PRICE SETTING ANOMALIES AND BANK PROFITABILITY CONCERNS IN THE ITALIAN RESIDENTIAL MORTGAGE MARKET

PAOLA ZOCCHI

Department of Economics and Business Studies

Università degli Studi del Piemonte Orientale "A. Avogadro"

Abstract

After the onset of the financial crisis, the discrepancy between interest rates on new residential mortgages and their reference rates has widened dramatically, moreover, since the third quarter of 2011, their normal relationship has broken down.

The aim of this work is to examine the determinants of this trend of new mortgages' interest rates and to set out the implications on bank profitability.

Outcomes from the empirical analysis show that, new mortgages interest rates increased as a result of a concurrent growth of credit risk charges and bank funding costs. Credit risk charges progressively increased starting from the begin of 2009, while the funding cost component boosted only in the fourth quarter of 2011, when an additional charge, which was related to the difference between long-term and short-term bank funding costs was added by Italian banks. As a result, since the end of 2011, the starting point for the interest rate setting of new mortgages does not coincide any longer with Euribor and Eurirs, although they still remain the formal reference rates. Therefore, in order to avoid unnecessary basis risk, a change of reference rate should be considered.

As a consequence of the fall in the Euribor and the increase in the cost of deposit, the net interest income related to the outstanding ARMs considerably shrank starting from 2009. The nature of the interest rate risk faced by Italian banks has also changed and should be carefully evaluated. To this end, a better matching of bonds maturity with the typical maturity of residential mortgages and the supply of fixed-rate mortgages with a fixation period lower than 10 years are desirable.

1. Introduction

Under normal market conditions, interest rates charged on new lending for residential mortgages follow the trend of their reference rate. In Italy, however, after the onset of the financial crisis, the relationship between new mortgages interest rates and their reference rates[1] has broken down.

The aim of this work is to examine the determinants of this anomalous trend of new mortgages' interest rates compared with that of their reference rates and to analyse its impact on Italian banks' net interest income.

The empirical analysis is divided into two parts. The first part explores the factors that may have influenced the trend of new mortgages interest rates in the aftermath of the financial crisis. To achieve this, interest rates on new adjustable rate mortgages (ARMs) and fixed rate mortgages (FRMs) will be decomposed into bank funding cost, credit risk charges and a residual component, following the analytical framework originally applied by Button (2010). The second part sets out the implications on bank profitability in the residential mortgage market by estimating Italian banks'interest margin on new mortgages and stock.

The paper's structure is as follows: section 2 discusses relevant literature on the determinants of lending interest rates; section 3 develops the empirical specification of the decomposition framework of new mortgage interest rate and presents the empirical results, section 4 analyzes the consequences for banks profitability, while section 5 summarises all of the main conclusions.

[1] The typical reference rate for ARMs is the 3-month Euribor and that for FRMs is a long-term Eurirs (having the same maturity of the mortgage).

2. Main concepts and relevant literature

After the onset of the financial crisis the discrepancy between interest rates on new residential mortgages and their reference rates has widened dramatically, moreover, since the third quarter of 2011, their normal relationship has broken down (Figure 1, for ARMs, and Figure 2, for FRMs).

Recent empirical contributions show that, as a consequence of the financial crisis, unusual behaviours of new mortgage interest rates had also occurred in other domestic market (Button (2010), Krainer (2010)). Outcomes from these analyses clearly underline that the main causes of such anomalous trends were liquidity shocks that affected bank funding.

The importance of bank funding cost in setting new mortgage interest rates also comes out from many other contributions not focussed on a financial crisis period (Hannan and Berger (1991), De Bondt (2002), De Graeve (2007), Vickery (2007), Rakanerud et al. (2011)). In particular, comparing the US and the UK mortgage markets, the analysis carried out by Vickery (2007) finds that US bank spreads on FRMs are considerably lower than those for the UK due to differences in bank funding between the countries[2].

Various contributions also analyze the influence on new lending price setting from other factors, such as the degree of competition (Mandelman (2006), Generali et al. (2010), Rakanerud et al. (2011)) and borrowers' credit risk (Kwark (2002), Amato and Remolona (2003) Cremers et al. (2005), Pederzoli and Torricelli (2005), Magri and Pico (2010), Vacca (2011)).

[2] More specifically US secondary market liquidity was traditionally favoured by Fannie Mae and Freddie Mac plans of purchase of mortgage back securities.

Using data from 124 countries for the years 1990-2000, Mandelman (2006) documents that cyclical fluctuations in bank spreads are related to changes in market power and competitive pressure within the sector. If banks have market power, Rakanerud et al. (2011) find evidence of incomplete pass-through from market interest rates to retail rates. While, Generali et al. (2010) highlight that the importance of preserving customer relationships could lead banks to smooth rates in order to shield borrowers from market rate fluctuations.

The impact of any variation in households financial situation on bank spreads is not clear cut. According to a forecasting approach, the economic cycle would follow a partly predictable pattern and the credit risk measure within interest rates would therefore grow before recessions, while, according to a random walk view, the irregular component of the cycle is predominant, making prediction difficult, as a result the credit risk charge within interest rates would basically reflect current economic conditions (Kwark (2002), Pederzoli and Torricelli (2005)).

The works by Amato and Remolona (2003) and Cremers et al (2005) also suggest that, in periods of economic expansion, banks may apply higher spreads with respect to historical default rates, because they incorporate an "insurance premium" against the risk that the quality of underlying debt experiences sudden systematic evolutions. In contrast, in economic downturns bank spreads may appear lower than those observed during expansion periods.

With reference to the Italian mortgage market, various contributions highlight a different scenario. During the period 2003-2008, the increase in households indebtedness and the rise in the interest payment burden occurred in parallel with the decline in bank spreads for ARMs and the increase in those for FRMs (Figure 3) (Rossi (2008), Infanti and Rossi (2009)). In contrast, the increase in bank spreads that occurred in mid-2011 was not

associated with a generalized deterioration of households' credit risk, because lending policies by Italian banks were more restrictive (Felici et al. (2012) and Magri and Pico (2012)). As a consequence of the above change in lending policies, Felici et al (2012) also find that mortgages originated in 2009 and 2010 show the lowest frequency of non-performing loans, while those originated in 2006, 2007 and 2008 show the highest.

The smaller spreads applied by Italian banks in the pre-crisis period may symbolize the surprise effect triggered by a crisis whose progress has been largely unforeseen, both in intensity and speed (Magri and Pico (2010), Vacca (2011)), while the higher spreads applied in the following periods may represent a compensation of previous estimation errors (Button (2010)). Moreover, since during periods of economic downturns the value of real estate possessions usually decreases (Resti and Sironi (2008)), expectations of lower recovery rates may reasonably induce banks to set higher credit risk charges.

Expectations of stricter regulation requirements on capital adequacy may also have affected interest rates on new lending. To this end, Button (2010) finds that, since the onset of the financial crisis, British banks seem to have anticipated the expected greater cost of capital over the life of the loans stemming from Basel III regulation, by increasing the relative capital charge in setting new lending interest rates.

Finally, institutional factors may also influence the level of bank spread. For instance, a number of research contributions investigate the relationship between the quality of legal enforcement of loan contracts and the allocation of credit to households. To this end, Fabbri and Padula (2004), Casolaro et al. (2005), Jappelli et al. (2005) and De Gasperis (2008) find that the performance of the judicial districts affects both the probability of being credit-

constrained and the amount of lending offered. In contrast, no clearcut effects are found regarding the level of interest rates.

3. Exploring the determinants of the increase in mortgage interest rates

3.1. Data and methodology

The empirical analysis decomposes new mortgage interest rates into three components: lenders' funding cost, credit risk charges and a residual component.

Data on interest rates, lending volumes, arrears and bank funding cost are taken from the statistical database of the Bank of Italy, in which they have been published on a periodical basis from different starting points. Thus, a calibration of the time period of the analysis was required. Since a complete set of the required data is available starting from 2004, the present analysis covers the period 2004-2012. Such a time period should allow us to capture the influences on interest rates setting under different market conditions. More specifically, three periods were isolated: the period from January 2004 up to the end of 2007, which was characterized by a buoyant residential mortgage market; the period comprised between 2008 and 2010, which was characterized by the international financial crisis and the period starting from 2011, in which the effects of the second stage of the crisis, related to sovereign debts, influenced the market.

The decomposition framework of new mortgage interest rates is based on the contribution by Button (2010), which is related to the UK households loan market. However, some relevant adjustments have been required in order to take into account country specific issues. In addition, differently from Button (2010), an analysis of the determinants of the residual component will be carried out by exploring the influence of two factors: the degree

of competition in the households loan market segment and the presence of a legal limitation on interest rates ceiling.

Section 3.2 and 3.3 describe the analytical framework respectively for the bank funding cost and the credit risk components. Section 3.4 discusses the main results.

3.2. Bank funding cost

Banks typically set new lending interest rates at a spread above their marginal funding cost (MFC).

Before the onset of the financial crisis, Italian banks were able to raise a large amount of funds over a short period through wholesale markets. The MFC typically used by Italian banks as a starting point to price new ARMs was the 3-month Euro Interbank Offered Rate (Euribor) (figure 5a). Regarding new FRMs, Italian banks usually managed interest rate risk by swaping the fixed-rate cash flows received from the borrowers into floating-rate cash flows (figure 6a). Therefore, the cost of the swap was reflected in the MFC, which was the 10-year Euro Interest Rate Swap (Eurirs).

As a consequence of the financial crisis, the scenario that has traditionally characterized the funding strategies of Italian banks has considerably changed.

Funding in interbank markets has become more and more difficult[3], due to banks' deteriorating confidence in their counterparts.

Italian banks have also experienced severe difficulties in issuing unsecured long-term debt in international markets (van Rixtel and Gasperini (2013)) and they have consequently

[3] This evidence is expecially true for larger banks, that were traditionally more dependent on the interbank money markets. Cf. Bank of Italy (2012).

increased their recourse to secured funding, such as covered bonds. In particular, mortgage-backed covered bonds have become the main source of long-term wholesale funding (ECBC (2013)). Between the second half of 2011 and the first half of 2012, as the sovereign debt crisis deepened, market access became more difficult even for secured bonds and Italian banks were forced to retain most of their bonds issued and to use them as collateral for ECB refinancing operations (Bank of Italy (2013b)). As a result, the dependence of the Italian banking system on central bank liquidity has progressively increased (Bank of Italy (2013a)).

As a consequence of the growing difficulties in raising funds through wholesale markets, the importance of the domestic market has progressively increased, in both short-term (Bank of Italy, (2013a)) and long-term funding (CONSOB (2013)).

The cost of funding has also been greatly affected by the financial crisis. As depicted in Figure 4, prior to the financial crisis Italian banks were able to raise additional funds in the wholesale market with little difference between long-term and short-term funding cost. Since December 2008, the long-term funding cost faced by Italian banks considerably increased and, starting from 2011, it became more strictly related to the cost of long-term treasury bonds than in the past (Cardillo and Zagnini (2012)). The cost of raising new domestic deposits widely increased too, as a result of a growing competition and of an increasing relevance of term deposits (Bank of Italy (2013b)).

