

Interest rate risk perception In households' mortgage choice decision

Paola Zocchi

EMFI WPs 1 - 2011



INTEREST RATE RISK PERCEPTION IN HOUSEHOLDS' MORTGAGE CHOICE DECISION

Paola Zocchi

Researcher – Università degli Studi del Piemonte Orientale A. Avogadro
Dipartimento di Studi per l'Impresa e il Territorio

Abstract

This paper examines households' interest rate risk perception when choosing between fixed rate mortgages (FRMs) and adjustable rate mortgages (ARMs).

The empirical analysis, carried out on the basis of data from the Survey on Household Income and Wealth by the Bank of Italy, highlights pervasive biased behaviours. First, the FRM-ARM choice appears to be influenced by the prospect of immediate savings. Second, due to households' short term view, as the maturity is extended and the borrower's risk is increased, then the preference for ARMs increases. Third, lending policies have a considerable impact on the FRM-ARM choice.

Keywords: interest rate risk, mortgage choice, adjustable rate

JEL codes: G14,G21

April 2011

Corresponding author: Università degli Studi del Piemonte Orientale A. Avogadro, Dipartimento di Studi per l'Impresa e il Territorio, Via Perrone 18, Novara Italy; e-mail: paola.zocchi@eco.unipmn.it

This paper analyses how Italian households perceive interest rate risk in the mortgage choice decision between fixed rate mortgages (FRMs) and adjustable rate mortgages (ARMs).

In Italy more than half of the stock of households' mortgage debt is based on variable rates, exposing the bulk of debt to interest rate risk. Actually, this aspect is partially explained by "Country system" issues, such as the tax treatment on mortgage interest payments, the policy on early repayment and the duration and the cost of the enforcement procedures. Moreover, junctual factors, related to the level and the evolution of interest rate, and personal issues are rather significant.

The existence of a problem of bounded rationality – resulting from a biased perception of interest rate risk - is the main research hypothesis developed in this work.

The empirical analysis, based on a sample of 908 Italian households drawn from the database of the Survey on Household Income and Wealth (SHIW) by the Bank of Italy, shows that households have a biased perception of interest rate risk, since the FRM versus ARM choice appears to be:

- i. guided by the prospect of immediate savings, roughly estimated on the basis of a comparison between the fixed and adjustable rates;
- ii. sustained by a temporal paradox, whereby ARM is more likely to be chosen with the lengthening of the maturity of the mortgage;
- iii. linked to the household's creditworthiness, hence riskier borrowers tend to prefer ARM;
- iv. influenced by bank lending policies.

The organization of the paper is as follows. Section 1 summarizes the main literature contributions on the factors influencing the FRM-ARM choice. Section 2 illustrates the research hypotheses; section 3 describes the empirical analysis carried out and section 4 summarises the main conclusions.

1. Literature review

Since the end of the 1980s, the choice between FRMs and ARMs was the object of a growing number of theoretical and empirical studies. These contributions are however restricted, to a large extent, to the United States.

Many theoretical contributions are related to standard finance theory assuming that individuals should rationally identify the choice that optimizes their intertemporal

utility function¹. Moreover, they mainly focus on the impact of the pricing conditions: the general level of interest rate and the FRM-ARM rate differential.

To this end, the contributions by Brueckner (1986) and Alm and Follain (1987) - modelling the reaction of households to the expectations underlying the form of the yield curves - show that the price effect is not entirely clear-cut. However, in front of large differentials, their analyses show that the preference for ARMs will prevail.

The importance of pricing is confirmed by all the empirical analyses carried out on this topic, though some significant discrepancies can be seen with regards to the sign and the interpretation of the results of the econometric estimates. On the one hand, a further contribution by Brueckner and Follain (1988) and Miles (2004) and the estimations carried out by Tucker (1989), Phillips and Vanderhoff (1991), Campbell and Cocco (2003) and Campbell (2006) confirmed that there is a positive relationship between the slope of the yield curve and the preference for ARMs. On the other, Dhillon, Shilling and Sirmans (1987), Sa-aadu and Sirmans (1995) and Coulibaly and Li (2007)² show that an increase in the slope of the yield curve is expected to negatively affect the preference for ARMs.

Campbell and Cocco (2003), Arsham, Ford and Morse (2008) and Brueckner (1993) also offer some interesting arguments against the accuracy of the use of the rational-agent model to describe household behaviour in the FRM-ARM choice, which actually give good points to doubt the consistency of the hypotheses developed in many contributions on this topic.

Campbell and Cocco (2003) explain the preference for FRMs, when long term interest rate have recently fallen, maintaining that households are driven by the irrational expectation that long-term interest rates follow a mean-reverting trend. Moreover, Arsham, Ford and Morse (2008) realized that the expectation of an economic advantage by choosing one type of mortgage over another is also irrational. In fact, according to the Efficient Market Hypothesis, the present value of FRMs and ARMs would be equivalent, since the expectations of future interest rates are already incorporated into current interest rates.

Otherwise, the thesis developed by Brueckner (1993) shows the inconsistency between most of the models of financial intermediation and the rising diffusion of ARMs. In accordance with these models, FRMs should prevail on ARMs, because lenders are assumed to be risk neutral (as a consequence of their ability to diversify their portfolio and to operate with derivatives³) and households are assumed to be risk averse. According to the author, the diffusion of ARMs could be explained by household's strong preference for current rather than future consumption. The preference for ARMs would therefore be driven by the desire to have a higher purchasing power in the short term. This effect should be obviously greater as the gap between FRM and ARM rates widens.

¹ In other words, it is assumed that the household will choose the mortgage that maximizes the utility function referred to a time span that is equal to the length of the contract. The optimal decision between FRMs and ARMs also assumes that the households react to the implicit expectations in the yield curve, have realistic expectations on their future earnings and act consistently to their risk aversion.

² The Coulibaly and Li model (2007) also highlights a positive relationship between the preference for the adjustable rate and the differential between FRM and ARM.

³ Nevertheless, the recent introduction of the Basel II capital requirement framework may have increased banks' preference for adjustable rate loans as it enables the credit risk to be shifted to households, thereby lowering banks' capital requirements. Cf. ECB (2009), p 29.

A number of contributions include the analysis of the role of borrower characteristics, such as affordability, demographics, education, financial literacy and mobility expectations, while the analysis of the decision making process receives limited attention.

First of all, Szerb (1996), Campbell and Cocco (2003) and Miles (2004) explore the role of economic and financial variables on the FRM-ARM choice.

More specifically, according to Szerb, the expected level of future income influences households' decision more than the current income. In other words, households that expect their incomes to grow rapidly, such as self-employed professionals and young graduates, would tend to prefer the adjustable rate; while, those characterized by a more stable income tend to show greater preference for the fixed rate. The former, in fact, would generally be less exposed to shocks caused by higher interest payments, while for the latter the increase in interest rates would have an immediate impact on their saving or on family consumption. This hypothesis is confirmed by the empirical analyses of Brueckner and Follain (1988) and Cutts, Green and Ramagopal (2006).

