The Demand and Supply of Mortgage Rate Fixation Periods. Managing Interest Rate Risk and Credit Risk in a Low Rate Environment

Preliminary and in progress. Comments welcome.

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We disentangle the demand and supply determinants of mortgage rate fixation periods. Our unique dataset features offers from multiple banks for each individual mortgage request. We show that households respond to the relative cost of different fixation periods. However, we also find that banks drive the empirical evidence that more vulnerable households are associated with longer fixation periods. This finding contrasts with the existing literature which interprets this as the households' choice. We demonstrate how banks influence fixation periods through several channels to trade off interest rate risk against credit risk, and we find that banks' choices depend on both bank and household characteristics, as well on the interbank market environment.

Keywords: Fixed-Rate Mortgage (FRM), Adjustable-Rate Mortgage (ARM), Fixation Period, Maturity Mismatch, Interest Rate Risk, Credit Risk.

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1 Introduction

In the wake of the Global Financial Crisis, central banks worldwide have pursued policies of historically low interest rates. One consequence has been an increase in the average fixation period of mortgages. Borrowers could thus lock in advantageous rates. At the same time mortgages with longer fixation periods and thus higher term premiums offered lenders an escape from the squeeze of their interest margins[1] that appeared to come at a low risk cost as most lenders deemed rate increases a distant scenario. But mortgages constitute not only the largest liability for the typical mortgage borrower, a household, but also the largest asset class for the typical mortgage lender, a retail bank.[2] And for retail banks, the fixation period (FP) of such mortgages are the key determinant of their interest rate risk exposure (IRRE), as the FP of mortgages tends to exhibit greater variability than the FP of most of their liabilities. But what determines mortgage fixation periods?

The existing academic literature on the choice between Adjustable Rate Mortgages (ARM) and Fixed Rate Mortgages (FRM), or more generally on mortgage rate fixation periods, has suggested that this is a choice made entirely by households, while banks provide merely the fixation period borrowers ask for. However, this view has been no more than an assumption: As researchers observed only aggregate data on the share of Fixed Rate Mortgages, or at best data on individual *contracted* mortgages, they could not actually tell to what extent the mortgage characteristics corresponded to the preferences of respectively lenders and borrowers, let alone what shapes these preferences.

In this paper, we use a truly unique dataset that captures separately the characteristics of individual mortgage requests and those of the ensuing offers. Furthermore, we observe for each household's request offers from multiple banks, so we can fully control for a possible selection of different types of borrowers to different types of banks. Finally, we merge these data on mortgage demand and supply with supervisory data on the maturity structure of each bank's assets and liabilities and the bank's resulting interest rate risk exposure, as well as on other relevant bank characteristics. Using these data, we question and refute the prevailing

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[1] The rates lenders received on their assets have fallen, while the rates they had to pay on their liabilities could not fall below zero, thus squeezing the margin between those rates.

[2] As in most countries, in the Swiss setup studied here the largest category of mortgage borrowers are households and the largest category of lenders are banks, so we henceforth use these terms.

consensus of banks merely accepting the requested fixation periods. We show that banks can and do influence fixation periods along several dimensions, and we examine which factors determine respectively which fixation periods households request and which ones banks offer. To start with, we find that households are not good “risk managers”, as some previous work as called it, but in a quest to minimize the initial cost tend to go for short fixation periods precisely when they would most need the insurance against rate increases provided by longer fixation periods. Banks however are found to exert their own influence on fixation periods. In doing so, they take into account both their own interest rate risk exposure, and the vulnerability of households to rate increases under short fixation periods. Finally, we investigate how an unforeseen shock to interest rate expectations impacts the choice of different fixation periods. We exploit the timing of a set of speeches by Fed Chairman Ben Bernanke about a possible end to the Fed’s (and thereby, to some extent, other central banks’) expansive monetary policies in the spring of 2013 as an exogenous shock to the yield curve and mortgage maturity pricing of Swiss mortgage rates. We find that banks’ responses to that unexpected shock took into account both their pre-existing IRRE and a household’s PTI ratios.The setup we exploit is the Swiss online portal Comparis. Between 2010 and 2013, households could submit mortgages requests there, in which they specified their desired mortgage amounts and fixation periods, while also giving details on the property as well as on their household finances. Then each request received responses from many lenders, allowing us to investigate how different banks responded to exactly the same request. This allows us to circumvent the problem in other data sets that different types of borrowers may self-select to interact with different types of lenders. On the lender side, we observe both banks and insurers, but we focus on banks as a homogeneous group for which we have bank-level supervisory information on their pre-existing interest rate risk exposure (IRRE) as well as other relevant balance sheet characteristics. In such a setup, banks have three channels to influence contracted fixation periods. First, they can condition their rejection probabilities on the requested fixation periods. Second, they can extend offers also to households requesting inconvenient fixation periods, but offer them a fixation period different from the one requested. And third, they can offer the fixation periods requested, but add a higher markup above term-adjusted refinancing costs for fixation periods inconvenient to the bank.[3]