The rise of the funding cost faced by Italian banks has hampered them in competing for new lending with foreign institutions, which were able to set lower mortgage interest rates. To this regard, a contribution by Felici et al. (2012) finds that the market share of the five major Italian banks in the residential mortgage market showed a 10% decrease in the period 2004-2010, while foreign banks enjoyed a 19% increase in their share over the same period.

In this new scenario, the cost of unsecured short-term wholesale funding has progressively lost its significance as the measure of banks' MFC for the setting of new mortgage interest rates. In fact, the issuance of retail bonds partially replaced short-term wholesale funding in the first stage of the crisis, while in the second phase the opportunity to use securitized instruments as collaterals in refinancing operations with the Eurosystem[4] fostered the issuance of mortgage-backed covered bonds.

Therefore, it seems reasonable that, since the onset of the financial crisis, the starting point for the setting of new mortgage interest rates was an average cost of long-term bonds rather than the Euribor. However, Italian banks did not update their pricing policies until the fourth quarter of 2011, probably because they originally considered the turmoil in wholesale markets as being of a temporary nature. On the contrary, the spread of the euro sovereign debt crisis and the European Central Bank's subsequent decision of carrying-out longer-term refinancing operations with a maturity up to 3 years put forward that the tensions in financial markets were likely to last for a period of time longer than expected.

On the basis of the above considerations, this research work assumes that, since the fourth quarter of 2011, Italian banks changed the MFC typically used to set new residential mortgages interest rates so that the average cost of long-term funding replaced the cost of short-term wholesale funding. More specifically, the MFC applied for the price setting of new ARMs is assumed to be an average yield of variable-rate bonds, while that for new FRMs it is assumed to be an average yield of fixed-rate bonds. Since Italian banks do not

[4] Basel III liquidity regulation also encourages banks to match mortgages maturity more closely with long-term funding. More specifically, Basel III delineates a bank liquidity regime based on two measures: the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR). In particular, the NSFR establishes a minimum acceptable amount of stable funding based on the liquidity characteristics of banks' assets over a one year horizon. NSFR and it will become a minimum standard by 1 January 2018. Basel Committee on Banking Supervision (2010).

issue new long-term debt on a regular basis, a 12-month average of the bond yield has been computed considering both wholesale and retail issuance.

In additions, as showed in Figure 5b and Figure 6b, in this new funding scenario, Italian banks manage the interest rate risk by matching cash flows received from borrowers with cash flows payed to investors, without using interest rate derivatives.

3.3. Credit risk charges

Credit risk includes two components: the expected loss (EL) and the unexpected loss or capital charge (UL). The first component takes into account the cost related to the most likely loss associated with the lending activity. The second component is related to the cost of holding capital to meet the possibility that losses might exceed estimation on EL.

This work estimates the credit risk charges on the basis of series of data on arrears, new defaults, recovery rates and loan-to-value, all of them published on a quarterly basis by the Bank of Italy. Therefore, it applies a backward-looking measure of credit risk[5].

In line with the well known specification, the EL is computed as the combination of three factors: the probability of default of the borrowers (PD), the loss given default (LGD), and the exposure at default (EAD).

$$EL_t = PD_t * LGD_t * EAD_t \quad (1)$$

[5] Although the estimation method applied is not very sophisticated, it seems appropriate to the purposes of this work, because for almost two thirds of the period under analysis the price setting of new lending was actually based on backward-looking credit risk estimations. Moreover, only at the end of the time period the greatest domestic bank received the Bank of Italy validation of their internal rating-based calculation method.

For the EAD the analysis adopts the full loan amount, since householders may default at any time during the mortgage duration and banks should include the whole exposure.

Since estimations on PD and LGD are computed by lenders and are not publicly available, the author has estimated their charges on the basis of data openly accessible from the statistical database of the Bank of Italy and on reasonable assumptions.

In accordance with the methodology adopted by Button (2010), PD is estimated calibrating data on arrears rates (arrears as a proportion of the outstanding loans for residential mortgages)[6] with a default rate (equation (2)). However, differently from Button (2010), that applies a constant 0.7 default rate for 75% loan-to-value (LTV) mortgages, the default rate applied in this work has been computed by the author on the basis of a 5-year average[7] of new defaults seen as a proportion of the outstanding loans for residential mortgages. Considering that the average LTV of Italian residential mortgages is significantly lower than 75% throughout all the period under analysis[8] and mortgages with higher

[6] In line with Basel II criteria, the present analysis applies an extensive definition of arrears, which comprises both bad debts (total loans outstanding to households who have been declared insolvent) and impaired loans (the amount of loans to households other than those classified as bad debts that have been overdue and overdrawn for more than 90 days.). Since the Bank of Italy database does not publish information on arrears and impaired loans specifically related to the residential mortgage contracts, these are approximated with data on arrears for guaranteed loans. To this end, it is likely that estimations on EL will result higher than those obtained by banks using a more detailed dataset related to their lending portfolio.

[7] For retail exposures the requirement banks must use at least five years of data to estimate loss characteristics. C.f. Basel Committee on Banking Supervision (2006) p.62.

[8] For the period 2003-2012 the average LTV for new residential mortgages varied from a minimum of 60.6% to a maximum of 73% (Bank of Italy (Statistical Bulletin - various years)), before 2003 it was even lower, around 55% (Casolaro et al. (2005)).

collateralisation generally show a lower probability of default[9], the default rate for the Italian residential mortgages is expected to be lower than that for the UK[10].

$$PD = \text{arrears rate}_t * \text{default rate} \quad (2)$$

For estimating LGD, data on LTV and recovery rates are required, since lenders will incur a loss only if the sums recovered are lower than the value of the backing collateral (equation (3)).

Data on LTV have been published on a quarterly basis by the Bank of Italy since the third quarter of 2008[11]. For the previous periods, the present analysis adopts the assumption of a yearly 1% growth since a peak of 70% in 2006, and a subsequent yearly 1% decrease. This hypothesis seems to tally with the information provided by Magri and Pico (2012) for the above period of missing data.

Only significantly out-of-date information on recorded recovery rates from defaulted loans is available from a survey conducted by the Bank of Italy in 1999[12]. This document gives a glimpse of the great ineffectiveness of the system governing Italian rules and procedures for creditor protection. The average duration of legal enforcement is roughly 6.3 years and the average effective recovery rate for all mortgage contracts is around 57%, while no specific information is provided on residential mortgages. Unfortunately, it is likely that the characteristics of the

[9] While LTV is not a measure of affordability, a lower LTV means that a borrower has larger financial resources for home purchase and, probably, also a higher income. Moreover a lower LTV should increase the willingness of a borrower to continue to meet mortgage payments. Button (2010) p. 177, Financial Services Authority (2009) p. 40.

[10] Throughout the period under analysis, the value of this coefficient varies from 0.29% to 0.49%, thus, as expected, it is constantly lower than the coefficient applied by Button (2010).

[11] Bank of Italy, Sample survey on the housing market in Italy, various years.

[12] Bank of Italy (2001).

Italian credit recovery system did not change a lot after 1999[13]. To this end, the present analysis applys a conservative estimate of 60% as a constant recovery rate.

$$LGD = \max (0;1 - (1/LTV) * 0.60) \quad (3)$$

The capital charge (CC) has been calculated taking into account the regulatory requirements from Basel I and II regulations, rather than on a economic capital basis (equation (4)):

$$CC = \text{Capital Requirement (CR)} * \text{Risk Weight (RW)} * \text{Cost of capital } (R_c) \quad (4)$$

However, instead of considering the 8% minimum capital requirement from the Basel I and II regulations, as in Button (2010), this analysis applies the average total capital ratios of the Italian banking system[14], with the aim of capturing the effect on new lending interest rate of the capital-strengthening efforts made by Italian banks following the onset of the financial crisis[15].

For the risk weights component, the coefficients from the standardised approach in Basel I and II regulations are applied[16].

For the cost of capital, in contrast with Button (2010), who places it at a constant 10% level, this analysis applies estimations on a monthly basis by the Bank of Italy (2012), which

[13] Cf. Cannata et al. (2012), p.13.
[14] Bank of Italy, Economic Bulletin, various years.
[15] Italian banks significantly strengthened their highest-quality capital resources, those best able to absorb losses, thanks to massive capital increases and, to a lesser extent, self-financing. Bank of Italy (2012). P.144.
[16] For residential mortgages the RW is 50% up to 2006 and 35% since 2007. Cf. Basel Committee on Banking Supervision (2006).

are available for the period January 2007-February 2012. Those estimations show a cost of capital which remained stable above the 10% level, since the third quarter of 2009, and more than 15%, during the second half of 2011. The cost of capital for the periods in which these estimations are not available, January 2004-December 2006 and March-December 2012, are estimated by the author using the CAPM method[17].

3.4. Results

This section discusses the results of the decomposition exercise. Considering the assumptions adopted in building this analytical framework, it is more useful to view the relative sizes of each component and their trends over time, rather than focusing on their absolute size at any particular point in time. The following subsection shows the results related to new ARMs interest rates, while paragraph 3.4.2 will discuss the outcomes for the FRMs side of the market.

3.4.1. Decomposing new ARMs interest rate

Figure 7 and 8 show the results of the decomposition framework of new ARMs interest rates. The two figures differ for the MFC used starting from the fourth quarter of 2011, which is the three-month Euribor in Figure 7 and an average bank adjustable-rate bond

[17] $E(R_c)$= Risk-free rate + beta * (E(market return) – Risk-free rate)
For the risk-free rate, since Italy abandoned the Lira in 2001 and this analysis covers the time period 2004-2012, it seems more proper to the author to apply a euro interest rate instead of the interest rate of Italian government bonds. The risk-free indicator here applied is therefore the 10-year Eurirs. For the risk premia, the 1980-2000 geometric mean returns estimated by Dimson et al. (2002) are applied.
The beta parameter is estimated by the author using a two years time series of data of the daily FTSE Mib and FTSE Italia All-Share Financials indices.
This CAPM method suffers from many limitations widely explained in literature (i.e. Damodaran (1999), however, it can be considered adequate for the purposes of the present work, because it is unlikely that banks apply more sophisticated methodology for their internal estimation of this component.

yield in Figure 8, while both of the figures use the three-month Euribor for the previous period.

Comparing Figure 7 and 8, it seems that the long-term MFC explains quite well the increase in the interest rate on new ARMs that occurred since the fourth quarter of 2011. Since the starting point for the interest rate setting of the new ARMs does not coincide with the Euribor any longer, a change of the reference rate would be desirable in order to avoid unnecessary basis risk (ECB (2013)). In particular, a reference rate that captures the banking sector funding costs should be preferable, as it could provide a proxy hedge against funding cost risks by passing the common bank funding cost risk on to the borrower[18].