From a risk management perspective, Campbell and Cocco (2003) and Miles (2004) point out that households with high debt to income ratio and risky income are more vulnerable to the rise of interest rates and should consequently prefer the FRM. On this point, the empirical literature provides diverging evidence. In Albaum (1979) the choice of an ARM is more frequent than the choice of a FRM in low income and low financial assets classes, while the opposite is true for classes with high income and high financial assets. In Cutts, Green and Ramagopal (2006) the probability of choosing an ARM is definitely higher as the debt to income ratio rises, while in Coulibaly and Li (2007) is greater in households characterized by financial constraints and in those with long term mortgages.

The influence of schooling and financial education is analysed by the contributions of Bucks and Pence (2006) and Hilgert et al. (2003). To this end, they suggest that the adoption of cautious financial behaviour is positively correlated to the level of education and financial literacy of the borrowers. More specifically, Bucks and Pence (2006) demonstrate that low-income and less educated borrowers tend to select the alternative mortgage that is perceived immediately as the cheapest without understanding the characteristics and conditions of the contract, and thus underestimating the inherent risk. Hilgert et al. (2003), also note that there is a positive relationship between financial knowledge and good financial management practices, as well as paying bills on time, keeping a low payment to income ratio, reviewing credit reports, comparing offers before applying for a credit card and setting aside some savings to cope with unforeseen events.

Finally, several theoretical studies state a relationship between the FRM-ARM choice and households' risk appetite, pointing out that a household with high risk aversion would more likely prefer a FRM (Brueckner (1986), Alm and Follain (1987), Campbell and Cocco, (2003), Miles (2004)). Nevertheless, in such works, the risk

appetite is taken as an exogenous variable and its determinants are not investigated⁴. Due to the lack of detailed data on household risk aversion, the few empirical contributions that study this issue (Brueckner and Follain (1988), Coulibaly and Li (2007)) use proxies related to the risk aversion in investment decisions that are not suitable to evaluate the impact of the risk aversion on the mortgage decision. Firstly - according to Basciano et al. (2008) - because the use of a mortgage itself has significant impact on the household risk appetite in investment decision. Secondly, because the implicit hypothesis at the basis of the use of these variables is that households show the same risk aversion to both investment and indebtedness decisions. Therefore, I believe that the analysis of the risk appetite in mortgage choice decision is an issue that awaits better understanding. To this end, the main contribution of this paper is the development of the theoretical hypothesis of diverging risk attitude in mortgage choice decision and in investment decision.

2. Research hypotheses

The review of the literature on the choice between a FRM and an ARM shows that households' decisions are often not consistent with the postulate of rationality underlying the traditional economic theory.

This evidence motivates the interest in developing alternative models to explain how households actually behave. To this end, the behavioral decision theory offers an important contribution highlighting, on the basis of many experimental evidence, how often individual behaviour is determined by biased perceptions, past experience, mood and preconceived beliefs. Furthermore, several behavioral models, applied to the framework of financial markets, show that some biases are so common that they influence the collective behaviour of the markets themselves.

This study - based on the main findings of the behavioral decision theory - tests the hypothesis that the choice of a FRM or an ARM is influenced by widespread cognitive biases that encourage borrowers to make decisions that are not consistent with their requirements.

More precisely, this work is based on the hypothesis that households tend to:

- i. maximise their immediate utility, assuming a short-term perspective (temporal bias);
- ii. show a higher risk aversion in investment decision than in the choice between a FRM and an ARM (reference point bias);
- ii. be influenced by the lending policies adopted by the main suppliers of mortgage loans (lending policy bias).

⁴ With the exception of a work by Van Hemert (2009), that offers an original contribution in interpreting households' risk aversion from an asset and liability management perspective, taking into account the different stages in the life cycle. The author however, arrives at rather simplistic outcome, according to which ARM would be preferable for all working age households.

2.1. Temporal bias

The rational theory of choice rules out that, in a decision-making process, emotional constraints and cognitive biases could lead to hamper the optimisation of the expected utility function. The choice of a residential mortgage is nonetheless an essential lifetime decision for a family that usually raises psychological pressures from expectations and anxieties. On the one hand, the mortgage allows the family to achieve a purpose of future security. On the other, the financial commitment related to the debt service is perceived as a sacrifice by the family, which often leads to the concern of not being able to choose the right the type of loan and to deal in the future with it.

To this end, the psychological pressure resulting from the burdensome commitment of the loan enhances the role of pricing on the choice the household makes, as it emerges from empirical findings in literature⁵ and from the attitude of households to compare the economic offers of different banks⁶.

As a result of these observations, I believe that possible immediate economic savings influence the choice between the FRM and ARM due to the comparison between fixed and adjustable rates. In other words, I assume that households tend to embrace the short-term outlook in order to maximise their immediate utility, choosing the alternative with the lower *ex ante* rate.

This interpretation clearly conflicts with the rational theory of choice, besides, it seems overambitious for the average homeowner to try to predict the future trend of interest rates, inflation and family income⁷.

The suggestion that households are driven by a “short-sighted” approach is supported by various studies in cognitive psychology and, in particular, by contributions of Frank (1991) and Hoch and Loewenstein (1991). These authors show that balancing the extent of future costs and benefits, especially if uncertain, is a difficult task for individuals, which tend to be influenced by immediate costs and benefits⁸. Kahneman (2000) also illustrates that individuals often perceive the utility in relation to current events, underestimating long-term implications.

In the FRM-ARM choice, the adoption of the “short-sighted” approach it is expected to be anchored to market conditions and to increase with high differentials between the rates of FRM and ARM.

2.2. Reference point bias

The theoretical literature assumes the occurrence of a positive correlation between the preferences for ARMs and households’ risk appetite. The empirical investigation of this issue is scarce and it neglects to analyze the determinants of

⁵ Cf. Di Giuli et al. (2007), p.35.

⁶ Cf. Valletta et al. (2007), p 92.

⁷ With reference to households’ financial literacy in indebtedness decisions see Filotto and Nicolini (2007).

⁸ Cf. McFadden (1999), p. 59.

households' risk aversion in the FRM-ARM choice, merely using the risk aversion in investment decisions as a proxy⁹.

With regards to Italy, the risk aversion in investment decision does not seem to influence the choice between a FRM and an ARM. Such evidence - emerged in the 25th Report on Savings and Savers in Italy (2007) - is confirmed on the database of the Survey on Household Income and Wealth (SHIW) by the Bank of Italy in this work, with the following logit function¹⁰:

$$RATE = F (RISK AVERSION_i) + e_i \quad (1)$$

RATE is the binary dependent variable and it assumes the value 1 for ARMs, and 0 for FRMs;

RISK AVERSION is the independent variable which assumes a value ranging from 1 to 4, depending on whether the household prefers investments that offer:

- very high returns, regardless of a high risk of losing part of their capital (RISK AVERSION= 1);
- a good return, with reasonable security for their invested capital (RISK AVERSION= 2);
- a reasonable return, with a good degree of security for their invested capital (RISK AVERSION= 3)
- low returns, without any risk of losing their capital (RISK AVERSION= 4).

Since the data are non-homogeneous¹¹, the model has been estimated separately for households interviewed in the 2004 survey and for those interviewed in the 2006 survey. In both cases, there was no statistically significant relation between the two variables (see Table 1: at the end of the paper).

<INSERT TABLE 1>

These findings suggest that the risk aversion in investment is not an appropriate proxy of the borrower's risk aversion for debt decisions such as the choice between a FRM and an ARM.