[3] In an offline context, banks can also use personal interaction to steer fixation periods through the advice channel. This is investigated in Foa et al (2015), as discussed in more detail below, but is not an available channel in the setup studied here.

Most of the existing literature on mortgage choice has focused exclusively on households as decision-makers. On the theory side, *Campbell and Cocco (2003)* provide a benchmark model of household choice and show that from a *household risk management* perspective, Fixed Rate Mortgages (FRM) are more attractive for a household that is risk-averse, has risky income, or has a high loan-to-income (LTI) or *high payment-to-income (PTI) ratio*. However, the current spread between long-term and short-term rates does also matter. Furthermore, *Campbell & Cocco (2014)* show that households with more risky labor income may self-select into Adjustable-Rate Mortgages (ARM), on the grounds that short-term rates tend to be lower in periods of low economic growth and hence when cyclical labor income is also lower. Empirically the picture of households as "risk managers" is supported also by *Ehrmann and Ziegelmeyer (2014)*, who find income volatility to be a relevant determinant of the choice between ARM and FRM, although the spread between long-term and short-term rates does also matter. Other work by contrast finds households' choice to incorporate the relative cost between FRM and ARM, see for example *Paiella and Pozzolo (2007)* or *Damen and Buyst (2013)*. Conceptually, this relative cost is given by the difference between FRM rates and the expected series of short-term rates over the same horizon. However, different papers emphasize different methods for households to form their expectations of future short-term rates. While *Coulibaly und Li (2009)* use the current spread between long-term and short-term mortgage rates, and *Paiella and Pozzolo (2007) and Damen and Buyst (2013)*) use the current spread between long-term and short-term government bond rates, *Koijen et al (2009)* argue that households are likely to have adaptive expectations and hence use the 3-year average of 1-year government bond yields instead of (the sequence of) 1-year rates themselves. Further measures of interest rate expectations are investigated by *Bacon and Moffat (2012*) and *Badarinza et al (2014).*[4]

For reasons of data availability, all these papers interpret mortgage choices as reflecting exclusively the preferences of borrowing households. A first exception is *Fuster and Vickery (2015)* who show that in the US, the market share of FRM mortgages drops when mortgages are harder to securitize. They interpret this evidence as reflecting banks' reluctance to retain too much interest rate and prepayment risk on their own books. More explicit evidence of supply side influence on mortgage terms is provided by *Foà et al. (2015):* They show that

[4] Johnson and Li (2014) find that borrowing-constrained households are more likely to choose ARMs. Further empirical research has suggested that financial literacy *Fornero et al (2011*) and past experience with mortgage products *Webb (2013*) affects the choice between ARM and FRM.

contracted mortgage fixation periods vary systematically with bank characteristics and conclude that banks use the advice channel to nudge households towards those fixation periods preferred by the bank. This is a major breakthrough and first evidence warranting a further analysis of banks' considerations about mortgage fixation periods.