The contribution to the price setting of new ARMs of the components that differ from the funding cost is better illustrated in Figure 9, which decomposes bank mark-up into three components: EL, UL and the smoothing effect related to the common practice of apply a three-months average of the idexation rate in setting ARMs interest rates.

As one can see, the decrease in mark-up, which occurred up to the end of 2008, mainly derives from the decline of the EL and UL components[19]. The smoothing effect also plays a role. In fact, in the period comprised between the end of 2005 and the third quarter of 2008, in which the Euribor sharply increased, it contributed to reducing mark-up (red area in Figure 9). Nevertheless, in the time period between September 2007 and October 2008, the mark-up applied by Italian banks was lower that that resulting from the present analytical framework,

[18] To this end "there is a wider question of whether the dominance of rates based on unsecured interbank markets is still economically appropriate. These markets have shrunk following the financial crisis, and the dispersion of bank credit risk has increased sharply, making average rates for unsecured interbank funding a less good proxy for bank funding costs. Moreover, the volatility of bank credit risk premia has made such rates a less appropriate proxy for risk free rates." Cf. BIS (2013) p.7.

[19] Those decreasing risk charges may symbolize the surprise effect triggered by a crisis whose progress has been largely unforeseen, both in intensity and speed. C.f. Magri and Pico (2010), Vacca (2011).

probably because they encouraged the supply of ARMs rather than FRMs, in order to take advantage from the positive effect on margin of a growing Euribor[20].

The smooting effect is the major determinant of the first jump in mark-up that occurred between November 2008 and March 2009 (green area in figure 9). Starting from the onset of the financial crisis, the EL and UL components also gradually increased, thus confirming the well known problem of procyclicality of backward-looking credit risk estimations. In particular, up to December 2012, the capital charge almost doubled, while the EL had a 30% increase up to December 2011, but then fell sharply, as a result of a wide reduction of LGD, which was determined by a decrease in LTV.

PD is strongly procyclical, as it is negatively correlated at 72% with the trend of new mortgages volumes (Figure 10). Since residential mortgages are characterized by very long maturities, a backward-looking PD freezes for many years credit risk estimations that could be greatly different from the risks really assumed by banks. During periods of economic growth, low PD estimations may encourage banks in pursuing expansive lending policies towards riskier borrowers, by setting inadequate credit risk charges, moreover, they give good reason for focusing on short-term returns, underrating possible severe consequences on long-term margins.

Therefore, a regulatory provision aimed to attenuate procyclicality could be welcome, if it is able to protect the banking sector from consequences of excessive credit growth[21].

[20] This aspect is the object of paragraph 4.

[21] To this end, the Countercyclical Capital Buffer (CCB), which is a component of the Basel III framework, is devoted to this object. The countercyclical buffer regime will be phased-in between 1 January 2016 and the year end 2018, becoming fully effective on 1 January 2019 (BCBS (2010).

3.4.2. Decomposing new FRMs interest rate

Figure 11 and 12 show the results of the decomposition exercise for the interest rates on new FRMs[22]. Figure 11 adopts the 10-year Eurirs for the whole time period, while Figure 12 applys a long-term MFC, starting from the fourth quarter of 2011. As for new ARMs, by comparing Figure 11 and 12, the main driver of the increase in the gap between the FRMs interest rates and their reference rates appears to be the stepping up of bank funding costs.

However, the decomposition framework does not seem to adequately explain the interest rate on new FRMs. In particular, it is possible to identify two distinct phases characterized by an interest rate which is considerably below the level resulting from the analytical framework (January 2004-March 2005 and January 2011-July 2011) and a period, comprised between January 2007 and August 2008, that shows an interest rate on new FRMs which is higher than that resulting from the analytical framework.

An analysis of the possible determinants of the above discrepancies has been performed. In particular, the influence of the degree of competition and the presence of legal cap on interest rates are explored. On the other hand, this work assumes that reorganization processes did not influence lending interest rates, since Italian banks' operating costs did not change significantly during the time period under analysis[23].

A simple OLS model has been performed (equation (5)) with the difference between the new FRMs interest rate and the interest rate resulting from the analytical framework as dependent variable (RESIDUALS).

[22] The present decomposition framework diverges from that applied for new ARMs only in the MFC component, because there are not significative differences in the credit risk charges evaluation, between ARMs and FRMs.

[23] Staff costs and other administrative expenses rose in 2008, 2010 and 2011, mainly for one-off items that included the cost of early retirement incentives, while the cost of wages and social security contributions remained unchanged since the onset of the financial crisis. Cf. Bank of Italy, Annual Report, various years.

As explanatory variables, the model uses two alternative variables for the degree of competition, the Herfindahl-Hirschman index (HHI) and an index of price heterogeneity (PHI), and two dummies for capturing the effects of the changes in the calculation method of the interest rate ceiling (FIRST-PHASE and THIRD-PHASE). The model also comprises the dependent variable at time t-1 (RESIDUALSt-1) as explanatory variable, in order to manage an autocorrelation problem[24](Wooldridge (2006)).

$$RESIDUALS_i = F(degree\ of\ competition_{ji}, FIRST\text{-}PHASE_i, THIRD\text{-}PHASE_i, RESIDUALSt\text{-}1_i) + e_i \quad (5)$$

The HHI of the household loan segment is a proxy of the degree of concentration of the banking system, published on an annual basis by the Bank of Italy[25]. The index of price heterogeneity is computed by the author as the standard deviation from the average Effective Annual Percentage Rates (EAPR)[26] of new FRMs for the five main geographical areas of the country. The main advantage of this second index is that it is directly related to the FRMs market. Moreover, since data on EAPR are provided on a quarterly basis, it allows us to appreciate any variation in the degree of competition with a more frequent recurrence than HHI. Its main limitation is that it comprises all the up-front fees related to the mortgage

[24] The delayed dependent variable is significant in both model specifications. It alternatively means that lenders are likely to smooth over any fluctuation in interest rate in setting the price on new lending or, that lenders are inclined to compensate for estimation errors, made in the previous period, with the fixing of new lending prices. Cf. Generali et al. (2010); Button (2010).

[25] It is defined as the sum of the squares of the bank market shares, calculated using consolidated data for banking groups (with reference to Italian units only) and individual data for banks not belonging to a group. Bank of Italy (2011).

[26] It is the conventional summary of the cost of credit and it comprises all the up-front fees related to the mortgage contract (origination fees, monthly service charges and insurance premiums) and the compound interest rate, calculated across a year. For new term loans, banks report the EAPR of charge (as defined in Directive 87/102/EEC).

contract (origination fees, monthly service charges and insurance premiums), thus every observable variation in it is not directly related to the setting of interest rate conditions.

Figure 13 shows the HHI and the PHI during the period under analysis.

Since it is likely that, with a higher degree of competition (lower value of the HHI and higher value of the PHI), banks are forced to reduce their markup, interest rates on new FRMs are likely to be lower than those resulting by adding up all the components of marginal cost. In contrast, with more market power (characterized by a higher value for the HHI and lower value for the PHI) interest rates on new FRMs are likely to be higher that those resulting after adding up all the components of marginal cost. Consequently, the expected sign for the HHI is positive and that for the PHI is negative.

Regulation on usury interest rates imposes a legal limitation on capping interest rates, that is published every three months by the Ministry of the Treasury, giving data for different categories of lending contracts[27].

Up to June 2004, residential mortgages interest rates had been capped without distinction between FRMs and ARMs. Since the cap was particularly limiting for FRM contracts (Figure 14), starting from July 2004, a separate ceiling for both FRMs and ARMs was imposed. A further modification in the calculation formula, which came into effect in July 2011, allowed for a wide increase in the ceiling for each type of mortgage contract.

Considering the aims of the present investigation, focusing on the variation of the calculation criteria offers us more information than does merely tracking the absolute value of the ceiling. To this end, the following two dummies were built: FIRST-PHASE, which

[27] Law 108/1996 introduced a cap on new lending interest rates.

assumes the value 1 for the period January-June 2004, and THIRD-PHASE, which is used for the period starting from July 2011.

The hypothesis related to the FIRST-PHASE dummy is that, since the ceiling for FRMs was particularly restrictive for the period ending June 2004, it is likely that interest rates applied on new FRMs were lower than those resulting after considering all the components of marginal cost. Thus the expected sign for the FIRST-PHASE dummy is negative.

On the contrary, the expected sign for the THIRD-PHASE dummy is positive because it is likely that, after the relaxation of the legal limitation on interest rates, banks have increased their mark-up.

Table 1 displays the results of equation (5). Both model and explanatory variables are significant. Moreover, all the signs of the explanatory variables confirm expectations.

Some special attention should be afforded to the FIRST-PHASE dummy. This variable is significant in the first specification of the model (those with the HHI as proxy of the degree of competition, see column 2 of table 1) but it is not significant in the second specification of the model (those with the PHI, see column 3 table 1). To this end, it is worth remembering that the price heterogeneity index takes into account all the components of cost associated with a mortgage contract, which are related to different factors from those affecting interest rates. These components are less, or not at all, restrained by legal limits and transparency requirements. Therefore, it is likely that in the period January-June 2004 Italian banks balanced the restrictions which they used to set their interest rates, by increasing other components of the total cost. For this reason, the PHI could overestimate the effect already captured by the dummy FIRST PHASE. Looking at Figure 13, the period ending in June 2004 was characterized by a high value for the price heterogeneity index, but, immediately

after the relaxation in the interest rate ceiling, the price heterogeneity considerably decreased. As expected, the outcomes of the OLS model are not affected by dropping the FIRST PHASE dummy from the explanatory variables (table 2).

In conclusion, the above analysis suggests that particularly strict legal limitations on interest rates may keep the interest rate setting by banks under the level obtaining carefully considering funding costs and credit risk charges. In addition, a low degree of competition appears compatible with new mortgage interest rates above the level resulting adding up all the components of marginal cost. However, this evidence only emerges in the period 2007-2008, when the highest degree of market concentration in the households loan segment existed. Moreover, since in the same period high negative residuals resulted from the ARMs analytical framework, a compensation policy between the price setting of ARM and FRM had possibly occurred.

4. Exploring the consequences on bank profitability

Under normal market conditions, banks are able to pursue their lending objectives without affecting their margin, by appropriately setting mark-down and mark-up.

Since the onset of the financial crisis, disruptions in wholesale markets have seriously affected Italian banks' margin. Moreover, the simultaneous fall in short-term interest rates and increase in the degree of competition in raising new deposits (Bank of Italy (2013b))[28] has considerably reduced profitability on both new mortgages and stock.

[28] The HHI for deposit is computed by the Bank of Italy and published in everyAnnual Report.

Figure 15 shows the evolution of Italian banks' interest margin on new residential mortgages over marginal composite deposit rate (MCDR)[29] for the period 2003-2012. Taking the 3-month Euribor as reference rate, banks'margin has been also decomposed in mark-up and mark-down.

