conclude that, contrary to theoretical predictions, household characteristics play only a limited role in ARM/FRM choice. However the important point made by Sa-Adu and Sirmans (1995) is that there is significant heterogeneity within the classes of ARM and FRM contracts; estimation that recognises this heterogeneity reasserts the result that borrower characteristics, and not just price variables, are important determinants of mortgage choice.

It is also important to recognise that the US, the location of most research on household finance, is not typical of developed mortgage markets; results from US studies may not be generally applicable. The institutional arrangements of Fannie Mae and Freddie Mac, the high degree of securitisation, the tax deductibility of interest on mortgage debt, the availability of very long term (30 year) fixed rate loans and the relatively low refinancing fees which characterise this market are not generally found elsewhere. A history of the development of these features in the US may be found in Green and Wachter (2005). Tsatsaronis and Zhu (2004) provide a comparison of 17 different developed mortgage markets.

The focus of this paper is on the determinants of ARM/FRM choice, and whether two groups within the population of loan applicants — first home buyers on one hand, and women on the other — make different choices. As far as we are aware, these questions have not been analysed using household-level data in Australia[1]. As mentioned earlier Blacklow *et al.* (2009) found, based on a panel of Australian States, that first home buyers are twice as sensitive to the difference in interest rates between the ARM and FRM contracts than repeat borrowers. This finding is similar to that of Martins

---

[1] La Cava and Simon (2003) and Wood and Parkinson (2009) use the HILDA household survey to examine the somewhat related question of the relationship between household characteristics and financial stress. For households with mortgages, their data do not facilitate a comparison between households whose loan contracts have different conditions — for example whether loans are ARM or FRM. Cardak and Wilkins (2009) study household allocations to risky assets using the HILDA survey. This survey includes questions on the composition of assets, and allows researchers to relate, *inter alia*, overall portfolio allocations to household income, family characteristics and a number of other variates.

and Villaneuva (2006) who examine a Portuguese scheme in the years of 1998-2001, which consisted of an interest rate subsidy for which they calculate some 83% of their sample were eligible. The subsidy took the form of an up to 44% interest rate subsidy, on a sliding scale dependent on income where the subsidy was tapered out over the life of the loan and participants were prevented from selling the home during the first five years. In particular, Martins and Villaneuva found that the effect of the introduction of a price ceiling on the value of the house being purchased, was to increase clustering of mortgages signed around this ceiling value. Additional reforms reducing the interest rate subsidy were used to identify an economically significant effect; the interest elasticity of the probability that an eligible borrower would apply for a loan was found to be between -1 and -4%, an estimate which is larger in absolute value than other estimates in the literature.[2]

Now turn to differences in the behaviour of men and women. Much of the existing experimental literature suggests that, in the context of choice over lotteries, females are more risk averse than males, and that women are more patient than men, evidenced by a willingness to accept a lower interest rate to compensate for waiting to receive a promised cash reward — see for example the survey of experimental evidence in Charness and Gneezy (2007) and Donkers and van Soest (1999). The latter also report evidence that women are 'less interested in financial matters'[3]. This would suggest that, conditional on demographic and financial characteristics, women are more likely to choose fixed-rate mortgages than men.

The strength of the gender-specific risk aversion result is, however, contingent on the context of the experiment. Schubert *et al.* (1999) report the results of 'abstract gambles', 'investment' and 'insurance' experiments. In all three cases subjects choose between the same set of risky decisions, and the authors control for the incomes of their subjects when analysing the results. The experiments suggest that when risky outcomes are framed in a specific context such as investment or insurance, there are no differences between the risk attitudes of men and women, but in abstract gambles women are less risk prone than men for gains (investment), but more risk prone for losses (insurance). In a later study Schubert *et al.* (2000) explore whether the 'abstract

---

[2]Vickery (2006) uses a similar identification procedure based on the conforming loan limit for mortgages to be securitised by Fannie Mae and Freddie Mac.

[3]Croson and Gneezy (2009) survey the literature in a broader setting, including experiments which reveal gender differences in preferences such as altruism and inequality aversion.

gambles' finding of differences in gender-specific risk attitudes can be attributed not to differences in risk aversion *per se*, but to ambiguity aversion. In these experiments the underlying risky choices are the same but ambiguity arises for some subjects as they are required to estimate the underlying probability distribution. The results suggest that women are more ambiguity-averse than men, but their underlying preferences over risky lotteries are the same.

This suggests that the extensive survey evidence on actual portfolio choice, which shows that women generally choose less risky portfolios than men, may not be due to underlying risk preferences, but to the way in which risky choices are framed. Another possibility evidenced by a number of studies is that gender effects interact with other factors such as age, family status, wealth, income, and job mobility. In recent studies of Australian superannuation product choice, for example, there is some evidence that gender itself is not a sufficient distinguishing characteristic; younger single uninformed females were found to be more risk averse than older married and informed females, although the first group remain unambiguously more risk averse than their male counterparts, and informed women were not distinguishable from informed men by gender; see Gerrans and Clark-Murphy (2004), Clark-Murphy and Gerrans (2001).

A third possibility is that estimated measures of gender-specific risk aversion are confounded by differences in financial literacy[4]. Results found by Dwyer *et al.* (2002) support this view — they find that, if results are conditioned on financial investment knowledge, men and women exhibit similar risk-taking behaviour in mutual fund investments.

3   Hypotheses

Estimates reported in this paper are designed to test two sets of hypotheses. The first provides a further exploration of the time-series panel results reported in Blacklow *et al.* (2009), which suggested that Australian first home buyers are less likely to take an FRM, and are more sensitive to the differential between the ARM and FRM interest rates than are repeat purchasers.