The reason of such a divergence is that individual perceptions surrounding investments decisions differ from those that impact on borrowing choices. In the former, the investor's reference point is its financial assets (or a specific sum to invest) and the

⁹ The topic has been presented in Section 2.2.

¹⁰ The logit function was tested on the households that originated the mortgage contract in the same year of the survey or in the previous one. To be able to verify the existence of a correlation between the FRM-ARM choice and the attitude toward risk, it is necessary that the latter not refer to a period of time that is too far from when the mortgage was drawn up. As is known, the attitude toward risk varies over time, based on changes in the financial markets and in the family life cycle.

¹¹ In the 2004 survey, the question on the attitude toward risk has been exclusively focussed on interviewees with financial assets that differed from the current account, while in the 2006 survey, the question was put to all those interviewed.

trade-off between risk and returns tends to be perceived as the alternative between a "riskless moderate return" and "a higher but uncertain return", thus soliciting risk aversion. In the latter, the main decisions referred to the mortgage (amount, maturity, payments) are related to family income¹². In the FRM-ARM choice, the focus of the borrower also tends to be concentrate on the "cost" of the funding and on the impact of the mortgage payment on the monthly income¹³. The trade-off between risk and "cost" is thus perceived as the alternative between "a higher certain cost" and "an uncertain lower cost". Therefore, while the impact of the risk on the capital is direct in the investment decisions, in the mortgage decisions the impact of risk on the family wealth is not evident as well¹⁴. As a result, such bias is likely to generate aversion to the *ex ante* more expensive mortgage contract - the fixed rate one - thus inducing risk taking behaviours.

This relationship results in a paradoxical situation: as the burden of the mortgage payments affects borrowers with low and unstable income more, actually these riskier households would be more likely to take on the risky mortgage contract. As it has been presented in Section 1, the findings in Cutts at al. (2006) and Coulibaly at al (2007) seem to confirm such a paradox.

The hypothesis developed in this section is that the risk aversion is tendentially higher in the FRM-ARM choice than in the investment decision. This bias is mainly due to the non-alignment of the reference point, represented by the wealth in the investment decisions and by the income in the mortgage decisions.

The above hypothesis is stimulated by the Kahneman and Tversky's prospect theory, according to which people display a different risk appetite depending on how they perceive it. In this respect, the authors carried out an interesting experiment¹⁵: "consider the choice between a prospect that offers an 85% chance to win \$1000 (with a 15% chance to win nothing) and the alternative of receiving \$800 for sure. A large majority of people prefer the sure thing over the gamble, although the gamble has higher (mathematical) expectation. (...) The expectation of the gamble in this example is $.85 \times \$1000 + .15 \times \$0 = \$850$, which exceeds the expectation of \$800 associated with the sure thing. The preference for the sure gain is an instance of risk aversion. (...) Consider a situation in which an individual is forced to choose between an 85% chance to lose \$1000 (with a 15% chance to lose nothing) and a sure loss of \$800. A large majority of people express a preference for the gamble over the sure loss. This is a risk seeking choice because the expectation of the gamble ($-\$850$) is inferior of the expectation of the sure loss ($-\$800$)."

The authors represented such evidences in a value function that is concave for gains, signifying aversion towards risk, and convex for losses, suggesting propensity towards risk. The cornerstone of the prospect theory is the idea that preferences are influenced by changes of wealth - resulting from gains and potential losses - and that

¹²More precisely, the decisions of the lender are based on the borrowers' annual family income, certified by the credits on the current account - when the borrower is the holder of an account - or by the income tax return requested for the preliminary investigation, if the borrower does not hold an account. If the borrower is an employee, its assessments on the sustainability of the mortgage payment are instead usually based on the monthly income.

¹³ This issue comes out of the experimental survey carried out by Di Giuli and Montefusco (2007) on a sample of Italian households. P. 118

¹⁴ With "wealth effect" I mean the possibility that the rise in interest rates will lead to an unsustainable level of the mortgage payment, leading the borrower to foreclosure.

¹⁵ Cf. Kahneman e Tversky (2000) p. 2-3.

people are substantially adverse to losses. Yet, the authors show that in some decision-making processes more complex than lotteries, the exclusive focus on earnings and on potential losses has a limited explanatory importance. In particular, financial investors found their preferences on financial assets as a reference point¹⁶.

2.3. Lending policy bias

Many experiments carried out by scholars on decision-making behaviour show that the format of the decision can modify the preference given to different alternatives (Tversky, Kahneman (1981), Tversky, Sattath e Slovic (1988)). From this point of view, the lending policies pursued by banks can play a decisive role in determining the preference of borrowers versus specific mortgage alternatives. For instance, the study by Phillips and Vanderhoff (1991) is of particular interest, because it shows that the offering of initial rate discounts has a significant effect on the choice made by borrowers, raising the attractiveness towards adjustable rate contracts.

On the other hand, the choice between a FRM and an ARM, is not always an independent decision of the household, since the advice of the trusted intermediary is often taken into great consideration¹⁷. Therefore, in analysing household's behaviour, one cannot neglect the influence of lending policies.

With reference to the Italian market, the present study assumes that, in the last few years, the lending policies adopted by the main players had a significant role in eliciting the preference of households toward ARMs.

More specifically, since the beginning of this last decade, the financial sector has considerably increased the supply of residential mortgages, resulting in a significant rise in competition¹⁸. These are the main consequences of this development:

- product innovations; such as the lengthening of the mortgage maturity up to 30 years or even more¹⁹; the rise of the loan-to-value ratio beyond 80% and the possibility for the borrower to exploit a great flexibility in the repayment of the loan;
- cutback in bank spreads²⁰;

¹⁶ Kahneman (2002) p.101.

¹⁷ An investigation carried out by the British Mortgage Code Compliance Board (MCCB) points out that 35% of English households have been advised by the intermediary or by the bank where the mortgage was drawn up according to the most suitable contract based on their needs. This percentage rises to 48% when taking into account those households who went to an intermediary rather than a bank. Cf. Miles (2004), p.30.

¹⁸ The main factors underlying the strong growth of housing loans are: the opportunities of a lending expansion resulting from interest rates being at a historic low, the need to develop alternative margins determined by the crisis of asset management, the opportunities stemming from the favourable treatment of residential mortgages under Basel II and the increasing role of securitisation in the funding of banks.

¹⁹ "In 2001 only 8.9% of intermediaries offered mortgages with a repayment period equal to or above 30 years. This percentage rose to 14.6% in 2003 and 59.2% at the beginning of 2007". Cf. Rossi (2008), p. 8

²⁰ Particularly the bank spread for home mortgages has, on average, gone from 2.13% in December 2004 to 1.53% in December 2006. See: Databank, (2007), p. 49.

- application of new evaluation techniques based on the use of credit scoring models²¹;
- risen of mortgage brokers;
- generalised loosening of credit standards²².

The evidences from juctural reports by the main research agencies and from recent surveys carried out by the Bank of Italy lead to the belief that at least since 2004, the lending activity towards riskier borrowers has also been encouraged by the offer of “favourable” pricing conditions, based on adjustable rate contracts often combined with initial rate discounts. Hence, the framework outlined above suggests that since 2004 the Italian household preference for ARMs has been somewhat influenced by the aggressiveness of the offer.