The banks'margin on new mortgages increased between 2006 and 2008, at the same time as Euribor was growing, while it shrank, after the onset of the financial crisis, when Euribor collapsed. Italian banks reached the pre-crisis margin only in the first half of 2012, after they added a funding spread in the price setting of new lending (paragraph 3.2). The mark-down and the mark-up are negatively correlated, although the fluctuations of the mark-down were larger than those of the mark-up.

Consequences for the margin related to the outstanding volume of residential mortgages were more severe. This work carries out an attempt to document this effect. The analysis was run for the ARMs and FRMs separately, in order to capture how their returns were differently affected by the crisis.

Since there is no publicly available data concerning the composition of the outstanding volume of residential mortgages in terms of their origination date, residual duration of the contracts and applied pricing conditions, the present analysis is based on some reasonable assumptions.

[29] The marginal composite deposit rate (MCDR) weights the interest rates on new business in deposits of households and non-financial corporations across maturities with the new business volumes for time deposits, and for savings deposits with the total deposit amounts outstanding. ECB (2009) computes a MCDR also including overnight deposits.

Firstly, the analysis estimates bank net interest income by applying the mortgage volume and the pricing conditions at the time of signing[30]. Since data on new mortgages are available starting form January 2003 and the latest data published at the time when this work was carried out are related to December 2012, the analysis is based on the contracts taken out in the period January 2003-December 2012. Therefore, both ARMs and FRMs are been divided into 120 pools, having the month of their signing as a basis.

Secondly, the present analysis assumes that the original maturity of the mortgage contrats was 20 years[31] and that borrowers regularly reimburse constant principal payments on a montly basis. Though it is not realistic to think that all the contracts had such a long maturity, this hypothesis is acceptable, considering that the average duration of Italian residential mortgages is roughly 20 years (Bank of Italy (2012)).

Then, the interest income has been computed on a monthly basis for both ARMs and FRMs contracts. Finally, bank net interest income has been estimated by deducting a monthly average composite deposit rate (ACDR), which was computed on the basis of data from the statistical data base of the Bank of Italy, from the monthly interest income.

Results are displayed in Figure 16.

Margins on the outstanding volume of residential mortgages are influenced by fluctuations in the Euribor, because up to the onset of the financial crisis Italian banks tipically get floating-rate basis cash flows from both ARM and FRM contracts. For the above reason, the net interest income on both the contractual types shows similar trends along all the time period.

[30] Interest rates, for the FRMs, and the bank spread over the reference rate. for the ARMs, are taken as constant throughout the duration of the contract, thus assuming that no renegotiation procedures have occurred during the period under analysis.

[31] For FRMs, the analysis is focused on the contracts with more than 10 years fixation period.

Nevertheless, the margin on ARMs was higher than that on FRMs during the first half of the time period, since, between the begin of 2004 and the first quarter of 2005, bank spreads on new FRMs were smaller than those of new ARMs (paragraph 3.4.2).

Between 2009 and 2012, the bank margin on ARMs (blue line in Figure 16) considerably shrank, as a consequence of the fall in the Euribor and the increase in the ACDR. Lending policies also played a role in reducing bank margin, since, during the pre-crisis period, Italian banks, progressively shrank mark-up. As one can see in Figure 17, the average interest rate on the outstanding ARMs varies on the basis of the year of signing and was at the lowest level for the contracts taken out in 2007 and 2008.

After the onset of the financial crisis, the bank margin on the FRM contracts (yellow line in Figure 16) became larger than that on ARMs because many banks began to manage the interest rate risk on new FRMs by matching asset-liability cash flows, without swapping their fixed interest payments with floating-rate basis cash flows as they typically did before (paragraph 3.2). In this way, they smoothed the negative effect on the interest income resulting from the basis risk related to Euribor.

The net interest income related to the whole portfolio of residential mortgages (Figure 16 – dotted line) was mainly influenced by the performance of the ARM contracts, since they account between 67% and 89% of the outstanding mortgages along all the time period.

The increased profitability of the contracts taken out in 2011 and 2012 (Figure 15) have had a limited effectiveness in preventing the fall in the margins related to the stock of mortgages, because the volume of mortgages signed up in that period was inferior to that from the pre-crisis period.

In addition, the nature of the interest rate risk faced by Italian banks has changed as a consequence of their new funding strategies and should be carefully evaluated. The increased recourse to long-term bonds has favoured a decrease in Italian banks'asset-liability maturity mismatch. However, the mismatch still remains significant, since the average maturity of new mortgages is 22 years (Bank of Italy (2013b)), while the average maturity of bank bonds is less than 5 years (van Rixtel and Gasperini (2013)). The maturity mismatch could affect Italian banks' net interest income in two ways.

Starting from the onset of the financial crisis, new FRMs are normally funded with fixed rate bonds with a significant maturity mismatch. Moreover, the typical fixation period of new FRMs, in Italy, is greater than 10 yeas (ECB (2009)). Therefore, if long-term interest rates increase, the interest rate of the new bond issuance could be greater than that on the outstanding FRMs.

Moreover, if short-term interest rates increase in the medium-term, householders with an ARM taken out since 2011 with high bank spreads are likely to face financial constraints. In such a situation, banks would probably favour a renegotiation of previous interest rate conditions but, this way, the interest cash flow that they receive from the borrowers would probably turn out to be lower than the cash flow they have to pay on their bonds.

On the basis of the above considerations, if this funding strategy is still followed in the future, the supply of FRMs with a lower fixation period could be preferable. In this way, Italian banks could reduce their interest rate risk exposure by matching the bond maturity with the interest rate fixation of the new FRMs. Moreover, since in normal market conditions an FRM with a fixation period of 5 years has a lower interest rate than an FRM with a fixation period greater than 10 years, the demand for FRMs could be favoured. In fact,

literature highlights that the level of the spread between FRMs and ARMs interest rates is the main determinant of borrowers' choice between fixed and adjustable rate contracts (Alm and Follain (1987), Tucker (1989), Phillips and VanderHoff (1991), Campbell and Cocco (2003), Paiella and Pozzolo (2007), Zocchi (2013)). Therefore, a lower spread is likely to reduce the preference for ARMs that typically characterize the Italian mortgage market. Italian bank could this way attenuate the negative effect on their net interest income resulting from the basis risk.

5. Conclusions

Outcomes from the empirical analysis show that, since the onset of the financial crisis, new mortgages interest rates increased as a result of a concurrent growth of credit risk charges and bank funding costs. More specifically, credit risk charges progressively increased starting from the begin of 2009, while the funding cost component boosted only in the fourth quarter of 2011, when an additional charge, which was related to the difference between long-term and short-term bank funding costs and accounted roughly 1.1% in December 2011 and 2.4% in December 2012, was added in the price setting of new residential mortgages by Italian banks. In contrast, the empirical analysis does not find any positive effect on new mortgage interest rate resulting from the two non-standard longer-term refinancing operations that the ECB carried out in December 2011 and February 2012.

As a result, since the end of 2011, the starting point for the interest rate setting of new ARMs and FRMs does not coincide any longer with, respectively, Euribor and Eurirs, although Euribor and Eurirs still remain the formal reference rates. Consequently, in order to avoid unnecessary basis risk for Italian banks, a change of reference rate should be

considered. To this end, a reference rate that captures banking sector funding costs would be desirable. Although the design of a new-generation of reliable reference rates is not only an Italian issue, it represents a challenging concern for the Italian banking system. In fact, if Italy maintains a greater country-specific risk, the replacement of current reference rates with others which represent the whole euro area may not be indicative of Italian bank funding cost. In contrast, the adoption of domestic reference-rates is likely to arise liquidity constraints, like a limited ability to readily trade, and to increase the cost of information.

As regards the credit risk charges, the analysis confirms the well known problem of procyclicality. In the credit growth phase comprised between January 2003 and July 2007, credit charges were low and decreasing, while, since the onset of the financial crisis, they gradually increased. In particular, between September 2008 and December 2012, the capital charge almost doubled, while, the expected loss showed a 30% increase between September 2008 and December 2011, but then fell sharply, as a result of a wide reduction of LGD, which was determined by a decrease in LTV.

The present analysis also highlights that the use of a backward-looking probability of default (PD) could produce some undesirable consequences. Since residential mortgages have very long maturities, a backward-looking PD freezes for many years credit risk estimations that could greatly differ from the risks really assumed by banks. In particular, during periods of growth, low PD estimations may encourage banks in pursuing expansive lending policies towards riskier borrowers with inadequate credit risk charges. Thus, a backward-looking PD could give a good reason for focusing on short-term returns, underrating possible severe consequences on long-term margins. To this end, the analysis shows that, during 2007 and

2008, a decreasing PD favoured expansive lending policies that played a role in cutting profitability from the residential mortgage portfolio in the subsequent periods.

On the contrary, during periods of downturn, a high PD often goes hand in hand with restrictive lending policies, thus discouraging the demand for new mortgages. The empirical analysis highlights that such a situation has occurred in the Italian mortgage market after the onset of the financial crisis.

This work also carries out an attempt to document how disruptions in wholesale markets have affected Italian banks' net interest income. In particular, as a consequence of the fall in the Euribor and the increase in the cost of deposit, the net interest income related to the outstanding ARMs considerably shrank starting from 2009. Moreover, the net interest income related to the whole portfolio of residential mortgages was mainly influenced by the performance of the ARM contracts, since they account between 67% and 89% of the outstanding mortgages along all the time period.

Finally, the analysis sheds some light on the risk of unwanted cash flow mismatches arising from the implementation of hedging strategies for asset-liability management purposes by Italian banks. To this end, a better matching of bonds maturity with the typical maturity of residential mortgages is desirable. Moreover, a reduction of the incidence of the ARMs in the portfolio of residential mortgages could attenuate the negative effect on the interest income resulting from banks' current exposure to basis risk. To this end, a change of the relative convenience of choosing an ARM over an FRM, that characterizes the Italian mortgage market is advisable. The supply of FRM contracts with a lower fixation period could be a step forward in this direction.

References

Alm, J.R. and Follain, J.R., 1987, Consumer demand for adjustable-rate mortgages, *Housing Finance Review*, Vol. 1, pp. 1-16.

Amato, J., and Remolona E., 2005, The Pricing of Unexpected Credit Losses, BIS Working Papers, No 190.

Bank of Italy, 2001, Bollettino di vigilanza, N. 12.

Bank of Italy, Economic Bulletin, various years.

Bank of Italy, Sample survey on the housing market in Italy, Statistical Bulletin, various years.

Bank of Italy, 2012, 2011 Annual Report.

Bank of Italy, 2013a, Financial Stability Report, No 5.

Bank of Italy, 2013b, 2012 Annual Report.

Bank for International Settlement, 2013, Towards better reference rate practices: a central bank perspective.

Bank for International Settlement, 2005, Housing Finance in Italy.