Our paper differs from the existing literature along several dimensions. First, *Foà et al. (2015)* observe for each household only the rate charged for either a FRM or an ARM and compute the spread between short-term and long-term rates ("term premium") by imputing the rate the same household would have been charged for a mortgage with a different fixation period. But *Foà et al. (2015)* do not observe each applicant's key risk characteristics like the loan-to-value (LTV) and payment to income (PTI) ratio, so the term premium may be overestimated (underestimated) if in their sample riskier households are more likely to get longer (shorter) fixation periods. Second, with only one offer per request and no observations on key risk characteristics, *Foà et al. (2015)* can exclude the sorting of different households to different banks only to the extent to which it is time-invariant and can therefore be captured by bank fixed effects. Third, *Foà et al. (2015)* observe only whether a household obtains a FRM or an ARM, whereas we observe the precise fixation period in years. As we observe the offered interest rate and can hence also compute the duration associated with each single mortgage offer. Finally, more qualitatively, in their dataset it is assumed that banks' influence takes place through the advice channel: Credit officers advise clients verbally to choose a specific fixation period. By contrast, in our automated setup no conversations between banks and households take place and so the banks' channels of response, first the decision to reject a request and second the offered fixation period truly reflect a bank's trade-off between IRR and CR.[5]

There is also a literature focusing on the implications of mortgage rate fixation periods for banks, albeit one that so far has analyzed the issue only at the bank rather than loan level. Thus Santomero (1983) derives the optimal FRM-ARM mix for banks. In the same vein, Chang et al (1995) show banks' optimal spread between FRM and ARM to vary with the volatility of funding cost, a bank's degree of risk aversion, and the competitive profit margin on ARM. They also characterize the optimal mix of ARM and FRM in a bank's portfolio.

[5] There is also a separate strand of the literature showing that shorter average fixation periods (a lower share of fixed-rate mortgages) tend to amplify the effectiveness of monetary policy, see e.g. Rubio (2011) or Calza et al (2013).

Alessandri and Drehmann (2010) consider also the relationship between IRR and credit risk: their model shows that to correctly compute the required level of economic capital banks should consider credit and interest rate risk jointly rather than additively. Landier et al (2013) look also at banks' hedging decisions: They show that banks do not fully hedge their IRR exposure. Therefore the 1-year income gap, the difference between respectively assets and liabilities with a fixation period below one year, strongly predicts the sensitivity of profits to interest rates, and therefore it predicts also how lending responds to interest rate changes. Purnanandam (2007) finds that interest rate derivatives are predominantly used by larger banks, likely reflecting economies of scale and scope of operations, and that dealing with them allows banks to hedge against possible interest rate shocks. Common to these papers is that they have analyzed IRR decisions only at the bank level. This however does not allow controlling for inter-bank differences in other mortgage characteristics, such as LTV or PTI ratios. Our loan level data allow us to dig deeper here.

The remainder of the paper is structured as follows: Section 2 presents the institutional setup and our data and Section 3 lays out our empirical strategy. Section 4 gives our results and Section 5 concludes.

2 Institutional Background and Data

In this section we start by explaining the difference between a mortgage's rate fixation period, its maturity and its contract period in the Swiss context. We then provide information on our two main data sources: First data on individual mortgage requests and offers from the Swiss online portal Comparis, with a special focus on the duration measure we have computed. And second supervisory data on banks' balance sheets and in particular on banks' pre-existing interest rate risk exposure.

2.1 Fixation Period vs. Maturity vs. Contract Period

The focus of this paper lies on the *fixation period* of the mortgage interest rate. We define this fixation period as the number of years for which the mortgage rate is fixed, while interest rates in the interbank market and hence banks' refinancing costs as well as the opportunity costs of both banks and households may vary during this period. Some bank offers specify a single fixation period for the entire mortgage, while others propose to split the mortgage into several tranches with distinct fixation periods and distinct mortgage rates[6][7]. In the latter case, we compute a weighted average fixation period and mortgage rate.