Since the introduction of the GST in Australia in July 2000 a scheme to encourage

---

[4]The main source of data on financial literacy in Australia is provided by the ANZ bank survey of adult financial literacy (ANZ, 2003, 2005, 2008).

first home buyers into the market has been operated by State and Territory governments. As part of the fiscal response to the global financial crisis the Federal government provided a temporary boost to this scheme from mid-October 2008 to the end of December 2010. Details of these cash grants for first home buyers are provided in Table 1. In the latter half of our sample period (from June 2008 onwards) first home buyers were given cash grants of up to 25 thousand dollars for purchase of a new home. Additionally, a number of States provide concessions on the stamp duties payable on mortgage transactions. These concessions are generally capped at a level somewhat higher than the median value of new houses in the relevant state. The sum of the federal and state cash incentives, together with duty concessions, can provide a significant incentive for new home buyers to enter the market. For example, first home buyers in New South Wales could, in June 2009, have been eligible for duty concessions of up to $17,990, making the maximum incentive $41,990. Although a detailed analysis of the impact of first home buyer subsidies is deferred for future work, it might be presumed that their effect is to encourage households who would otherwise be marginal in terms of wealth or income to purchase a house.

The two types of mortgage loan contract available to potential home buyers provide insurance against different types of risk — capital and income risk, and we seek to establish whether differences in ARM/FRM choices of first home buyers reflect differences in exposure to these risks. The real capital value of an ARM is invariant to inflation if the Fisher effect holds, so there is little wealth risk. An ARM subjects the borrower to an income risk, however, if variability of monthly real interest payments leads to volatility in consumption in states where the household is constrained against further borrowing against future income. An FRM protects against this income risk.

An FRM also protects the borrower against the risk that real interest rates will rise, although it is not clear how this effect could be distinguished empirically from income risk in a loan applications dataset such as ours, where FRMs are available for only a relatively short term. In Australia the prepayment penalty on an FRM fully compensates the bank for the present value of foregone interest streams. Unexpected rises or falls in the rate of inflation change the real capital value of the loan, so that an FRM is subject to a capital risk for the borrower.

These considerations suggest that, conditional on socioeconomic and demographic

6

characteristics, the probability that borrowers will choose an FRM should fall as the absolute loan amount and the loan-to-valuation ratio increases. Capital risk should be more important for these borrowers, and they are less likely to choose an FRM[5]. Conversely, borrowers wanting insurance against income risk are less likely to take an FRM, the higher is their income and the lower are their expenses. The Blacklow *et al.* (2009) result would be corroborated if first-home-buyer households are found to be less likely to take an FRM after controlling for these determinants of capital and income risk, as well as demographic and socioeconomic characteristics which control for possible differences in attitudes to risk.

The second question of interest is whether men and women make different choices when faced with a risky portfolio allocation. Investigation of this issue is facilitated by considering only households with a single man or woman as head — in these cases there is no ambiguity as to the gender of the decision maker. It is expected that the same priors apply to both sexes with respect to the effects of their exposure to capital and income risk. ANZ (2008) suggests that the presence of children affects attitudes to income risk, and it is possible that this affects portfolio choices by women in ways which differ than for men. We allow for this possibility in the estimations reported below.

4 Data

The dataset consists of the loan applications for owner-occupied houusing received by the branches of a large Australian bank for the period January 2006 - January 2009. Observations in the top 1% and bottom 1% of the total distribution for a range of financial variables were removed[6]. Further, only those applicants who were successful in applying for a new property loan were considered (as opposed to re-financing).

---

[5]Campbell and Cocco (2003) simulate a lifecycle model of housing finance calibrated on US mortgage markets. They note that long term FRMs, as are the norm in the US, imply that the volatility of consumption over the life cycle owes more to wealth risk than income risk, supporting their finding that ARMs provide greater lifetime utility for households with low income risk and large loans. As noted earlier, there are many differences between the markets for housing finance in Australia and the US, but it might be expected that the shorter term of FRMs in Australia would attenuate the effect of capital risk in favouring ARMs.

[6]The variables for which the top and bottom 1% of observations were removed are total assets, total liabilities, gross income, net income, applicant estimated expenses, bank estimated expenses, applicant estimated uncommitted funds and bank estimated uncommitted funds.

This resulted in 111,149 successful property applicants of which 13,887 were single persons. Descriptive statistics for the dataset are contained in Table 1. The mortgage applicants come from all regions of Australia, with the three largest states, Victoria, New South Wales and Queensland generating almost 70% of the bank branch originated applications. Of this total database, some 28% of applications are for a FRM, the remainder are ARM contracts. However, this breakdown is slightly different when first home buyer status or gender are taken into account. Only 14% of applicants are first home buyers, and they are likely to be younger (with a mean age of 31.3) than the repeat purchasers who have a mean age of 40.7 years. However, the proportion of first home buyers choosing a FRM is not substantially different to the total sample, at 15% of the first home buyers and 14% of the total sample. The average household in the database has 0.63 dependents, and 16% of them have children less than five years old. Unconditionally, the presence of children increases the probability that an applicant chooses a FRM slightly, more notably in the presence of under 5 year olds than for older dependents.

The financial status of the applicants is well detailed in the database. The average value of financial assets of the households (excluding superannuation funds) is almost $760,000 for the total database and average liabilities are $190,130, but this masks important differences. Applicants for ARM have around $100,000 more assets and $100,000 less in liabilities than applicants for FRM contracts, meaning the average ARM applicant has a net asset position which is $200,000 greater than the average FRM applicant (recall there is an average of 2 years age difference between the two groups). First home buyers are at a completely different end of the spectrum, with average assets of $203,829 and liabilities of $29,362. The first home buyers hence have a liabilities to asset ratio of 14% whereas for the entire sample it is 25% and 28.5% for the FRM applicants. Average monthly income, expenses and uncommitted funds are highest for ARM applicants, with average income of around $113,000 per annum and annual uncommitted funds of $31,500 per annum. In contrast, FRM applicants have the lowest uncommitted funds at the equivalent of $18,708 per annum. Primarily, this reflects greater monthly expenses, with average income in this group some $800 per month lower than ARM applicants, but expenses only approximately $600 per month lower. The first home buyers, while they have lower monthly income than the other

households in the sample, also have lower monthly expenses and hence have higher uncommitted funds than the sample average, at the equivalent of $28,020 per annum.