Bank for International Settlement, 2006, Housing Finance in the global financial market.

Basel Committee on Banking Supervision, 2006, International Convergence of Capital Measurement and Capital Standards, Bank for International Settlement.

Basel Committee on Banking Supervision, 2010, Guidance for national authorities operating the countercyclical capital buffer, Bank for International Settlement.

Bonaccorsi di Patti, E., and Felici R., 2008, Il rischio dei mutui alle famiglie in Italia evidenza da un milione di contratti, Occasional papers No.32, Banca d'Italia.

Button, R., 2010, Understanding the price of new lending to households, Quarterly Bulletin, Bank of England, 2010 Q3.

Campbell, J.Y. and Cocco, J.F., 2003, Household risk management and optimal mortgage

choice, *Quarterly Journal of Economics*, Vol. 118, pp. 1449-1494.

Cannata, F., Casellina S., and Giudi G., 2012, Inside the labyrinth of Basel risk-weighted assets: how not to get lost, Occasional Paper n. 132, Bank of Italy

Cardillo, Andrea, and Andrea Zagnini, 2012, Recent trends in long-term bank funding, Occasional Paper n. 137, Bank of Italy.

Casolaro, L., Gambacorta L., and Guiso L., 2005, Regulation, formal and informal enforcement and the development of the household loan market. Lessons from Italy, Working Paper n. 560, Bank of Italy.

Commission of the European Communities, 2007, White Paper on the Integration of EU Mortgage Credit Markets – Impact Assessmen.

CONSOB, 2013, Relazione per l'anno 2012.

Cremers M., Driessen J., Maenhout P., Weinbaum D., 2005, Explaining the Level of Credit Spreads: Option-Implied Jump Risk Premia in a Firm Value Model, BIS Working Papers N. 191.

De Bondt, G., 2002, Retail bank interest rate pass-through: New evidence at the Euro area level, ECB Working Papers, No 136.

De Gasperis, 2008, Better foreclosures make for better access to mortgage lending, *Housing Finance International* 22, No. 3, 35-40.

De Graeve, F., De Jonghe O., and Vennet R.V., 2007, Competition, transmission and bank pricing policies: Evidence from Belgian loan and deposit markets, *Journal of Banking and Finance*, 31, 259.278.

European Central Bank, 2009, Housing finance in the euro area, Occasional Paper No. 101.

European Central Bank, 2012a, Monthly Bulletin, April 2012.

European Central Bank, 2012b, Financial Stability Review, December 2012.

European Central Bank, 2013, Financial Stability Review, May 2013.

European Covered Bond Council, 2013, 2012 European Covered Bond Fact Book.

European Mortgage Federation, 2008, A review of Europe's mortgage and housing markets.

European Mortgage Federation, 2006, Study on interest rate variability in Europe.

Fabbri, D., and Padula M., 2004, Does poor legal enforcement make households credit-constrained?, *Journal of banking & Finance* 28, 2369-2397.

Felici, R., Manzoli E., and Pico R., 2012, La crisi e le famiglie italiane: un'analisi microeconomica dei contratti di mutuo, Occasional Paper n. 125, Bank of Italy.

Financial Services Authority, 2009, Mortgage market review, Discussion Paper No. 3.

Hannan, T., and Berger A., 1991, The rigidity of prices: Evidence from banking industry, American Economic Review, 81, 938.945.

Infante, L., and Rossi P., 2009, L'attività retail delle banche estere in Italia: effetti sull'offerta di credito alle famiglie e alle imprese, Bank of Italy Working paper, N. 714.

Jappelli, T., Pagano M., and Bianco M., 2005, Courts and banks: effects of judicial enforcement on credit markets, *Journal of Money, Credit and Banking*, Vol 37, No. 2, 223-244.

Krainer, J., 2010, Mortgage choice and the pricing of fixed-rate and adjustable-rate mortgages, FRFSF Economic Letter.

Kwark, N.S., 2002, Default Risks, Interest Rate Spreads, and Business Cycles: Explaining the Interest Rate Spread as a Leading Indicator, *Journal of Economic Dynamics & Control*, 26, pp 271–302.

Mandelman, F., 2006, Business cycles: a role for imperfect competition in the banking System, Federal Reserve Bank of Atlanta Working Paper, No 21.

Magri, S., and Pico R., 2010,The rise of risk-based pricing of mortgage interest rates in Italy, Bank of Italy Working Paper, No 778.

Magri, S., and Raffaella Pico, 2012, L'indebitamento delle famiglie italiane dopo la crisi del 2008, Occasional Paper n. 134, Bank of Italy

Paiella, M. and Pozzolo, A.F., 2007, Choosing between fixed and adjustable rate mortgages, Economics & Statistics Discussion Paper No. 33/07, Universita` degli Studi del Molise, Campobasso.

Pederzoli, C, and Torricelli C, 2005, Capital Requirements and Business Cycle Regimes: Forward-looking Modelling of Default Probabilities, *Journal of Banking and Finance*, No 29, pp 3121–3140.

Petersen, M.A., and Rajan R.G., 1995, The Effect of Credit Market Competition on Lending Relationships, *The Quarterly Journal of Economics*, Vol. 110, No. 2, pp. 407–443.

Phillips, R. A., and VanderHoff J., 1991, Adjustable versus fixed-rate mortgage choice: the role of initial rate discounts, *The Journal of Real Estate Research* 1, 39-51.

Raknerud, A., Bjørn H. V., and Ketil Rakkestad, 2011, How do banks' funding costs affect interest margins?, Norges Bank Working paper n. 9.

Resti, A., Sironi, A., 2008, *Rischio e valore nelle banche*, Egea.

Rossi, P., 2008, L'offerta di mutui alle famiglie: caratteristiche, evoluzione e differenze territoriali. I risultati di un'indagine campionaria, Occasional papers n. 13, Bank of Italy.

Tucker, M., 1989, Adjustable-rate and fixed-rate mortgage choice, a logit analysis, *The Journal of Real Estate Research*, Vol. 4 No. 2, pp. 81-91.

Vacca, V., 2011, An unexpected crisis? Looking at pricing effectiveness of different banks, Working paper n., 814, Bank of Italy.

Van Rixtel, A., and Gasperini G., 2013, *Financial crises and bank funding: recent experience in the euro area*, Bank for International Settlements, Working Paper No 406.

Vickery, J., 2007, Interest rates and consumer choice in the residential mortgage market, Federal Reserve Bank of New York and JYU Stern.

Wooldridge, J. M., 2006, *Introductory Econometrics. A modern approach*, Thomson South-Western.

Zocchi, P, 2013, Why do Italian households prefer adjustable-rate mortgages?, *Journal of European Real Estate Research*, Vol 6 No.1, pp. 90-110.

Table 1 – Determinants of the residuals related to the FRMs analytical framework

	Equation (1a)	**Equation (1b)**
	Coefficients	Coefficients
Variables	(t-stat)	(t-stat)
HHI	1.10***	-
	(3.61)	-
PHI	-	-0.47**
	-	(-2.82)
FIRST PHASE	-0.21**	0.17
	(-2.49)	(1.34)
THIRD PHASE	0.14**	0.11**
	(2.60)	(2.12)
RESIDUALS t-1	0.61***	0.68***
	(8.66)	(10.37)
Constant	-1.14**	0.12**
	(-3.61)	(2.54)
Adjusted R-squared	0.7521	0.7407
Number of observations	107	107

Dependent variable: RESIDUALS

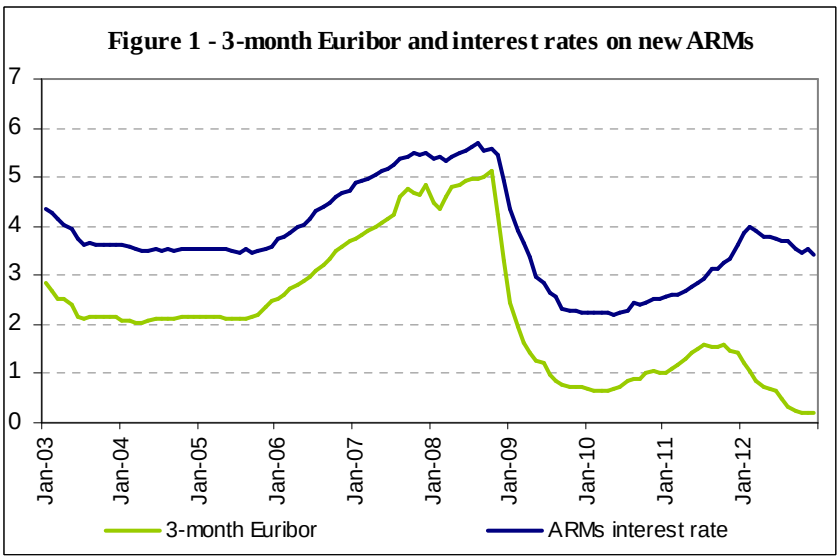
*** significant at 1% level; ** significant at 5% level

Table 2 – Determinants of the residuals related to the FRMs analytical framework without the FIRST PHASE dummy variable

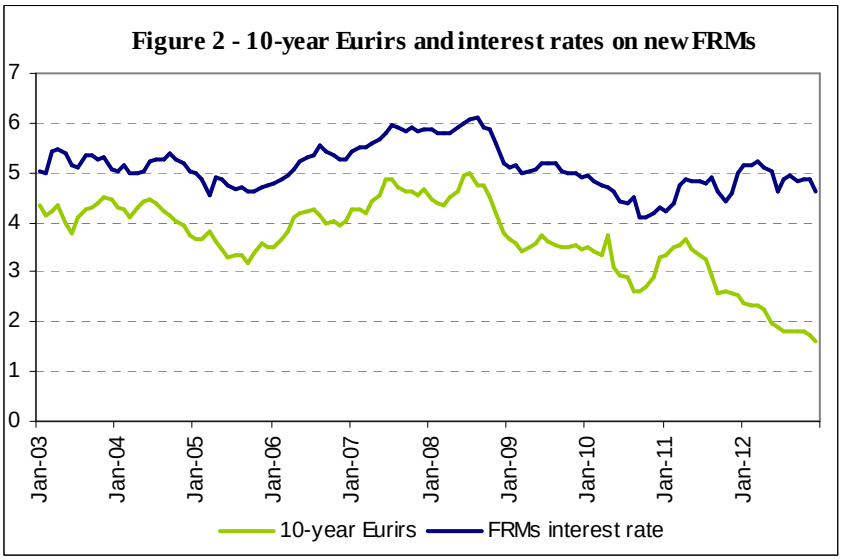
Variables	Coefficients
	(t-stat)
PHI	-0.30**
	(-2.78)
THIRD PHASE	0.08
	(1.66)
RESIDUALS t-1	0.69***
	(10.56)
Constant	0.08**
	(2.21)
Adjusted R-squared	0.7361
Number of observations	107