3. The empirical analysis

3.1. Data description

The empirical analysis carried out in this study utilizes data from the biennial “Survey on Household Income and Wealth (SHIW)” by the Bank of Italy. The original dataset contains about 8.000 households selected randomly and provides a broad set of information on demography, jobs, finance and wealth. Since the survey of 2004, the section on housing has been supplemented with information about household mortgages, including the distinction between fixed and adjustable rate mortgages.

The 2004 and the 2006 surveys contain a total of 1,156 observations related to households with a residential mortgage. The subsample used for the present analysis consists of 959 observations and was obtained by dropping out the 148 panel families of the 2006 survey²³, the 29 families with a zero rate mortgage and 20 observations that had improbable data.

For this analysis, the use of such a database leads to two obstacles. Firstly, it gives no indication about the date of the drawing up of the mortgage. Secondly, most of the survey data (income, consumptions, family size, interest rates, etc.) have been reported for each year in which the investigation was carried out and not in the year in which the mortgage was drawn up.

²¹ In 2003 26% of intermediaries had adopted this method of granting residential mortgages. In 2006, it was already 51% of the intermediaries. Its spreading was also higher among large banks (91%) than small ones (63%) and cooperative credit banks (34%). Cf. Op. Cit., p.7. On the use of credit scoring techniques see also: Abereto et al. (2008).

²² On this topic, larger sized banks show a tendency to shift to more than 30% the debt servicing to disposable income ratio. Cf. Rossi (2008), p. 15. Compared to generalist banks, specialized banks use segmentation as a positioning lever of differentiation and extend their offering towards categories at the margin of the traditional market, such as young people, atypical workers, immigrants, retired. Cfr. Databank (2007), p. 9. Due to commercial pressure, sometimes the evaluation credit criteria have also become slacker: through appeal on overrated real estate collaterals (so as not to exceed the 80% loan to value and avoid additional guarantees) or through the acceptance of income documents of questionable reliability.

²³ In order to have data as near as possible to the date when the mortgage was drawn up the panel observations of the 2004 survey were maintained; this is common practice in mortgage surveys carried out on a panel. Cf. Campbell (2006) – Appendix B.

To overcome the first problem, the year and month of signing have been computed based on available information, taking the principal payments constant. In order to have at least 5 observations for each year in a row, another 51 families - whose mortgage had been signed before 1991 - were excluded. This resulted in a final sample of 908 families who had subscribed a mortgage between 1991 and 2006.

The bias induced by the second problem has been reduced adopting specific corrections. Regarding the distinction between fixed and adjustable rate mortgages, it was assumed that it did not change since signing²⁴. With reference to interest rates, only fixed rates were used, assuming that they have not been subject to renegotiation. As for income and consumptions, each amount was discounted back to the year when the mortgage was drawn up, according to the yearly ISTAT coefficients, with reference to occupation and geographical area of the household. For household size, children born after entering the mortgage were not taken into account, but it was not possible to retrieve how many of the family members had left after this date. Lastly, the professional activity before retirement was coupled to those households who retired after they signed for the mortgage.

B. Model description

The choice between a fixed and an adjustable rate mortgage has been estimated using the following logit model:

$$\Pr(RATE)_i = F(YIELD_CURVE_i, DIFFERENTIAL_i, FIX_RATE_i, COMPETITION_i, MATURITY_i, LNAMOUNT_i, PAYMENT/DISPOSABLE_INCOME_i, AGE_i, LOW_EDUCATION_i, NORTH_i, SOUTH_i, FACTORY_WORKER_i, MANAGER_i, SELF-EMPLOYED_i, NUMBER_WORKERS_i, INSURANCE_i, DEDUCTION_i, CONCESSIONAL_RATE_i) + e_i \quad (2)$$

where:

RATE is the dependent binary variable, equal to 1 for ARMs and 0 for FRMs. The independent variables are:

<i>YIELD CURVE:</i>	yield curve (difference between the mean quarterly yield of 10-year BTPs and of annual BOTs)
<i>DIFFERENTIAL:</i>	difference between reference rates for fixed and adjustable rate mortgages ²⁵

²⁴ This hypothesis is supported by the fact that until 2006, due to its costs, early payment in Italy was not a very widespread practice. Cf. Section I.A.

²⁵ For FRMs drawn up between 2001 and 2006, the reference rates used are: 3 years Eurirs for mortgages with a 1 to 5 year maturity, 7 years Eurirs for mortgages with a 5 to 10 year maturity, 10 years Eurirs for mortgages with more than 10-year maturity. Cf. Bonaccorsi di Patti and Felici (2008), p. 6. Rendiob is the reference rate used for FRMs drawn up prior to 2001. Cf. Di Battista (1984), p. 14. The three-month Euribor was used for ARMs drawn up from 1999 to 2006 (Cf. Bonaccorsi di Patti and Felici (2008), p.6), while the three-month Ribor was used for those originated before 1999 (Cf. Moro (1995), p.143). The differential is calculated

<i>FIX RATE:</i>	nominal fixed rate applied by the bank
<i>COMPETITION:</i>	dummy=1 for 2004, 2005 and 2006; <i>proxy</i> of the pressure from competitors in the Italian mortgage market
<i>MATURITY:</i>	maturity of mortgage expressed in years
<i>LNAMOUNT:</i>	logarithm of the principal mortgage amount
<i>PAYMENT/DISPOSABLE INCOME:</i>	constant principal payment vs disposable family income ratio ²⁶
<i>AGE:</i>	age of household when drawing up the mortgage
<i>LOW EDUCATION:</i>	dummy=1 if the level of education of the household is equal to or lower than secondary school
<i>NORTH:</i>	dummy=1 for households resident in Northern Italy
<i>SOUTH:</i>	dummy=1 for households resident in Southern Italy
<i>FACTORY WORKER:</i>	dummy=1 if the household is a factory worker
<i>MANAGER:</i>	dummy=1 if the household is a manager or a senior executive
<i>SELF-EMPLOYED:</i>	dummy=1 if the household is a self-employed
<i>NUMBER WORKERS:</i>	number of workers
<i>INSURANCE:</i>	dummy=1 if the household and/or his partner are insured in case of death
<i>DEDUCTION:</i>	fiscal benefit: deduction of interest payments in euro in the first year of the mortgage
<i>CONCESSIONAL RATE :</i>	dummy=1 for mortgages with concessional rate

The *YIELD CURVE*, *DIFFERENTIAL* and *FIX RATE* variables estimate the reaction of the borrowers to mortgage pricing. Contrary to traditional economic theory, in which the borrowers should base their choice on the shape of the yield curves, the hypothesis is that they do not express any expectation on the future movements of the rates, since the average household does not seem to have such a sophisticated decision-making process²⁷. Moreover, according to Arsham, Ford and Morse (2008), the present value of FRM and ARM interest payments would be equivalent as market expectation of future interest rates would be instantly discounted into current interest rate.

It is therefore assumed that the decision of households is biased by a “short-sighted” view, guided by the attractiveness of an immediate saving roughly estimated by

by subtracting the mean reference adjustable rates for the quarter when the mortgage was originated from the mean reference fixed rates for the month when the mortgage was originated.