The houses being purchased by the sample have an average value of $330,506, with an average loan of $254,363, giving an average loan to value ratio of 85% and deposit to value ratio of 17.3%. As the sum of these two ratios exceed 100%, it appears that loans are used to cover purchaser's expenses. Some 19% of applicants take mortgage insurance. In the largest subsample, of ARM applicants, only 17% of applicants take mortgage insurance, although their loan to value ratio is 84.3% and deposit to value ratio is 18.2%. Their better net asset position most likely contributes to this feature of the data. The average house purchased by this group is valued at $347,489 and has a loan of $265,291. The FRM applicants purchase houses which are approximately $61,000 cheaper than ARM applicants, but take a loan which is only $40,000 lower. Consequently, their loan to value ratio is somewhat higher at 86.7% and deposit to value ratio is lower at 15%. Of the FRM applicants, 24% take mortgage insurance. The greatest take up of mortgage insurance is amongst the first home buyers, where almost half of the applicants take insurance. This represents their relatively low net asset position, despite their higher than average deposit to value ratio at 22.9% and lower than sample average loan to value ratio at 76.7%.

The income and loan risk effects detailed above are reflected in the average mortgage interest rates in the sample. The loan interest rate is highest for the FRM applicants, who it will be recalled had lower uncommitted funds per month, a lower deposit to value ratio and higher loan to value ratio than other categories. Their average interest rate at 7.71% is 25 basis points above those for the ARM which represent the highest income group. First home buyers have an average interest rate 3 basis points above the ARM applicants and have, on average, the highest deposit to value ratio and the highest degree of mortgage insurance. However, their generally lower income and high loan to value ratio appear to weigh against a more favourable interest rate.

We also know a significant amount about the occupations of applicants. These are divided into 13 different occupation codes; professional, semi-professional, management, technical, office, sales, skilled, military or police, unskilled, service, small business and agriculture, other, unemployed and not in the labour force. The predominant number of applications in all categories, at around 20-25% is from the professional category,

followed by the management and 'skilled, military or police' which jointly make up a further quarter of the sample. The least represented category is predictably the 'not in the labour force' grouping. At the time of application, the majority of applicants, around 60%, either hold existing mortgages or rent; most of the remainder either own their home or are living with their parents - representing the two extremes of the life cycle in the housing market.

The majority of loan applications, some 87%, are made jointly between two or more householders. Thus it is very difficult to use these to examine the different risk preferences of male and female applicants, as they are embedded in a household decision making structure. To examine this cleanly we use a subset of the full database consisting of loan applications by single-head households - that is we excluded all loans which did not relate to the financial information of one single identifiable householder as the lead decision maker and where the home mortgage type applied for was a standard owner occupied product. This excluded all cases of joint liability, including those with loan guarantors or where income of any other party was to be taken into account. In this way we avoid cases where a second home is bought by one member of a household for taxation purposes. The sample was consequently reduced considerably, to a total of 13,887 observations, of which 45% represented female applicants and 55% male applicants. There are potential problems with this selection of households to estimate gender effects. As mentioned previously, there is some evidence that single females behave differently to married females in Gerrans and Clark-Murphy (2004), and Italian evidence from Paiella and Pozzolo (2007) suggests that banks are more inclined to lend to married applicants, particularly in the case of first home buyers.

The characteristics of the single household sample are detailed in Table 2. The average single household applicant in this database is 36.7 years old, with a monthly before tax income of $5,944, monthly expenses of $1,796, and a consequent monthly balance of uncommitted funds of $1,581. These applicants on average have existing assets worth $406,603 and liabilities of $93,554. Some 70% of these applications are for ARM contracts, for loans averaging $203,103, for homes worth on average $270,648 with a loan to value ratio of 82%. One quarter of the applicants take out mortgage insurance. For comparison with the first sample, in this case the first home buyers are some 29% of the sample (as in the total database as discussed above), and again

some 30% of them take FRM contracts. They are on average younger than repeat purchasers, here 29 years, and with fewer households with dependents. Their existing assets total just over one quarter that of the total single household sample, at $131,244, and liabilities at $14,554 representing a ratio of liabilities to assets of 11%, almost half that of the entire sample. Their uncommitted monthly funds are a lower proportion of their income than the sample average, and unsurprisingly given their relative youth, they have had fewer months with their current employer.

Surprisingly, given their financial situation, the average purchase price for a first home buyer is almost $6,000 higher than the average loan for the sample, but this is the category with the largest take up of mortgage insurance (at 47% of the first home buyers) and a relatively low loan to value ratio of 76.3% and low deposit to value ratio of 22.9%.

The ARM applicant has the highest average asset value of the groups examined, at $423,573, and liabilities averaging $91,852. and has the lowest liabilities to asset ratio at 21% with the exception of the first home buyers. The average purchase price for ARM applicants is $280,299, the highest in the sample subgroups, and their average loan is also larger at $208,299, with a loan to value ratio of 81.5%, and deposit to value ratio of 20.1%. Mortgage insurance take up in this group is 24%.

The FRM applicants predictably have lower average assets and higher average liabilities than the ARM applicants. They also have lower average monthly incomes, higher monthly expenses and lower uncommitted funds. They are more likely to have dependents in all age categories. The average loan this group requests is almost $18,000 less than the ARM group, while the average purchase price is $30,000 less - meaning that the loan to value ratio for the FRM applicants is 83.2%. They also have a lower deposit to offer, with a deposit to value ratio of 17.7%, and consequently a higher take up of deposit insurance at 29% of the group.

Breaking down the single household applicants by gender reveals that 45% of the sample are female. These applicants are on average older than their male counterparts (38.4 versus 35.2 years), are more likely to have dependent children and to have more of them. They also have lower average monthly income by $1,037 per month ($12,444 per annum) and lower uncommitted funds by $235 per month ($2,820 per annum). The assets of these two groups are lower for females by some $14,000, but females have

almost \$20,000 less in liabilities, meaning that the female applicants have lower liability to asset ratios. In the data sample one third of the female applicants opt for FRM contracts, while 27% of the males do so. The average loan amount for males is \$213,660, but for females \$190,254, although the purchase price of the homes sought differ by less than \$10,000. Consequently, the loan to value ratio of the females is 79.6%, while for males it is 84.1%. The female applicants also typically offer a higher deposit, by some \$13,403, giving a higher deposit to value ratio (21.7% for females and 17.5% for males), and only 21% of the female applicants take mortgage insurance, compared with 28% of male. The differences outlined here in the raw data are consistent with female applicants who are more financially conservative than their male counterparts, taking on smaller loans with larger deposits, and presumably seeking to avoid the ongoing cost of mortgage insurance.