Dependent variable: RESIDUALS

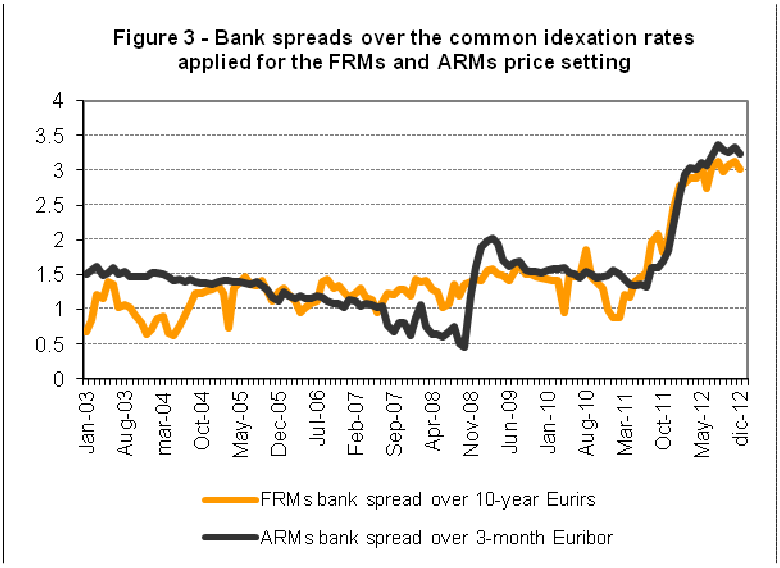
*** significant at 1% level



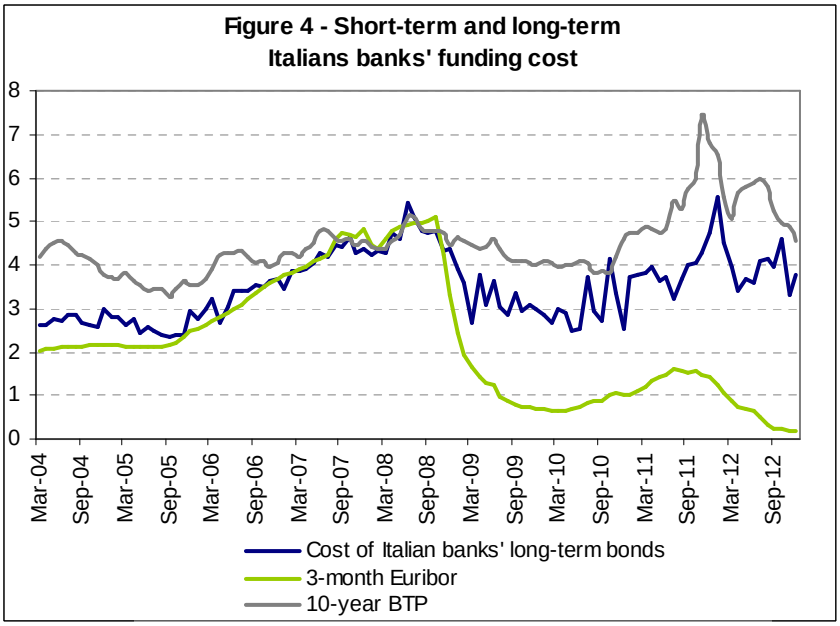
Sources: Bank of Italy and European Banking Federation



Sources: Bank of Italy and European Banking Federation



Sources: Bank of Italy, European Banking Federation and author calculations



Sources: Bank of Italy, European Banking Federation and Ministry of the Treasury

Figure 5a – Pre-crisis Marginal Funding Cost on new ARMs

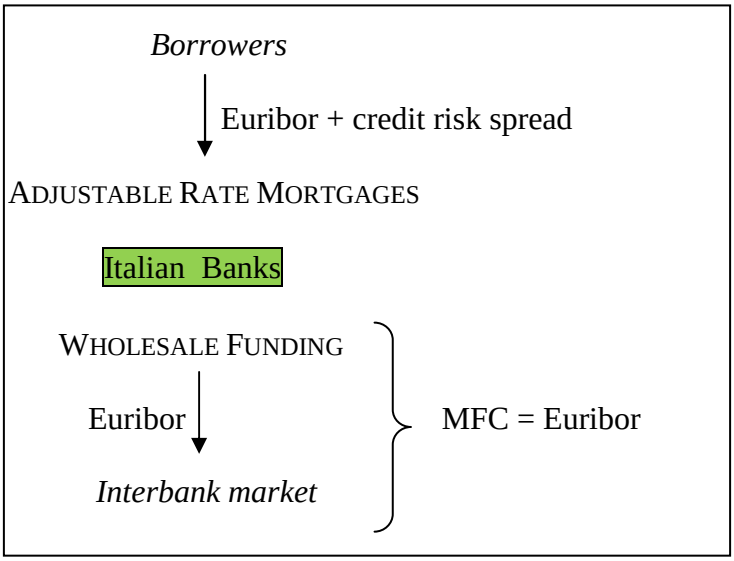


Figure 5b – Marginal Funding Cost on new ARMs after the onset of the financial crisis