²⁶ Available income was calculated by subtracting non-durable goods from family income. Both entities have been carried over to the year when the mortgage was drawn up and updating them to the corresponding annual ISTAT coefficients that are distinct for geographical area and job of the breadwinner.

²⁷ The limited time that is usually given to financial information justifies the firm belief that for the average household the yield curve is not an easily understood concept. On this issue see: Liera (2007), p. 131-134.

comparing the level of fixed and adjustable rates. Such a preference is expected to prevail with the rising of the differential between FRM and ARM.

Since the differential between FRM and ARM rates depends on the slope of the yield curve, the sign expected for the *YIELD CURVE* and *DIFFERENTIAL* variables is therefore positive.

The choice between FRM and ARM is also influenced by the level of fixed rates²⁸. Here, the assumption is that with high rates the cost of the FRM is considered too expensive by borrowers, thus tending to prefer ARMs. In this analysis, such a relationship has been verified using *FIX RATE* that, for each borrower, corresponds to the FRM rate at the mortgage origination. In accordance to Brueckner and Follain (1988), the expected relationship between *FIX RATE* and the dependent variable is positive. To test this hypothesis it has been necessary to make some data processing, as the SHIW does not provide the rate applied for the alternative mortgage that was not chosen. The fixed rates for the subset of variable contracts were thus estimated using the following OLS function²⁹:

$$FIX\ RATE_i = F(REFERENCE\ RATE_i, CONCESSIONAL\ RATE_i, MATURITY_i, AMOUNT/INCOME_i, LIFECYCLE_i, SELF-TEMP_i, NONOCC_i) + e_i \quad (3)$$

where:

REFERENCE RATE: mean reference rate ³⁰ for fixed rate mortgages referred to the month when signing the contract

CONCESSIONAL RATE: dummy=1 if the mortgage is at a concessional rate

MATURITY: length of mortgage expressed in years

AMOUNT/INCOME: original mortgage sum based on family income

LIFECYCLE: dummy=1 for singles, =2 for young couples with no children, =3 for couples with children at school, 4= for pensioners and couples with adult offspring

SELF-TEMP: dummy=1 for self-employed or temporary workers

NONOCC: dummy=1 for households with no occupation

For *COMPETITION*, the hypothesis is that, in the period 2004-2006, lending policies have given rise to the preference for ARMs. In other words, it is assumed that, since 2004, household's preference for ARMs is higher than can be explained from

²⁸ This, in turn, depends on the overall level of the rates, the length of the mortgage and the borrower's risk attitude.

²⁹ The function has been applied to the subset of fixed rate mortgages. In additions, in order to avoid biases, 90 observations were removed from this subset. These were contracts with no concessional rates that were lower than the mean reference rate for the month of subscription. The linear regression has therefore been made on 317 fixed rate contracts.

³⁰ From 1991 to 2000, the reference rate is the Rendib and, from 2001 to 2006, the Eurirs. See also Footnote 41.

borrowers' reaction on the pricing conditions³¹. The expected sign for *COMPETITION* is positive.

The literature has given limited attention to the characteristics of the mortgage that differs from pricing. The hypothesis is that the maturity and the principal amount are not neutral to the choice between fixed and adjustable rate mortgages. As is known, the lengthening of the maturity reduced the amount of the recurring payments, allowing borrowing to low-income households. Other conditions being equal, it is therefore reasonable that the need to extend the mortgage maturity goes hand in hand with greater borrowing constraints, leading to the preference for ARMs. Therefore, the expected relationship between *MATURITY* and the dependent variable is positive. The amount for interest payment also rises with the rising of the principal amount. It is therefore assumed that the sensitivity of the borrower to the difference between the fixed and adjustable rates increases, as does the mortgage principal amount. Thus the expected sign for *LNAMOUNT* is positive.

A further factor which is believed to influence the choice between fixed and adjustable rate mortgages is the level of the debt service ratio. From a rational point of view, as the borrower constraints become more significant it would be expected caution to prevail and hence the fixed rate option to be chosen. However, it is likely that the psychological pressure from the payment commitment brings about the preference for immediate savings in stead of a cautious medium term focus. By using the debt to income ratio, Coulibaly and Li (2007) have shown how rising financial pressure increases the probability that the family signs an ARM. The data provided by the SHIW allows the use of a more reliable proxy of possible financial distress: the payment to disposable income ratio³². The *PAYMENT/DISPOSABLE INCOME* variable is expected to have a positive sign.

Factors related to the person and the family of the borrower may also influence the mortgage choice. To this end, several studies show that factors - such as the level of education, age, professional employment and the number of families members - have a relatively modest impact on the FRM-ARM decision (Brueckner and Follain (1988), Phillips and Vanderhoff (1991), Duffy and Roche (2005), Follain (1990)). As control variables, this paper tests the influence of nine variables related to borrower's characteristics with expected limited significance: *AGE*, *LOW EDUCATION*, *NORTH*, *SOUTH*, *FACTORY WORKER*, *MANAGER*, *SELF-EMPLOYED*, *NUMBER WORKERS*, *INSURANCE*.

AGE is expected to be negatively correlated to the adjustable rate choice. Young families, compared to older ones, tend to be characterized by averagely low incomes and by pressing family commitments. With other conditions being equal, this exposes them to greater pricing sensitivity and thus to greater pull towards the possibility of immediate savings. Expecting a negative sign for the *AGE* variable is therefore coherent with the reference point bias hypothesis.

The *LOW EDUCATION* variable is used to verify, for the Italian situation, evidence from Hilgert et al. (2003) as well as Bucks and Pence (2006), according to whom cautious behaviours - as is the preference for a FRM - are less frequent for those with a

³¹ Estimated using the following independent variables: *FIXRATE*, *DIFFERENTIAL* and *CURVAREND*.

³² Calculated by subtracting annual non-durable consumptions from the annual family income.

low level of education and financial literacy. Thus, the expected sign for *LOW EDUCATION* is positive.

The geographical area of residency may also have an impact on the choice between the fixed and the adjustable rate, due to the differences on the cost of real estate and on the employment market³³. Southern Italy has a higher incidence of temporary workers and sweated labour than other geographical areas³⁴, leading to unsteady family income. Income instability can determine higher risk aversion in the selection of loan and the tendency to favour the FRM. The expected signs for *NORTH* and *SOUTH* are respectively positive and negative.

In agreement with the hypothesis developed by Szerb (1996), it is believed that those households that expect to have a raise in their working income would show a greater risk attitude choosing an ARM. The SHIW does not ask about households' expectations on this subject, so two proxies were used in their place. The proxies - *FACTORY WORKER* and *MANAGER* - are referred to the employment of the household. Specifically, the assumption was that, on average, factory workers have fewer expectations of rising wages while managers and senior executives prospect getting higher income over time. The signs expected for *FACTORY WORKER* and *MANAGER* are therefore respectively negative and positive.

In addition, it is reasonable to expect that self-employed households are subject to an income instability that is on average higher than that for the other two working groups. The income instability should lead to preferring the FRM, which allows one to plan future financial expenditures. Hence the sign expected for *SELF-EMPLOYED* is negative.