5   Modelling framework

The study uses the standard two-step IV probit of Amemiya (1978) and Maddala (1983) to estimate the marginal probability of an applicant taking a FRM over an ARM, while taking into account the endogeneity of income and expenses[7]. In particular we wish to consider whether first home buyer status and gender have indirect effects on mortgage choice, through their role in determining income and expenses as well as possible direct effects. The model can be written as

$$
\begin{aligned}
y_1 &= \mathbf{z}_1\boldsymbol{\delta}_1 + \nu_1 \\
y_2 &= \mathbf{z}_2\boldsymbol{\delta}_2 + \nu_2 \\
y_3^* &= \beta_0 + \beta_1 y_1 + \beta_2 y_2 + \mathbf{z}_3\boldsymbol{\delta}_3 + u,
\end{aligned}
\tag{1}
$$

where $\mathbf{z}_1$, $\mathbf{z}_2$, and, $\mathbf{z}_3$ are vectors of exogenous variables, y_1 and y_2 are endogenous continuous variables, and y_3^* is a latent variable, which when positive indicates that an applicant chooses an FRM[8].

The probability that an applicant chooses an FRM is given by $P(y_3 = 1) = \Phi(y_3^*)$, where $\Phi(\ )$ is normal CDF, and thus y_3 ignoring the endogenous variables would be

---

[7]Note that these are not true marginal effects, but rather average partial effects, since they are the partial effect of a change in each variable averaged over the unknown distribution of the error term.

[8]The latent variable y_3^* can also be considered the random net utility derived from choosing FRM over ARM. If the random net utility is positive then FRM is the applicant's choice.

estimated as a probit.

The terms ν_1, ν_1 and u represent errors; u is assumed to have a zero mean bivariate normal distribution with each of ν_1 and ν_2, while ν_1 and ν_2 are assumed to be independent from one another. From

$$y_3^* = \beta_0 + \beta_1 \widehat{y_1} + \beta_2 \widehat{y_2} + \mathbf{z}_3 \boldsymbol{\delta}_3 + \beta_1 \nu_1 + \beta_2 \nu_2 + u, \tag{2}$$

it follows that

$$y_3^* = \beta_0 + \beta_1 \mathbf{z}_1 \boldsymbol{\delta}_1 + \beta_2 \mathbf{z}_2 \boldsymbol{\delta}_2 + \mathbf{z}_3 \boldsymbol{\delta}_3 + \beta_1 \nu_1 + \beta_2 \nu_2 + u. \tag{3}$$

Now denote the variance of ν_1, ν_2 and u respectively as σ_1^2, σ_2^2 and σ_u^2 and the two covariances as σ_{u1} and σ_{u2}. Using the approach of Rivers and Vuong (1988), the fact that ν_1, u and ν_2, u are jointly normal and normalising $\sigma_u^2 = 1$ we can re-write u as

$$u = (\sigma_{u1}/\sigma_2^2)\nu_1 + (\sigma_{u2}/\sigma_2^2)\nu_2 + e, \tag{4}$$

where e is independent of ν_1, ν_2 and also z_1, z_2 and thus y_1 and y_2. The disturbance e is jointly normal with zero mean and variance given by

$$\sigma_e^2 = \sigma_u^2 - (\sigma_{u1}/\sigma_1^2)\sigma_{v_1}^2 + (\sigma_{u2}/\sigma_2^2)\sigma_{v_2}^2, \tag{5}$$

where $\sigma_e^2 = 1 - \rho_1^2 - \rho_2^2$, and where $\rho_1 = \sigma_{u1}/\sigma_1$ and $\rho_1 = \sigma_{u1}/\sigma_1$ (since $\sigma_u = 1$).

Using the definition of u above allows y_3^* to be written as

$$y_3^* = \beta_0 + \beta_1 y_1 + \beta_2 y_2 + \mathbf{z}_3 \boldsymbol{\delta}_3 + (\sigma_{u1}/\sigma_1^2)\nu_1 + (\sigma_{u2}/\sigma_2^2)\nu_2 + e, \tag{6}$$

where $y_3^* \backsim N(0, \sigma_e^2)$ or denoting $\theta_1 = (\sigma_{u1}/\sigma_2^2)$ and $\theta_2 = (\sigma_{u2}/\sigma_2^2)$, as

$$y_3^* = \beta_0 + \beta_1 y_1 + \beta_2 y_2 + \mathbf{z}_3 \boldsymbol{\delta}_3 + \theta_1 \nu_1 + \theta_2 \nu_2 + e. \tag{7}$$

Converting y_3^* to a standard normal,

$$P(y_3 = 1 | z_3, y_1, y_2, \nu_1, \nu_2) = \Phi \left[\frac{\beta_0 + \beta_1 y_1 + \beta_2 y_2 + \mathbf{z}_3 \boldsymbol{\delta}_3 + \theta_1 \nu_1 + \theta_2 \nu_2}{(1 - \rho_1^2 - \rho_2^2)^{\frac{1}{2}}} \right]. \tag{8}$$

Suppose for the moment that ν_1 and ν_2 are observable. Then a probit of y_3 on z_3, y_1, y_2, ν_1 and ν_2 would consistently estimate the parameters above but scaled by $(1 - \rho_1^2 - \rho_2^2)^{\frac{1}{2}}$; for example $\beta_1^* = \beta_1/(1 - \rho_1^2 - \rho_2^2)^{\frac{1}{2}}$ could be recovered.