Conceptually this is distinct from the mortgage *maturity*, i.e. the number of years over which the entire principal must be repaid to the lender. In some countries these two coincide, in Switzerland they often do not. Fully amortizing mortgages are not very popular in Switzerland. This is because even for owner-occupied property, borrowers can deduct interest payments from their taxable income, and deduct outstanding mortgage debt from their (in some cantons/states) taxable wealth. For this reason, households tend to amortize only at the minimum speed required by the regulator. Since July 2012, regulation requires that the loan-to-value (LTV) ratio must be reduced to 67% within at most 20 years after the purchase date, and since July 2014 within at most 15 years. Yet, after this period has expired, many households just keep the remaining debt outstanding and invest any surplus savings into other

[6] In some but by no means all cases, the tranching coincides with the 67% LTV threshold. During our sample period, banks typically required (and from July 2012 onward had to require given new regulation) households to amortize the portion above that threshold within 20 (since July 2013, 15) years. In our regressions we control for LTV ratios.

[7] Tranching is attractive to banks also since it makes it harder for households to switch to a cheaper bank for roll-overs: Whenever one tranche comes up for refinancing, another one is still running. Prepaying the running one would imply a prepayment penalty, but typically other banks will not refinance the other tranche without full claim to the collateral. We do not explicitly investigate such tranching motives here, as they would not appear correlated with fixation period choices.

asset classes rather than amortizing their mortgages.[8] The amortization schedules resulting from these regulatory requirements are decoupled from the mortgage rate's fixation period, which has the advantage that we can analyze borrowers' and lenders fixation period choices independently from the amortization schedules.

A third relevant term in that respect is the *contract period* of a mortgage: This is the number of years for which neither a household nor a bank can leave the existing contract without incurring a prepayment penalty. At the end of the contract period, Swiss borrowers typically repay not out of their savings, but by refinancing their mortgage (or tranche) either with the same or with another lender. In many countries the prepayment option before the end of the initially agreed contract period is commonly exercised, generating *prepayment risk* for the bank (see for *example Campbell and Cocco*, 2003, or *Green and Wachter, 2005*). Swiss mortgage contracts by contrast typically contain "*yield maintenance clauses*" as described in *Green and Wachter (2005)*: when households prepay, they must fully compensate the bank for any foregone interest caused by their prepayment. Therefore households usually will prepay only if they have to sell their property, for example due to a change of jobs or due to divorce, but not for strategical reasons. And when they do prepay, they have to fully compensate the bank for any losses resulting from their prepayment.

2.2 Data on Mortgage Demand and Supply

Our key data source is the Swiss online portal *Comparis*: The dataset provides information on individual mortgage requests submitted through the Comparis website between 2010 and 2013, after which Comparis changed their business model and our data end. For each request, we then observe the responses from multiple banks. On the household side, the data contain comprehensive information on the property to be bought (e.g. its size, age and location zipcode), on the household's finances (including income, wealth, pension wealth, debt, further real estate holdings) and the requested mortgage amount and fixation period. For submitting a request, a household had to pay CHF 148 (about USD 155 as of April 2015).

Comparis then sent the anonymized requests to participating mortgage lenders. These included both banks and insurance companies, but the present analyses, we focus on the offers

[8] These tax incentives result in Switzerland having one of the highest mortgage-debt-to-GDP ratios in the world, despite an ownership rate still below 50%, although households also hold large significant financial assets. For more information on the Swiss real estate and mortgage markets, see Basten and Koch (2015a) and Basten and Koch (2015b).

by banks. After screening the requests, banks then decided whether to make a binding offer and specified the terms of the offer. While they had to take the requested mortgage amount as given, they could deviate from the requested fixation period. Furthermore, besides choosing the mortgage's average fixation period, and resulting duration, they could also decide to split the mortgage in up to three tranches with different tranche fixation periods. For example, one way to obtain an average fixation period of five years was to offer the entire mortgage with a five year fixation period, while another was to offer half of the amount with a fixation period of 8 years and the other half with a fixation period of 2 years. For fixed-rate tranches, i.e. tranches with fixation periods of one or more years, the fixation period typically coincided with the contract period of that tranche. For the present analysis, we focus on the tranche-weighted average fixation period.