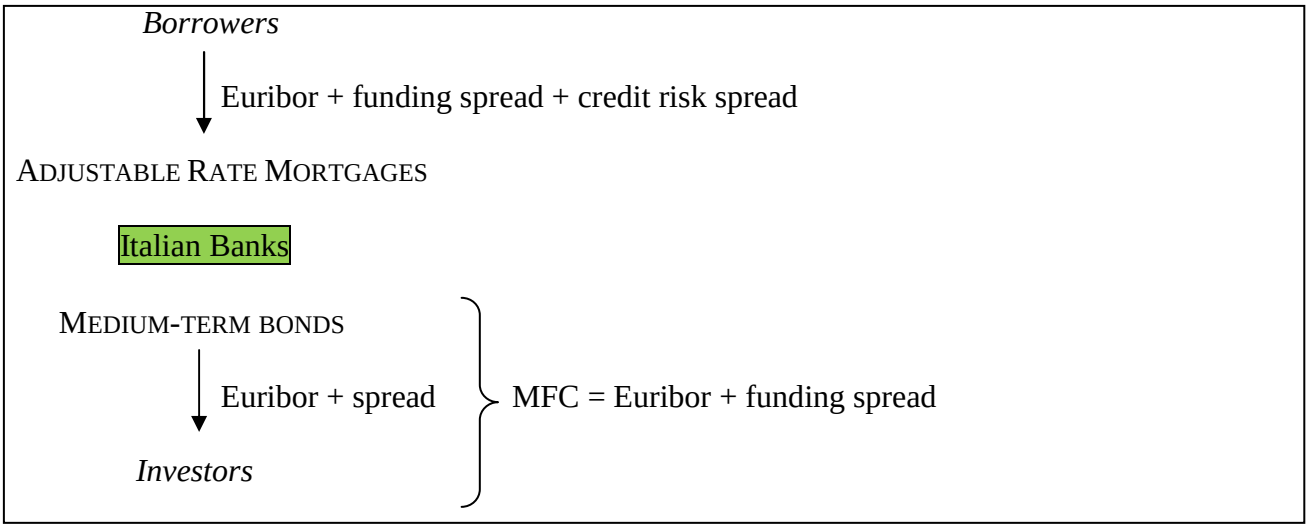


Figure 6a – Pre-crisis Marginal Funding Cost on new FRMs

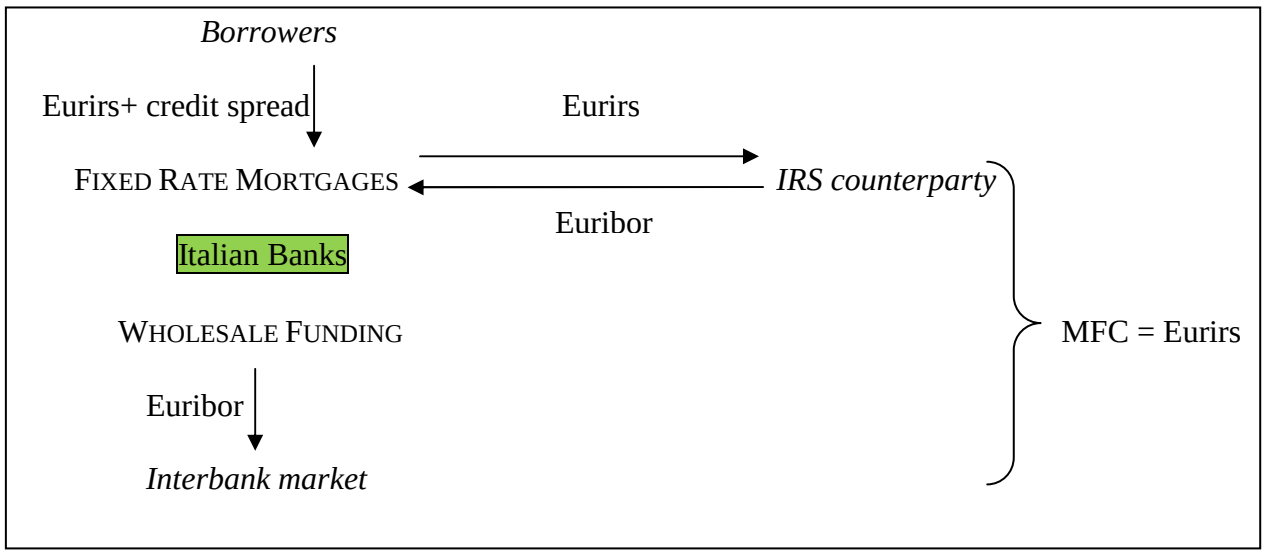
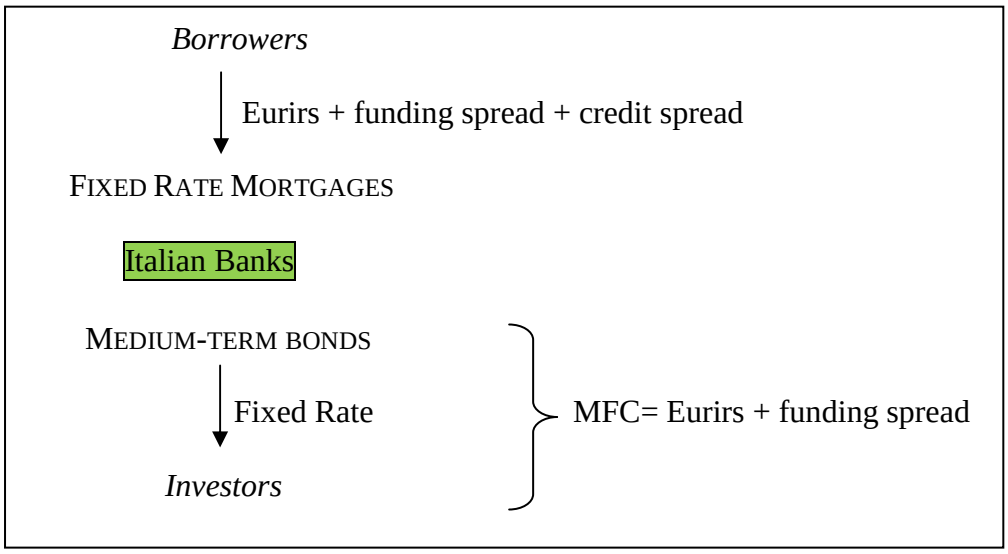
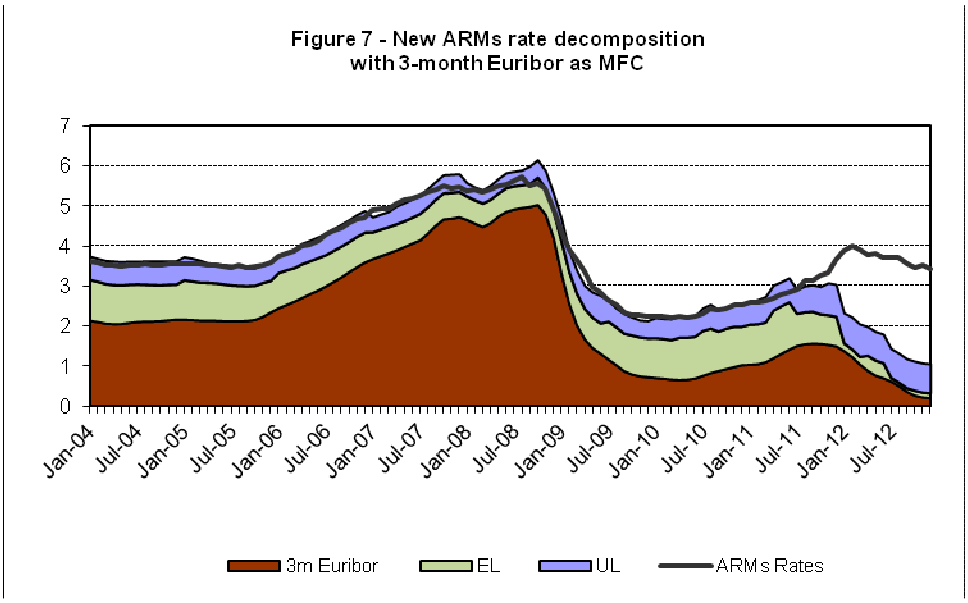
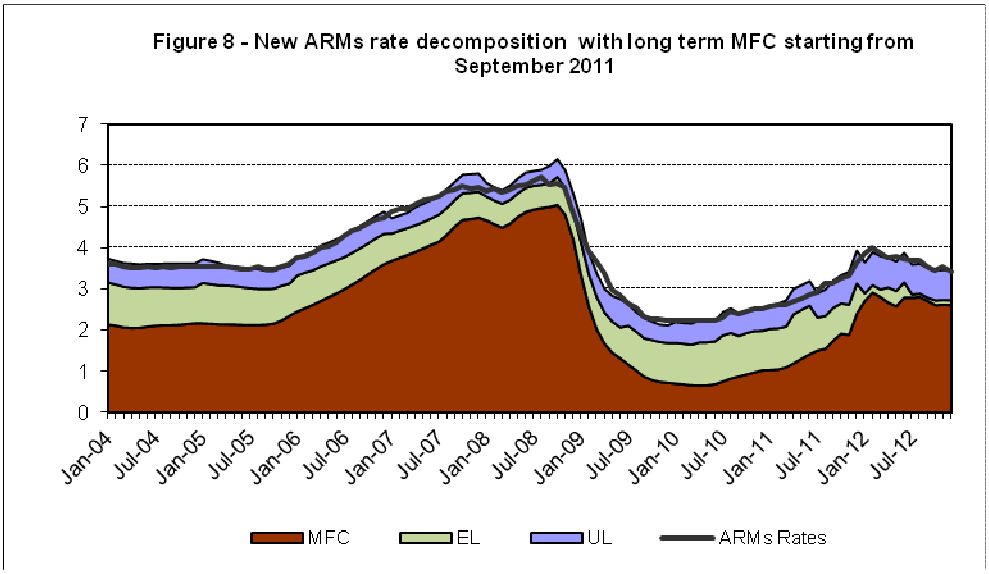


Figure 6b – Marginal Funding Cost on new FRMs after the onset of the financial crisis





Sources: Bank of Italy, European Banking Federation, Borsa Italiana and author calculations



Sources: Bank of Italy, European Banking Federation, Borsa Italiana and author calculations

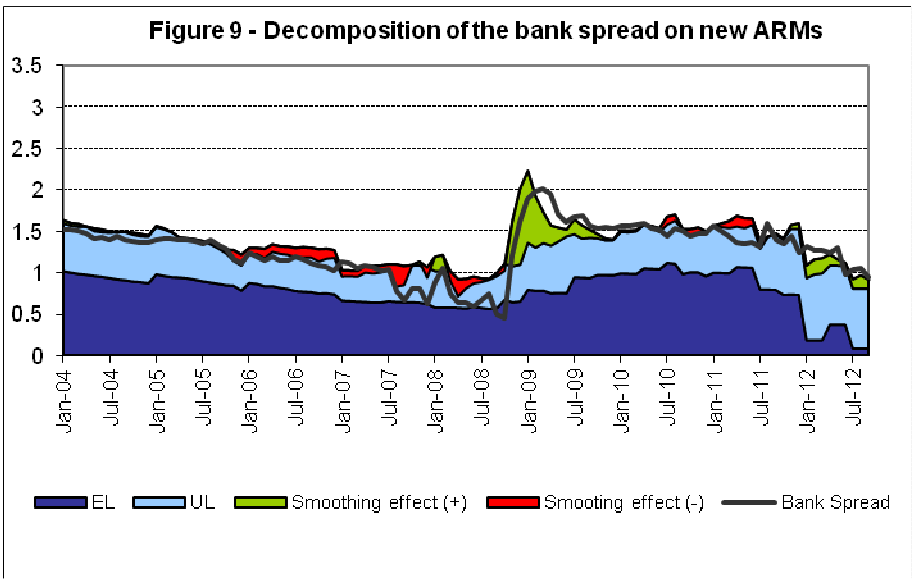


Figure 9 - Decomposition of the bank spread on new ARMs
3.5
3
2.5
2
1.5
1
0.5
0
Jan-04
Jul-04
Jan-05
Jul-05
Jan-06
Jul-06
Jan-07
Jul-07
Jan-08
Jul-08
Jan-09
Jul-09
Jan-10
Jul-10
Jan-11
Jul-11
Jan-12
Jul-12
EL
UL
Smoothing effect (+)
Smooting effect (-)
Bank Spread

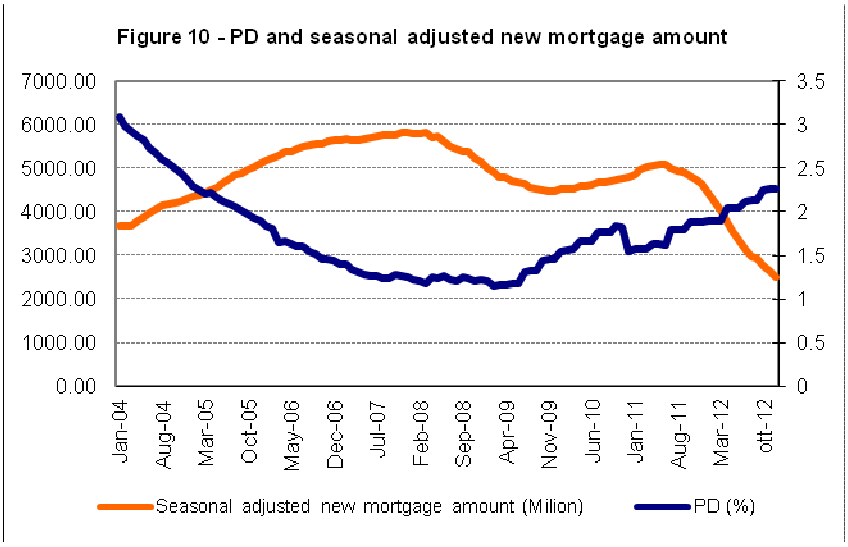
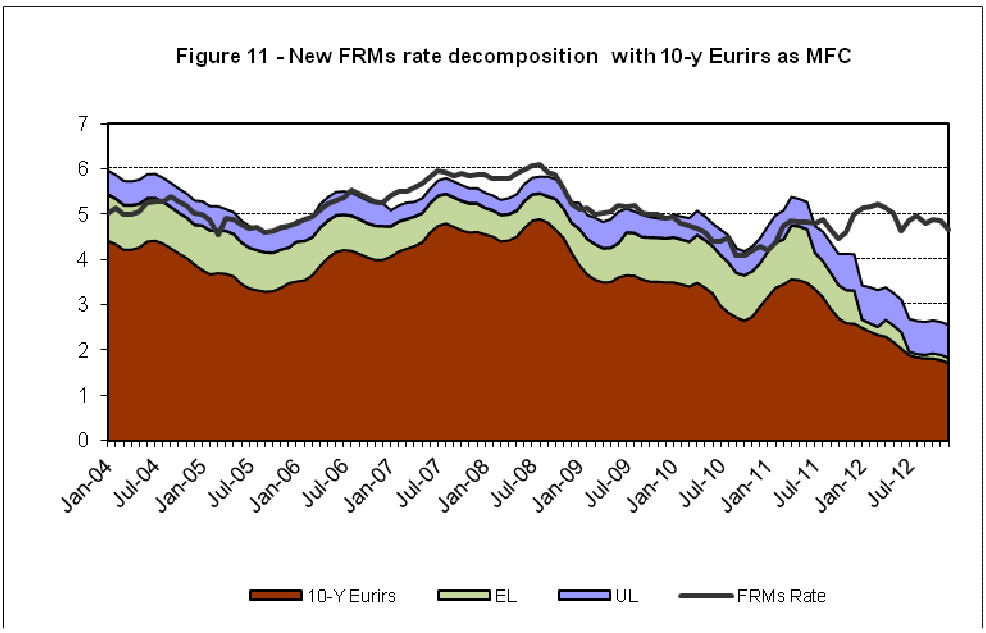
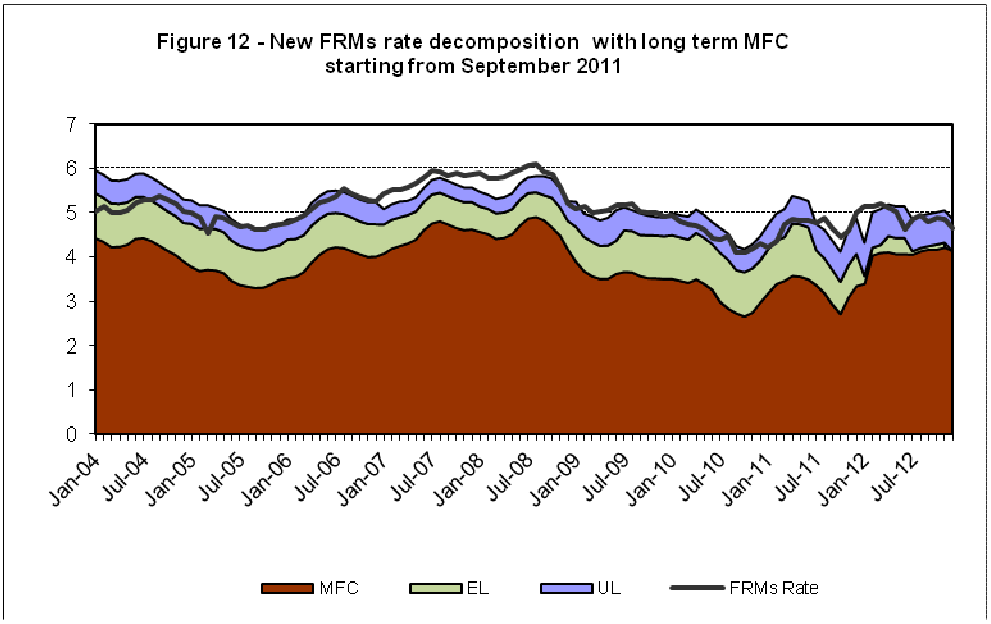