A standard t-test that the coefficients are zero on ν_1 and ν_2 indicates that σ_{u1} and σ_{u1} are zero and thus y_1 and y_2 are exogenous, although if the coefficients are non-zero then the standard errors and t statistics are invalid.

Average partial effects (APE) are obtained by differentiating or differencing the following expression

$$
\begin{aligned}
& E_{v_1 v_2} \Phi \left[\frac{\beta_0 + \beta_1 y_1 + \beta_2 y_2 + \mathbf{z}_3 \boldsymbol{\delta}_3 + \theta_1 \nu_1 + \theta_2 \nu_2}{(1 - \rho_1^2 - \rho_2^2)^{\frac{1}{2}}} \right] \\
= \; & E_{v_1 v_2} \Phi \left[\beta_0^* + \beta_1^* y_1 + \beta_2^* y_2 + \mathbf{z}_3 \boldsymbol{\delta}_3^* + \theta_1^* \nu_1 + \theta_2^* \nu_2 \right] \quad\quad (9) \\
= \; & \Phi \left[\frac{\beta_0^* + \beta_1^* y_1 + \beta_2^* y_2 + \mathbf{z}_3 \boldsymbol{\delta}_3^*}{(\sigma_u^2 + \theta_1 \sigma_1^2 + \theta_2 \sigma_2^2)^{1/2}} \right].
\end{aligned}
$$

A consistent estimator of the APE can be found by differentiating or differencing

$$
\Phi \left[\frac{\widehat{\beta}_0^* + \widehat{\beta}_1^* y_1 + \widehat{\beta}_2^* y_2 + \mathbf{z}_3 \widehat{\boldsymbol{\delta}}_3^*}{\left(\sigma_u^2 + \widehat{\theta}_1 \widehat{\sigma}_1^2 + \widehat{\theta}_2 \widehat{\sigma}_2^2 \right)^{1/2}} \right]. \quad\quad (10)
$$

For example, the average partial effect for y_1 is found from

$$
\Phi \left[\frac{\widehat{\beta}_0^* + \widehat{\beta}_1^* (y_1 + 1) + \widehat{\beta}_2^* y_2 + \mathbf{z}_3 \widehat{\boldsymbol{\delta}}_3^*}{\left(\sigma_u^2 + \widehat{\theta}_1 \widehat{\sigma}_1^2 + \widehat{\theta}_2 \widehat{\sigma}_2^2 \right)^{1/2}} \right] - \Phi \left[\frac{\widehat{\beta}_0^* + \widehat{\beta}_1^* y_1 + \widehat{\beta}_2^* y_2 + \mathbf{z}_3 \widehat{\boldsymbol{\delta}}_3^*}{\left(\sigma_u^2 + \widehat{\theta}_1 \widehat{\sigma}_1^2 + \widehat{\theta}_2 \widehat{\sigma}_2^2 \right)^{1/2}} \right]. \quad\quad (11)
$$

6   Empirical Findings

Table 3 reports the estimated coefficients and marginal effects for the panel estimation for the larger sample of all households[9].

Non-price variables, represented by buyer characteristics, are significant. Most important are those associated with income and capital risk. As expected increased net income decreases the probability a household will choose a FRM contract, by 0.35%, but increased expenses increase the probability of an FRM choice by 0.56%. The purchase price of the house is less important in influencing the ARM/FRM decision (higher purchase prices cause a fall in FRM probability by an insignificant 0.03%) than

---

[9]The instruments used in this paper for income and expenses are: female, dependents, female×dependents, children<5, female×children<5, children 5 to 17, female×children 5 to 17, age, age^2, state, occupation, female×occupation, occupation×age, occupation×age^2, time current employer, time previous employer, principal source income, market variable interest rate, assets and liabilities.

the loan amount. An increase in the loan amount by $10,000 results in a decrease of the propensity to choose an FRM by 0.25%. More importantly, as the deposit to loan ratio rises, applicants are less likely to opt for a FRM contract. An improvement in the asset position of the household significantly reduces their probability of choosing an FRM, although by only -0.03%, but the effect of increased liabilities is statistically insignificant.

Other characteristics play a lesser role. Older households are less likely to choose an FRM. More importantly, results from this larger sample indicate that there is no significant effect from gender or the number of dependents, or first-home buyer status as a significant determinant of choice between an FRM and ARM contract. Estimated coefficients on 'female', 'dependents', 'female × dependents', 'female × loan to valuation ratio', 'first home' and 'female × first home' are not significantly different from zero. Thus, in this sample we find no evidence to reject the hypothesis that women and men, or first home buyers and repeat buyers, have the same propensity to select for FRM once the appropriate demographic and financial conditioning variables have been taken into account. Despite the arguments that first home buyers may be more income-risk averse, the empirical results are not supportive.

There are some interesting results regarding geographical effects. State dummies are generally significant. For example, the marginal effect of being in South Australia, compared with the base case of NSW, is to increase the probability of choosing a FRM by 5.14%. This is a substantial impact in terms of the results presented. As discussed earlier, there are marked differences between states in terms of the financial incentives offered to first home buyers, and in the extent to which these take the form of cash grants or stamp duty concessions. South Australia, for example, has from mid-2008 changed from a duty concession scheme to a cash grant which provides extra support for first-home buyers of $4,000, but only for those purchasing a house valued less than $400,000 (the grant is phased out between $400,000 and $450,000). It may be that the application of a cash grant with a price ceiling does pick up the first home buyers who are more risk averse in the sense discussed in Section 3.

As with the existing literature, price information is important in mortgage choice. The influence of the interest rate offered to the applicant is significant at the 1% level and suggests that a 100 basis point rise in this interest rate increases the probability

of choosing an FRM by 6.85%. Additionally, an increase in the premium between the offered interest rate and the prevailing market (variable) interest rate also increases the probability of choosing an FRM by 6.86%. These results are difficult to interpret; if borrowers have mean-reverting preferences one might expect that high interest rates imply that rates are expected to fall in the future, so that the likelihood of choosing an FRM should fall. This result is discussed further below.