NUMBER WORKERS verifies if there is a relationship between the number of family earners and the FRM-ARM choice. Analysing the data set it appears that as the number of family earners rises so does the family income and that the income per head tends to decrease as the number of income earners rises (Table 2). From household point of view, if the perception of the income level prevails on the perception of the income per head than, it is likely that the borrower would show lower pricing sensitivity and would express the preference for the FRM. Conversely, if the second instance prevail, it is reasonable to assume that the household would be more aware of the limitations on the family budget, expressing the preference for immediate savings on interest expenses.

<INSERT TABLE 2>

It is reasonable to believe that households insured against death, accidents or unemployment feel more protected from the risk that future events could interfere with their ability to honour their debt. The hypothesis is that such protection will lead, with other conditions being equal, to a greater propensity to risk, thus favouring the choice of an ARM. For the purpose of this analysis, the SHIW offers just information on the

³³ In the SHIW, the average mortgage principal amount is equal to 79,000 euro in Northern Italy compared to about 64,000 euro in the South, but the debt to income ratio is greater in the South, equal to 3.36 versus 3.23 in the North.

³⁴ The database permits to verify only the statement about temporary workers.

subscription of death insurance. The expected sign for the *INSURANCE* dummy is positive.

Lastly, the impact of two structural factors is verified with *DEDUCTION* and *CONCESSIONAL RATE*.

In the light of the thesis developed by Vartia (2006), according to whom countries that allow maximum deductions of interest expenses on residential mortgages encourage the preference for FRMs, the aim here is to verify whether the Italian tax system has some incentive on choosing FRMs. The *DEDUCTION* variable is a proxy of the amount that each household has been able to deduct from income taxes in the first year of the mortgage³⁵. In the presence of an incentive to choose a FRM, *DEDUCTION* should be negative³⁶.

The variable *CONCESSIONAL RATE* verifies if the possibility of obtaining a concessional rate influences the choice between FRM and ARM. During the past decades, various public operations have arisen in Italy to favour residential real estate³⁷. In addition, up to the half of the '90s the high inflation rate was the basis for a widespread offering of adjustable rate loans. In this case, the *SPECIAL RATE* variable should take a positive sign.

C. Results

The test of multicollinearity conducted on the independent variables has revealed that two pairs of variables - *YIELD CURVE* and *DIFFERENTIAL*, and *LNAMOUNT* and *DEDUCTION* - are correlated at 54% and 76% respectively. The importance of underlying assumptions to each of the variables has precluded the possibility of selecting only two of them and to drop the others from the model. It was therefore decided to estimate two logit models that differed only by these variables. More specifically, model (a) includes *YIELD CURVE* and *LNAMOUNT*, while model (b) includes *DIFFERENTIAL* and *DEDUCTION*.

The results of the two versions of the model are presented in Table 3, where, respectively, the second column shows version (a) and the third column version (b). As one can see, for both estimates, most of the variables analysed are statistically significant and they appear with the expected sign.

³⁵ For FRMs, *DEDUCTION* is calculated by multiplying the initial amount with the fixed rate declared by the borrower. For ARMs drawn up before the survey of the Bank of Italy, the rate of the first mortgage payment is calculated by adding the mean reference rate, reported for the quarter when the contract was originated, to a bank spread estimated using the following OLS function: $BANKSPREAD_i = F(REFERENCE\ RATE_i, CONCESSIONAL\ RATE_i, MATURITY_i, PAYMENT/DISPOSABLE\ INCOME_i, LIFE\ CYCLE_i, SELF-EMPLOYED\ and\ TEMPORARY\ WORKER_i, UNEMPLOYED_i), RATE_i + e_i$

where $BANKSPREAD$ is equal to the difference between the rate applied by the bank at the origination and the reference rate for that month (for fixed rate mortgages) or for that quarter (for adjustable rate mortgages). The function has been calculated on the total number of fixed rate and adjustable rate mortgages drawn up in 2004 and in 2006 (contract originating year which corresponds to the year when the Bank of Italy carried out the survey), for a total of 478 observations. The coefficients so obtained were used to estimate the bank spread for adjustable rate mortgages originated prior to the Bank of Italy survey.

³⁶ Recall that the highest tax deduction granted by the Italian legal system is equal to 686.89 Euro.

³⁷ Cf. Cacciamani (1995), p.79.

<INSERT TABLE 3>

With reference to the variables related to pricing, the probability that households will choose the ARM rises both as the differential between FRM and ARM rises, and with the increase in the fixed rate.

The *COMPETITION* dummy is significant and positive. Such evidence seems consequently to confirm the research hypothesis that between 2004 and 2006 the preference for ARMs has been encouraged by commercial pressure exerted by the offer³⁸. On examining the odds' ratios, this relationship also appears to be particularly relevant.

The variables on the characteristics of the mortgage, *LNAMOUNT* and *MATURITY*, are significant and positive. As the costs connected to the mortgage (related to large principal amount) and the borrower constraints (highlighted indirectly by the extended maturity of the mortgage) rise, so does the probability that the household has chosen an ARM. The finding, connected to *MATURITY*, is apparently paradoxical, since the preference of borrower to the short-term utility results in a more likely choice of the adjustable rate as the maturity of the mortgage increases.

The payment to disposable income ratio (*PAYMENT/DISPOSABLE INCOME*) is significant and positive in model (b). This seems to confirm the presence of a risk paradox where, as the risk of the borrower rises, so does the probability that the mortgage chosen is an adjustable rate one.

As expected, the variables related to the characteristics of the borrower show a relatively modest impact on the FRM-ARM decision, with the exception of the geographical area variables that show a significant difference between the North and the South of the Country.

LOW EDUCATION is significant only in model (a), denoting a statistically unstable relationship. In contrast, there are no statistically significant relationships for *AGE*.

The geographical area of residence has a significant impact on the choice between FRMs and ARMs. More specifically, the probability that a borrower choose the adjustable rate is higher if residing in the North, rather than in other areas of Italy. Otherwise, the probability of signing a FRM is higher in the South compared to the rest of the country.

Statistical evidence on the *MANAGER* variable forces the rejection of the related research hypotheses. Conversely, for *FACTORY WORKER*, the hypothesis of an aversion to choosing an ARMs is confirmed. The variable that qualifies the self-employed is 5% significant in model (a), confirming the expected negative relationship with *RATE*.

NUMBER WORKERS is significant and negative in both models. The probability of drawing up an ARM therefore falls as the number of family earners rises.

³⁸ In contrast to the findings in other European countries, such as Belgium and the Netherlands, the influence of the lending policies could be the reason for the limited reaction of the Italian residential mortgage market to the rise of the Euribor and the fall of the differential between the FRM and ARM rates, since the end of 2005. Cf. EMF (2006), p.13.

INSURANCE is significant and has a positive impact on the decision to choose an ARM.

Finally, the two structural variables are both statistically significant. The negative sign of *DEDUCTION* highlights that the Italian taxation on mortgage interest payments has a certain power to incentivate the choice of the more cautious alternative mortgage, while the positive sign of *CONCESSIONAL RATE* confirms that the probability of a concessional rate mortgage being drawn up at an adjustable rate is higher than the probability of a fixed rate one.

IV. Conclusions

The analysis carried out on a sample of Italian households shows a biased perception of the relative attractiveness between FRM and ARM, over the period 1991 to 2006, that is produced by an underestimation of the interest rate risk inherent in the adjustable rate contracts.