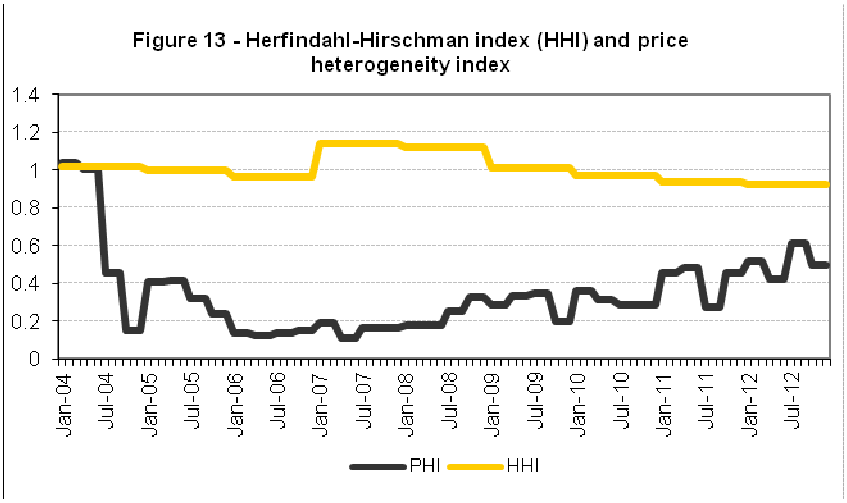
Figure 10 - PD and seasonal adjusted new mortgage amount
7000.00
6000.00
5000.00
4000.00
3000.00
2000.00
1000.00
0.00
3.5
3
2.5
2
1.5
1
0.5
0
Jan-04
Aug-04
Mar-05
Oct-05
May-06
Dec-06
Jul-07
Feb-08
Sep-08
Apr-09
Nov-09
Jun-10
Jan-11
Aug-11
Mar-12
ott-12
Seasonal adjusted new mortgage amount (Milion)
PD (%)



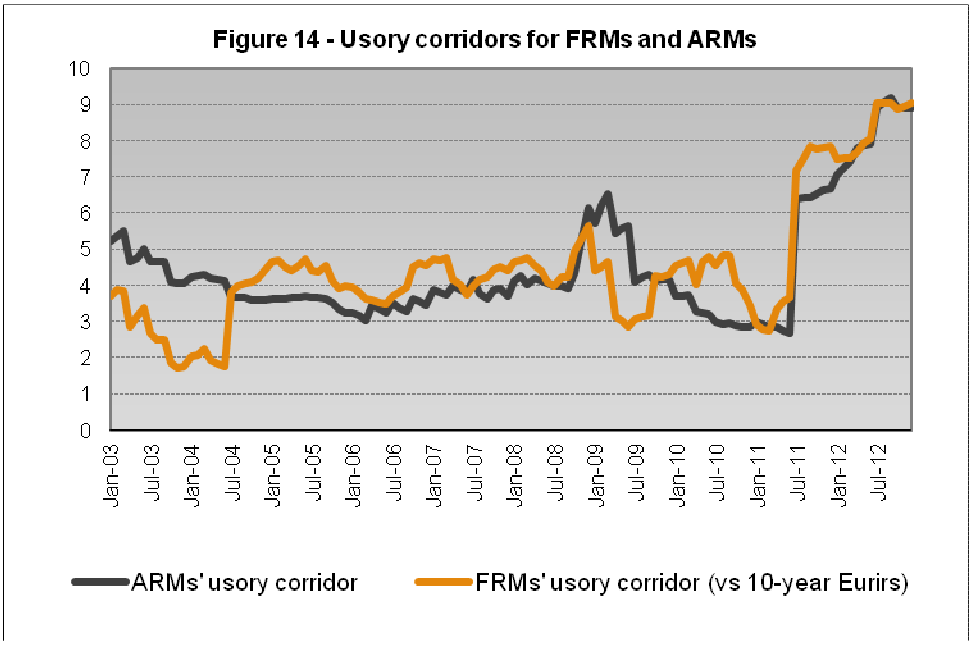
Sources: Bank of Italy, European Banking Federation, Borsa Italiana and author calculations



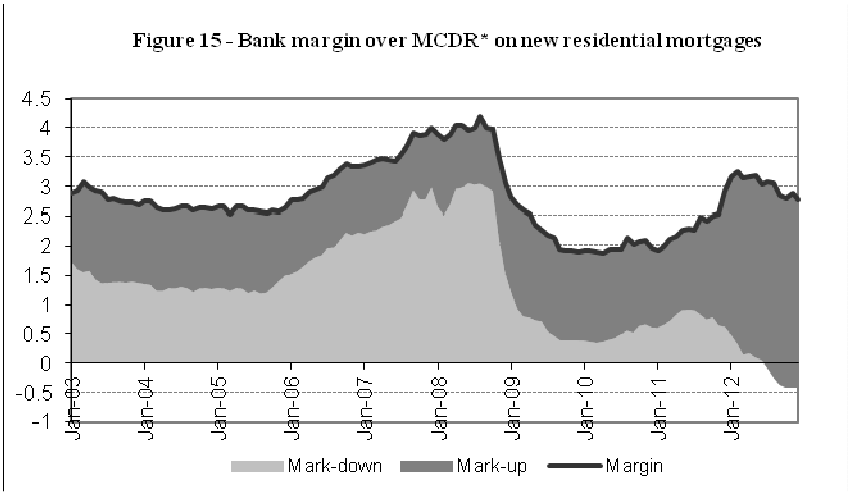
Sources: Bank of Italy, European Banking Federation, Borsa Italiana and author calculations



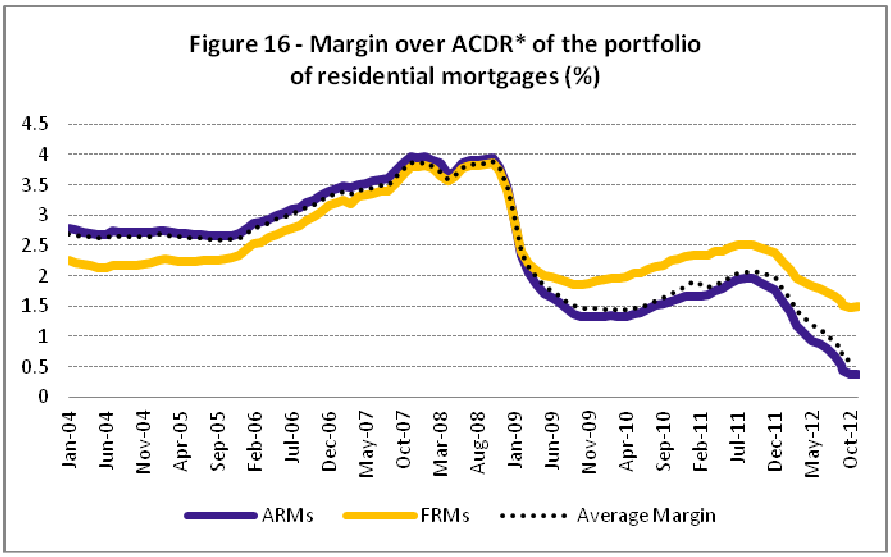
Sources: Bank of Italy and author calculations



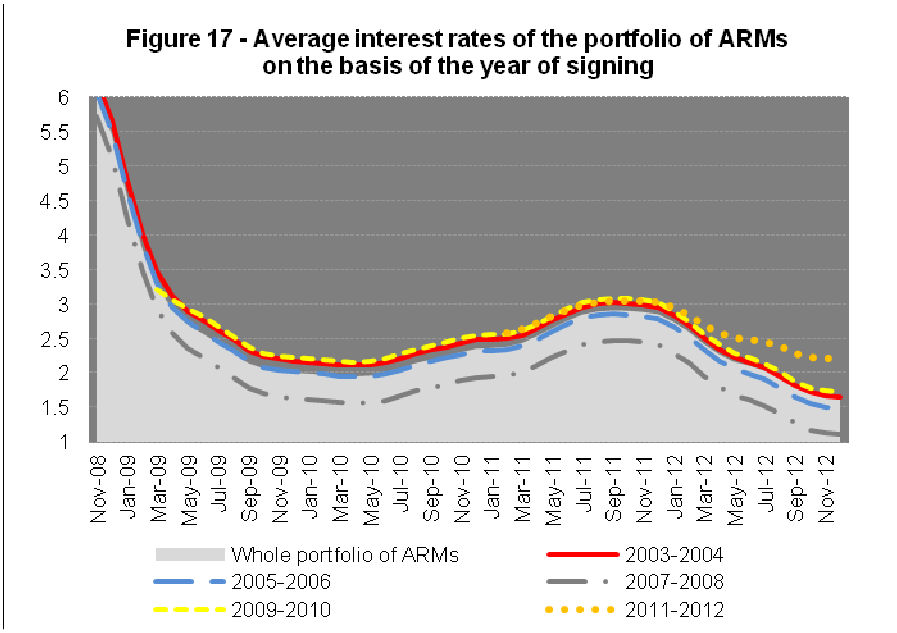
Sources: Ministry of the Treasury, European Banking Federation and author calculations



* MCDR = marginal composite deposit rate
+ Mark-down = Euribor3M – MCDR
° Mark-up = (new ARMs interest rate – Euribor3m) for ARMs contracts and (new FRMs – Eurirs10y) for FRMs contracts
Sources: Bank of Italy, European Banking Federation and author calculations



* ACDR= Average Composite Deposit Rate
Sources: Bank of Italy, European Banking Federation and author calculations



Sources: Bank of Italy, European Banking Federation and author calculations