The results in the single household estimation reflect some similarities from the full database. Increased income reduces the probability of choosing an FRM, by 0.72%, and increased expenses lead to an increased probability of taking an FRM. Note that in both cases the marginal effects in the single householder estimation are larger than for the full database reported in Table 3. In this case, however, the first-home buyer amongst single householders does have a statistically significant effect on the propensity to take an FRM, by decreasing it, which we interpret as indicating that they are more concerned about wealth risk than income risk. There is no evidence, however, that this is more marked for the females (the 'female × first home' term is insignificant). Again the mortgage interest rate and mortgage interest rate premium are statistically significant. However, in this data sample the mortgage interest rate premium reduces the chance of taking an FRM. An increase in the loan to value ratio also reduces the probability of taking a FRM, by some 11.42%, but again there is no evidence that this differs for the female heads of household compared with the males. Higher deposit to value ratios also decrease the probability of opting for an FRM as in the total dataset, but in this case an increase in the purchase price, rather than the loan amount, is statistically significant in reducing the probability of taking an FRM. The significant increase in probability of taking a FRM for those located in South Australia as compared with the benchmark of NSW is also present in the single householder estimates.

So as to explore the interest-rate effects in more detail a second specification was estimated. Now the interest rate variables are the interest rate accepted by the applicant, the difference between the Reserve Bank of Australia's monthly series on fixed interest rates and the standard variable rate, and this difference variable crossed with first home buyer status[10]. Estimation results for the other variables are broadly unchanged and

---

[10]For our purposes it is unsatisfactory that the Reserve Bank data are monthly averages. For future work we are compiling a daily data series of average standard variable rates and average fixed rates of

Table 6 focusses only on the estimated marginal effects for the interest-rate variables in the two samples.

Again, the interest rate variables are difficult to interpret. None of the estimated coefficients are significantly different from zero in the smaller sample. In the larger sample the offered interest rate is, as before, positive and both economically and statistically significant. Taken at face value a one percentage point increase in the difference between the Reserve Bank of Australia's fixed interest rate and the standard variable rate has the effect of increasing the probability of taking an FRM by 18.67%. We doubt that this is a meaningful result. As mentioned earlier, the interest rate data presently available (other than rates offered to and accepted for individual contracts) are subject to significant shortcomings. The present sample period is one in which (for all but the last four months of the sample period) interest rates rose. Also, the Reserve Bank data for FRMs are the average monthly values for loans with interest rate fixed for three years. It is likely that there will be important differences between these data and the fixed interest rates (of differing terms) offered to loan applicants on a daily basis. In future work we propose to address this deficiency in two ways. The first is to construct a daily interest rate series for market averages of standard variable rates and for market averages of fixed interest rates of a variety of terms. Second, by merging two datasets of applicants (albeit with slightly different definitions for some of the applicant characteristics) the time series dimension of the sample can be extended from Jan-2006 to Jan-2009 to one which begins in 2003. It is expected that the greater variability of interest rates over the longer sample will help to identify the interest-rate effects.

7 Conclusions

Our overall results are mixed. Indicators of individual exposure to income and capital risk have the expected sign and are generally significant. Applicants with higher income risk are more likely to choose an FRM, while those subject to higher capital risk — those with a higher loan amount, for instance — are more likely to choose an ARM. Older applicants are more likely to choose an FRM. In neither of the subsample

_____

various maturities. In this way the daily fixed interest premium can be matched with the datestamp on individual applications.

cases investigated here, first home loan buyers and female applicants, can we discern statistical significance from those characteristics with regard to the ARM/FRM choice. Gender, number of dependents, first home status are all insignificant explanatory variables for this choice. It seems that when making context-specific financial decisions, householders make choices with respect to their individual financial and lifecycle positions, and once these are appropriately controlled for, there is no support for viewing either women or first-home buyers as more or less risk averse than any other member of the sample group.

The most problematic feature of our results concerns the role played by interest rates. Other studies have found that when the fixed-adjustable spread is high, applicants are less likely to choose an FRM. Also, conditional on the spread, when the adjustable rate is high applicants are less likely choose an FRM, consistent with mean reverting preferences. This is not what we find in these data, and further work will be directed towards resolving this puzzle.

References

[1] Amemiya, T. 1978, 'The Estimation of a Simultaneous Equation Generalized Probit Model', Econometrica, 46, 1193-1205.

[2] ANZ (2008) ANZ Survey of Adult Financial Literacy in Australia: Final Report, available at http://www.anz.com/Documents/AU/Aboutanz/ AN_5654_Adult_Fin_Lit_Report_08_Web_Report_full.pdf

[3] Blacklow, P., Dungey, M. and Wells, G. (2009), "Fixed versus floating rate - Supply and demand effects on household mortgage choice', paper presented to 2nd Finsia – Melbourne Centre Consumer Finance, Investment & Regulatory Symposium, August.

[4] Calza, A., Monacelli, T. and Stracca, L. (2009) 'Housing Finance and Monetary Policy', European Central Bank Working Paper 1069.

[5] Campbell, J.Y. (2006), 'Household Finance', Journal of Finance, 61, 1553-1604.

[6] Campbell, J.Y. and Cocco, J.F. (2003), 'Household Risk Management and Optimal Mortgage Choice', Quarterly Journal of Economics, November, 1449-1494.

[7] Cardak, B. and Wilkins, R. (2009), 'The Determinants of Household Risky Asset Holdings: Australian Evidence on Background Risk and Other Factors', Journal of Banking and Finance, 33, 850-860.

[8] Charness, G. and Gneezy, U. (2007), 'Strong Evidence for Gender Differences in Investment', manuscript available at http://ssrn.com/abstract=648735.

[9] Clark-Murphy, M. and Gerrans, P. (2001), 'Consultation and resource usage in retirement savings decisions: Australian evidence of systematic gender differences', Financial Services Review, 10, 273-290.

[10] Croson, R., and Gneezy, U. (2009), 'Gender Differences in Preferences', Journal of Economic Literature, 47, 448-474.

[11] Debelle, G. (2004) 'Household Debt and the Macroeconomy', Bank for International settlements Quarterly Review, March, 51-64.