Firstly, it emerges a temporal bias, since households tend to prefer the immediate economic savings related to the contract with an *ex ante* lower rate. More specifically, the empirical analysis highlights that the probability of choosing an ARM increases with the rise of the differential between the FRM and the ARM rates, the level of the fixed rate, the principal amount and the maturity. The latter evidence is quite paradoxical, since the preference for the short term utility will increase the preference for an ARM as the maturity rises.

Secondly, there is a risk bias, as the greater preference for ARMs is related to a generalised risk aversion. In addition, as the borrower risk increases – with the rise of the payment to disposable income ratio – the likelihood of choosing an ARM also increases. Such anomalies can be explained with the fact that the reference point of a mortgage decision is the family income. In other words, as households are generally focussed on the cost of the mortgage, they are led to emphasize the burden of the debt servicing on the family income and to underestimate the risk related to the cheaper contract. This bias aggravates the natural aversion for the *ex ante* more expensive contract, encouraging a risk taking behaviour.

Thirdly, the empirical analysis proves that the probability of a mortgage being at an adjustable rate is higher between 2004 and the 2006 than in previous years, while the interest rate movements would have suggested a greater preference for FRMs. This result validates the hypothesis that lending policies have a significant influence on households' choices.

Overall, the personal characteristics of the borrower, such as age, education and job, are not very relevant.

Lastly, the findings demonstrate that a higher deduction on interest payments encourages the choice of a FRM.

In conclusion, it should be noted that the recent legislative measures on early repayment and mortgage portability could have a direct effect on the choice between FRM and ARM, increasing the preference for FRMs. It would therefore be interesting to verify this effect with data on mortgages originated after 2007.

Finally, this work points out that the issue of risk perception in mortgage choice decisions needs to be studied in greater depth. To this end, a further analysis, based on the experimental model typical of cognitive sciences, would be valuable in order to directly investigate household perceptions.

References

- Albaum, Gerald, 1979, Consumer reactions to variable rate mortgages, *The Journal of Consumer Affairs* 2, 262-281.
- Albereto, Giorgio, Michele Benvenuti, Sauro Mocetti, Marcello Pagnini, and Paola Rossi., 2008, L'organizzazione dell'attività creditizia e l'utilizzo di tecniche di credit scoring nel sistema bancario italiano: risultati di un'indagine campionaria, Occasional paper No.12, Banca d'Italia.
- Alm, James R., and James R. Follain, 1987, Consumer demand for adjustable-rate mortgages, *Housing Finance Review* 1, 1-16.
- Arsham, Hossein, Deborah Ford and Joel N. Morse, 2008, The efficient market hypothesis in personal finance: choosing an adjustable or a fixed rate mortgage, *Journal of Global Business Issues* 2, 191-200.
- Bank of Italy, 2004 and 2006, Survey of Household Income and Wealth.
- Bank of Italy, 2007, Relazione per l'anno 2006.
- Bank of Italy, 2008, Relazione per l'anno 2007.
- Bank for International Settlement, 2006, Housing finance in the global financial market.
- Bank for International Settlement, 2005, Housing finance in Italy.
- Basciano, Peter M., Pamela Z. Jackson, and James M. Grayson, 2008, Mortgage choice: a review of the literature, *Journal of Personal Finance* 1, 42-67.
- Bonaccorsi di Patti, Emilia, and Roberto Felici, 2008, Il rischio dei mutui alle famiglie in Italia evidenza da un milione di contratti, Occasional papers No.32, Banca d'Italia.
- Bottiglia R., 2005, Il credito fondiario: normativa, implicazioni e prospettive, in Roberto Bottiglia, ed.: *Il mercato del credito fondiario* (Egea, Milan).
- Brucks, Brian, and Karen M. Pence, 2006, Do homeowners know their house values and mortgage terms?, Working Papers, Federal Reserve.
- Bru Eckner, Jan K., 1986, The pricing of interest rate caps and consumer choice in the market for adjustable-rate mortgages, *Housing Finance Review* 5, 119-136.
- Bru Eckner, Jan K., and James R. Follain, 1988, The rise and fall of the ARM: an econometric analysis of mortgage choice, *The review of economics and statistics* 70, 93-102.
- Bru Eckner, Jan K., 1993, Why we have ARMs?, *Journal of the American Real Estate and Urban Economics Association* 3, 333-345.

- Cacciamani, Claudio, 1995, *La domanda di credito all'edilizia abitativa*, in Roberto Bottiglia, ed.: *Il mercato del credito fondiario* (Egea, Milan).
- Campbell, John Y., and Joao F. Cocco, 2003, Household risk management and optimal mortgage choice, *Quarterly Journal of Economics* 118, 1449-1494.
- Campbell, John Y., 2006, Household finance, *The Journal of Finance* 4, 1553-1604.
- Casolaro, Luca, Leonardo Gambacorta, and Luigi Guiso, 2005, Regulation, formal and informal enforcement and the development of the household loan market. Lessons from Italy, Working Paper n. 560, Banca d'Italia.
- Commission of the European Communities, 2007, *White Paper on the Integration of EU Mortgage Credit Markets – Impact Assessment*.
- Cosma, Stefano, and Umberto Filotto, 2003, *La formica e la cicala: famiglie, credito e crisi*, in Giampio Bracchi, and Donato Masciandaro, ed.: *Oltre la crisi le banche tra le imprese e le famiglie – Ottavo Rapporto Fondazione Rosselli* (Bancaria Editrice, Rome).
- Coulibaly, Brahim, and Geng Li, 2007, Choice of mortgage contracts: evidence from the Survey of Consumer Finance, *Finance and Economics Discussion Series – Federal Reserve Board*.
- Cutts Crews, Amy, Richard K. Green, and Buchi Ramagopal, 2006, Mortgage contracts and household risk management, Paper presented at the AREUEA annual meeting
- Databank, 2007, *Competitors - Mutui Ipotecari*.
- Duffy, David, and Maurice J. Roche, 2005, Heterogeneous homebuyers, mortgage choice and the use of mortgage brokers, Working Paper Series - Department of Economics, Finance and Accounting, National University of Ireland.
- Dhillong, Upinder S., James D. Shilling, and C. F. Sirmans, 1987, Choosing between fixed and adjustable rate mortgages, *Journal of Money, Credit and Banking* 1, 261-267.
- Di Battista, Maria L., 1984, Sistema creditizio e finanziamento della casa: i risultati di un'indagine, Working paper, Università Cattolica del Sacro Cuore.
- Di Giuli, Alberta, Andrea Montefusco, Patrizia Monzeglio, and Anna Omarini, 2007, *Il mutuo casa, la banca e il cliente* (Bancaria Editrice, Rome).
- European Central Bank, 2009, *Housing finance in the euro area*, Occasional Paper No. 101.
- European Mortgage Federation, 2008, *A review of Europe's mortgage and housing markets*.
- European Mortgage Federation, 2006, *Study on interest rate variability in Europe*.
- Fabrizi, Pier L., 1977, *Il credito fondiario e il credito edilizio* (Franco Angeli, Milan).