[12] Dhillon, U.S., Shilling, J.D. and Sirmans, C.F. (1987), 'Choosing between Fixed and Adjustable Rate Mortgages', Journal of Money Credit and Banking, 19, February, 259-267.

[13] Donkers, B. and van Soest, A. (1999), 'Subjective Measures of Household Preferences and Financial Decisions', Journal of Economic Psychology, 20, 613-642.

[14] Dwyer, P.D., Gilkeson, J.H. and List, J.A. (2002), 'Gender differences in revealed risk taking: Evidence from mutual fund investors', Economics Letters, 76, 151-58.

[15] Gerrans, P. and Clark-Murphy, M. (2004), 'Gender Differences in Retirement Savings Decisions', Journal of Pension Economics and Finance, 3, 145-164.

[16] Green, R. and Wachter, S. (2005) 'The American Mortgage in Historical and International Context', Journal of Economic Perspectives, 19, 93-114.

[17] La Cava, G. and Simon, J. (2003) 'A Tale of Two Surveys: Household Debt and Financial Constraints in Australia', Reserve Bank of Australia Discussion Paper 2003/08.

[18] Leece, D. (2000), 'Household Choice of Fixed versus Floating Rate Debt: A Binomial Probit Model with Correction for Classification Error', Oxford Bulletin of Economics and Statistics, 62, 61-82.

[19] Maddala, G. S. 1983, Limited-Dependent and Qualitative Variables in Econometrics, Cambridge: Cambridge University Press.

[20] Martins, N. and Villaneuva, E. (2006), 'The Impact of Mortgage Interest-Rate Subsidies on Household Borrowing', Journal of Public Economics, 90, 1601-1623.

[21] Miles, D. (2004), 'The UK Mortgage Market: Taking a Longer-term View. Final Report and Recommendations', UK Treasury.

[22] Paiella, M. and Pozzolo, A.F. (2007), 'Choosing Between Fixed and Adjustable Rate Mortgages', manuscript available at http://ssrn.com/abstract=976346.

[23] Rivers, D. and Vuong,Q. 1988, 'Limited Information Estimators and Exogeneity Tests for Simultaneous Probit Models', Journal of Econometrics, 39, 347-366.

[24] Sa-Aadu, J. and Sirmans, C.F. (1995), 'Differentiated Contracts, Heterogeneous Borrowers, and the Mortgage Choice Decision', Journal of Money Credit and Banking, 27, May, 498-510.

[25] Schubert, R., Brown, M., Gysler, M. and Brachinger, H.W. (1999), 'Financial Decision-Making: Are Women Really More Risk-Averse?", American Economic Review, 89, 381-385.

[26] Schubert, R., Brown, M., Gysler, M. and Brachinger, H.W.(2000), 'Gender specific attitudes towards risk and ambiguity: An experimental investigation', Center for Economic Research, Swiss Federal Institute of Technology, available at http://www.cer.ethz.ch/research/wp_00_17.pdf

[27] Tsatsaronis, K. and Zhu, H. (2004) 'What Drives Housing Price Dynamics: Cross country evidence', Bank for International Settlements Quarterly Review, March, 65-78.

[28] Vickery, J. (2006) 'Interest Rates and Consumer Choice in the Residential Mortgage Market', Federal Reserve Bank of New York working paper available at http://www.newyorkfed.org/research/economists/vickery/ Interest_Rates_Consumer_Choice.pdf

[29] Wood, G. and Parkinson, S (2009), 'Negative equity and house price risk in Australia', AHURI RMIT Research Centre, February.

Table 1: Details of the First Home Buyer Scheme

			State Schemes		NSW supplement		SA supplement*		Commonwealth Bonus	
			Established	New	Established	New	Established	New	Established	New
Jan 1, 2000	to	June 4 2005	$7000	$7000	-	-	-	-	-	-
Jun 5, 2008	to	Oct 13 2008	$7000	$7000	-	-	$4000	$4000	-	-
Oct 14, 2008	to	Nov 10 2008	$7000	$7000	-	-	$4000	$4000	$7000	$14000
Nov 11, 2008	to	Sep 30 2009	$7000	$7000	-	$3000	$4000	$4000	$7000	$14000
Oct 1 2009	to	Dec 31 2009	$7000	$7000	-	$3000	$4000	$4000	$3500	$7000

*The SA supplement (The First Home Bonus Grant) phases out by $8 per $100 for properties of $400,000 and above to zero value at $450,000 property value. A number of caps restricting eligibility have been introduced from January 2010, including housing values equivalent to or exceeding $750,000 in NSW, VIC, NT, $1million in QLD, and for WA property up to the 26th parallel is subject to a cap of $750,000 and $1million above it (the 26th parallel runs through Shark Bay Western Australia, slightly south of the town of Denham).

Table 2: Descriptive Statistics for the entire household database

	All households	First home buyer	ARM	FRM
Observations	111,149	15,985	80,132	31,017
Sample (%)	100%	14%	72%	28%
Female (%)	29%	32%	28%	31%
First home buyer	14%	100%	14%	15%
FRM (%)	28%	30%	0%	100%
Age first applicant (years)	40.7	31.3	41.3	39.3
Dependents, number of	0.63	0.30	0.62	0.65
Dependents, under 5 years	16%	10%	15%	17%
Dependents, aged 5 to 18 years	24%	11%	24%	25%
Assets, total ($)	759,174	203,829	787,482	686,042
Liabilities, total ($)	190,130	29,362	187,827	196,081
Income, monthly total before tax ($)	9,206	7,015	9,439	8,605
Expenses, monthly applicant estimate ($)	6,444	5,453	6,608	6,020
Uncommitted funds monthly, applicant estimate ($)	2,328	2,335	2,625	1,559
Time with current employer (months)	80	39	81	76
Loan interest rate (%)	7.53%	7.49%	7.46%	7.71%
Loan Amount ($)	254,363	234,734	265,291	226,129
Purchase Price ($)	330,506	327,478	347,489	286,630
Deposit ($)	81,685	89,557	88,854	63,163
Loan to Value ratio (%)	85.0%	76.7%	84.3%	86.7%
Deposit to Value ratio (%)	17.3%	22.9%	18.2%	15.0%
Mortgage Insurance (% of sample)	19%	49%	17%	24%

Table 3: Marginal effects estimates for all householders in ARM/FRM contract choice

	Coefficient	robust s.e.	p-value	Marginal effect	Significance
Net income ($00 per month)	-0.0107	0.0022	0.000	-0.35	**
Expenses ($00 per month)	0.0035	0.0109	0.000	0.56	**
age	-0.0077	0.0005	0.000	-0.25	**
female	0.0461	0.0308	0.134	1.53	
dependents	0.0063	0.0061	0.304	0.21	
female × dependents	-0.0135	0.0098	0.167	-0.44	
first_home	0.0035	0.0153	0.821	0.11	
female × first_home	0.0179	0.0250	0.474	0.59	
market interest rate	0.1979	0.0067	0.000	6.85	**
mortgage interest rate premium	0.1981	0.0107	0.000	6.86	**
loan to value ratio	-0.1240	0.0367	0.001	-3.91	**
female × loan to value ratio	0.0343	0.0329	0.297	1.14	
deposit to value ratio	-0.4046	0.0393	0.000	-11.48	**
loan amount ($10,000)	-0.0078	0.0007	0.000	-0.25	**
purchase price ($10,000)	-0.0009	0.0006	0.113	-0.03	
assets ($m)	-0.1021	0.0152	0.000	-0.03	**
liabilities ($m)	-0.1285	0.1003	0.200	-0.04	
Victoria	-0.1031	0.0126	0.000	-2.03	
Queensland	-0.0261	0.0124	0.035	0.90	**
Western Australia	0.0294	0.0144	0.041	-0.16	
South Australia	0.0998	0.0166	0.000	5.14	**
Tasmania	-0.0502	0.0253	0.047	0.24	
Australian Capital Territory	-0.0253	0.0373	0.498	2.21	**
Northern Territory	-0.0982	0.0303	0.001	-3.06	

** 1% significance, *5% significance

Table 4: Descriptive Statistics for single householder database

	All households	First home buyer	ARM	FRM	Female	Male
Observations	13,887	3,944	9,726	4,161	6,264	7,623
Sample (%)	100%	29%	70%	30%	45%	55%
Female (%)	45%	42%	43%	50%	100%	0%
FRM (%)	30%	30%	0%	100%	33%	27%
Age (years)	36.7	29.0	37.1	35.7	38.4	35.2
Dependents, number of	0.17	0.06	0.16	0.19	0.25	0.11
Dependents, under 5 years	4%	2	3	4	4	3
Dependents, aged 5 to 18 years	8%	3	8	10	13	4
Assets, total ($)	406,603	131,244	423,573	366,937	398,968	412,876
Liabilities, total ($)	93,554	14,554	91,852	97,533	82,963	102,257
Income, monthly total before tax ($)	5,944	5,048	6,085	5,614	5,374	6,411
Expenses, monthly applicant estimate ($)	1,796	1,292	1,787	1,817	1,675	1,896
Uncommitted funds, monthly applicant estimate ($)	1,581	1,669	1,791	1,091	1,452	1,687
Time with current employer (months)	64	40	65	61	60	66
Loan interest rate (%)	7.25%	7.21%	7.25%	7.25%	7.25%	7.25%
Loan Amount ($)	203,103	198,631	208,372	190,787	190,254	213,845
Purchase Price ($)	270,648	276,620	280,299	248,090	265,541	274,845
Deposit ($)	69,747	22.9	74,676	58,228	77,105	63,702
Loan to Value ratio (%)	82.0	76.3	81.5	83.2	79.6	84.1
Deposit to Value ratio (%)	19.4	22.9	20.1	17.7	21.7	17.5
Mortgage Insurance (% of sample)	25%	47	24	29	21	28

Table 5: Marginal effects estimates for gender issues in ARM/FRM contract choice

	Coefficient	robust s.e.	p-value	Marginal effect	Significance
Net income ($00 per month)	-0.0212	0.0074	0.004	-0.72	**
Expenses ($00 per month)	0.0035	0.0109	0.001	1.22	**
age	-0.0033	0.0015	0.028	-0.11	*
female	0.0068	0.0810	0.933	0.23	
dependents	-0.0281	0.0352	0.425	-0.95	
female × dependents	0.0648	0.0434	0.136	2.25	
first_home	-0.0949	0.0380	0.013	-3.15	*
female × first_home	0.0700	0.0516	0.175	2.43	
market interest rate	0.2137	0.0351	0.000	7.69	**
mortgage interest rate premium	-0.3378	0.0400	0.000	-10.32	**
loan to value ratio	-0.3796	0.1133	0.001	-11.42	**
female × loan to value ratio	0.1669	0.0880	0.058	5.94	
deposit to value ratio	-0.2460	0.1077	0.019	-7.77	*
loan amount ($10,000)	0.0039	0.0029	0.184	-0.13	
purchase price ($10,000)	-0.0084	0.0023	0.000	-0.29	**
assets ($m)	-0.2527	0.0057	0.000	-0.09	**
liabilities ($m)	-0.3191	0.2904	0.272	-0.11	
Victoria	-0.0604	0.0343	0.078	-2.03	
Queensland	-0.0263	0.0350	0.453	0.90	**
Western Australia	-0.0046	0.0402	0.909	-0.16	
South Australia	0.1452	0.0459	0.002	5.14	**
Tasmania	0.0069	0.0682	0.919	0.24	
Australian Capital Territory	0.0637	0.1092	0.560	2.21	**
Northern Territory	-0.0921	0.0871	0.291	-3.06	

** 1% significance, *5% significance

Table 6: Marginal Effects of Interest Rates

	All Households		Single-head Households	
	Marginal effect	Significance	Marginal effect	Significance
Interest rate	5.67%	**	-0.04%	
Fixed interest premium	18.67%	**	5.37%	
Premium × first home buyer	-4.83%	**	-9.91%	

** 1% significance, *5% significance