- Filotto, Umberto, and Gianni Nicolini, 2007, Credito alla famiglia e consapevolezza dei consumatori: una proposta operativa, *Bancaria* 10, 2-17.
- Follain, James R., 1990, Mortgage choice, *American Real Estate and Urban Economics Association Journal* 2, 125-144.
- Gori, Massimo, and Elisabetta Gualandri, 1994, Il credito al settore immobiliare in Italia: evoluzione e prospettive, *Bancaria*.3, 16-25.
- Guiso, Luigi, and Monica Paiella, 2005, The role of risk aversion in predicting individual behaviour, Working Paper n. 546, Banca d'Italia.
- Hilgert, Marianne A., Jeanne M. Hogarth, and Sondra G. Beverly, 2003, Household financial management: the connection between knowledge and behavior, *Federal Reserve Bulletin*.
- Hoch, Stephen J., and George F. Loewenstein, 1991, Time inconsistent preferences and consumer self-control", *The Journal of Consumer Research* 4, 492-507.
- Kahneman, Daniel, 2002, Maps of bounded rationality: a perspective on intuitive judgment and choice, Nobel lecture.
- Kahneman, Daniel, 2000, Experience utility and objective happiness: a moment-based approach, in Daniel Kahneman, and Amos Tversky, ed.: *Choices, values and frames* (Cambridge University Press).
- Kahneman, Daniel, and Amos Tversky, 2000, Choices, values, and frames, in Daniel Kahneman, and Amos Tversky, ed.: *Choices, values and frames* (Cambridge University Press).
- Landi, Andrea, and Antonio Rigon, 1994, L'evoluzione del mercato a medio-lungo termine, *Bancaria* 1, 12-24.
- Liera, Marco, 2007, L'informazione finanziaria e il rapporto tra i risparmiatori e gli intermediari, in Andrea Beltratti, ed.: *XXV Rapporto sul risparmio e i risparmiatori in Italia* (Guerini e Associati, Milan).
- McFadden, Daniel L., 1999, Rationality for economists?, *Journal of Risk and Uncertainty* 1-3, 73-105.
- Miles, David, 2004, The UK mortgage market: taking a longer-term view. Final report and recommendations, Final report and Recommendations (HM Treasury, London).
- Moro, Ornella, 1995, L'offerta di credito all'edilizia abitativa, in Roberto Bottiglia, ed.: *Il mercato del credito fondiario* (Egea, Milan).
- Phillips, Richard A., and James VanderHoff, 1991, Adjustable versus fixed-rate mortgage choice: the role of initial rate discounts, *The Journal of Real Estate Research* 1, 39-51.

- Rossi, Paola, 2008, L'offerta di mutui alle famiglie: caratteristiche, evoluzione e differenze territoriali. I risultati di un'indagine campionaria, Occasional papers No 13, Bank of Italy.
- Sa-aadu, Jay, and C.F. Sirmans, 1995, Differentiated contracts, heterogeneous borrowers and the mortgage choice decision, *Journal of Money, Credit and Banking* 2, 498-510.
- Simon, Herbert A., 1997, *Models of bounded rationality, Vol. III* (The MIT Press).
- Szerb, Laszlo, 1996, The borrower's choice of fixed and adjustable rate mortgages in the presence of nominal and real shocks, *Real Estate Economics* 1, 43-54.
- Tversky, Amos, Shmuel Sattath, and Paul Slovic, 2000, Contingent weighting in judgment and choice, in Daniel Kahneman and Amos Tversky, ed.: *Choices, values and frames* (Cambridge University Press).
- Tversky, Amos, and Daniel Kahneman, 1981, The framing of decisions and the psychology of choice, *Science* 4481, 453-458.
- Valletta, Mario, and Paola Zocchi, 2007, I rapporti tra i risparmiatori e le banche, in Beltratti Andrea, ed.: *XXV Rapporto sul risparmio e i risparmiatori in Italia* (Guerini e Associati, Milan).
- Van Hemert, Otto, 2009, Household interest rate risk management, Working paper, New York University.
- van Els, Peter J.A., Jan W. van den End, and Maarten C.J. van Rooij, 2003, Financial behaviour of Dutch households: analysis of the DNB Household Survey 2003, BIS paper N.22.
- Vartia, Laura, 2006, Finland's housing market: reducing risks and improving policies, Working Papers No. 514, OECD.

Table 1 - Risk aversion and Mortgage choice

Logit model of mortgage choice decision. The dependent variable is equal to one for the ARMs. The independent variable (*RISK AVERSION*) has a value ranging from 1 to 4, depending on whether the households prefer investments that offer: very high returns, regardless of a high risk of losing part of their capital (*RISK AVERSION*= 1); a good return, with reasonable security for their invested capital (*RISK AVERSION*= 2); a reasonable return, with a good degree of security for their invested capital (*RISK AVERSION*= 3); low returns, without any risk of losing their capital (*RISK AVERSION*= 4).

Variables	Odds Ratios (z-test)	
	Survey 2004	Survey 2006
<i>RISK AVERSION</i>	1.08 (0,19)	-0,91 (-0,36)
Pseudo R ²	0	0
Number of obs	53	84

The coefficients are not significant.

Table 2 - Family income and number of family earners

The second column reports the Ols regression of the family income. The last column reports the Ols regression of the income per head.

Variables	Coefficients (t stat)	
	Dependent Variable <i>LNREDDITO</i>	Dependent Variable <i>LNREDDITO/NCOMP</i>
<i>NPERC</i>	0,16*** (3,81)	-0,24*** (-4,55)
<i>Constant</i>	9,90 (135,43)	9,58 (105,24)
Adj R ²	0,0147	0,0213
Number of obs	908	908

*** significant at the 1% level

Table 3 - Mortgage choice between ARM and FRM

Variables	Odds Ratios (z-test)	
	Equation (a)	Equation (b)
<i>YIELD CURVE</i>	3,08*** (7,48)	-
<i>DIFFERENTIAL</i>	-	1,41*** (5,02)
<i>FIX RATE</i>	3,04*** (13,43)	2,92*** (13,40)
<i>COMPETITION</i>	3,45*** (5,21)	3,14*** (5,00)
<i>MATURITY</i>	1,04** (2,29)	1,08*** (4,62)
<i>CONCESSIONAL RATE</i>	1,80*** (3,13)	1,76*** (3,06)
<i>LNAMOUNT</i>	1,65*** (3,07)	-
<i>NORTH</i>	1,66** (2,26)	1,73** (2,48)
<i>SOUTH</i>	-0,41*** (-3,24)	-0,40*** (-3,34)
<i>AGE</i>	-0,99 (-1,60)	-0,99 (-1,17)
<i>LOW EDUCATION</i>	1,79*** (2,80)	1,36 (1,52)
<i>PAYMENT/DISPOSABLE INCOME</i>	1,03 (0,85)	1,08** (2,04)
<i>FACTORY WORKER</i>	-0,49*** (-2,96)	-0,65* (-1,84)
<i>MANAGER</i>	1,29 (0,63)	1,56 (1,19)
<i>SELF-EMPLOYED</i>	-0,58** (-2,01)	-0,92 (-0,32)
<i>NUMBER WORKERS</i>	-0,57*** (-2,77)	-0,66** (-2,11)
<i>DEDUCTION</i>	-	-1,00*** (-4,06)
<i>INSURANCE</i>	1,66** (2,42)	1,72*** (2,65)
Pseudo R ²	0,379	0,353
Number of obs	908	908

Dependent variable equal to one for the ARMs. Coefficients significant: * 10% level, **5% level, ***1% level.