This data set has several characteristics that are advantageous for our empirical analysis: First, we observe separately requests and offers and thus distinguish between the preferences of households and those of banks. Second, we observe for each request the response from not just one but several banks, and can fully control for possible self-selection of different types of households to different types of banks that may exist in the offline mortgage market. Third, all banks have access to exactly the same set of anonymized information that we observe and control for, so we can rule out that bank responses depend also on the additional soft information generated in other contexts through relationship banking.

Table 1 presents summary statistics on the 7'338 requests submitted between 2010 and 2013 in Panel A, and on the 227'474 responses submitted by the 31 banks in Panel B. As Panel A shows, households could choose between fixation periods of 0 years and 1 through 10 years. 0 years includes firstly Libor mortgages, whose rate resets automatically every 3 months and secondly "variable rate" mortgages whose rates banks can reset at their discretion (while households can always leave that contract type without prepayment penalty). The average fixation period requested was about 7 years, reflecting the fact that the single most frequently requested category was a 10-year Fixed Rate Mortgage. The ratio of Payments (5% of the mortgage amount for interest payments plus 1% for amortization plus 1% for house maintenance) to Income amounted on average to about 27%, with 21% of requests exhibiting Payment to Income (PTI) ratios in excess of 33%. The Loan-to-Value (LTV)[9] ratio amounted

[9] This is based on the actual purchasing price. Banks might value the house above or below that, but must make the offer based only on the information submitted online.

on average to 65%, reflecting the fact that only about half of the requests were for new mortgages and the other half for roll-overs (see last line of the Panel). In our baseline regressions we use both new mortgage and roll-over requests, while in the Online Appendix we repeat all regressions also for the subsample of new mortgage requests only. 10% of the requests observed have an LTV ratio in excess of 80%.

In Panel B, Table 1 presents summary statistics on banks' responses. After removing the responses of insurers, we observe a total of 28'535 bank responses, or about 4 per request. This is because not all 31 banks are active in all regions of Switzerland. For some of our analyses, we have also assumed that every bank could have responded to every request, which yields a total of 227'474 bank-household pairs. On all those hypothetical pairs the rejection rate is 90%, whereas on those pairs for which we do actually observe a response the rejection rate is about 18%, so that the 28'535 explicit responses lead to 23'347 offers, or about 3.2 bank offers per request. On average the offered fixation period is about 7.13 years, slightly above the requested one. The offered mortgage rate, across all fixation periods, varies between a mere 10 basis points 691bp, with a mean of 216bp. When we subtract from that banks' refinancing costs, i.e. the 3-month interbank rate plus the swap rate for the respective fixation period, a spread of on average 94bp remains. These offered fixation periods combined with the interest rates yield an offered duration of on average 6.66 years, as explained in the dedicated subsection below.

Table 3 investigates how representative our sample is of the entire Swiss mortgage market. This is a relevant question because a priori the answer is not clear: On the one hand one might hypothesize that only those households who fail to get a mortgage offer from their existing bank end up using the Comparis platform. On the other hand, one might hypothesize that to the contrary the best risks use the platform to maximize the returns (in the form of low mortgage rates) to their low risk. The problem is reduced either way by the fact that we observe an extensive range of both house and household characteristics, yet some bias on unobservables could conceivably remain. We have therefore gathered all available public data on the Swiss mortgage market: First from the "Banks in Switzerland" publication by the Swiss National Bank (SNB, 2014) and second from a survey of mortgage borrowers conducted by Seiler (2013). The drawback of the former is that it captures only the stock of mortgages already on banks' balance sheets rather than specifically the set of mortgages granted or refinanced in a given year. The drawback of the latter is that due to a different research purpose (the use of pension money for house purchases) the survey itself is not guaranteed to yield a representative picture of the entire market. Yet these are the best sources known to us. Comparing our data with these two sources shows that the geographical composition of our sample is pretty much representative of the other two, and in fact of the distribution of the Swiss population as a whole. The sample appears to have slightly higher weights on the German-speaking cantons when compared to the SNB data, but slightly lower ones when compared to the Seiler data. More importantly, there is no clear evidence of a bias toward or against the more urban areas, neither when we look at the distribution of the number of requests nor when we look at the implied mortgage volumes.

2.3 Modified Portfolio Duration of a Mortgage

One contribution of our paper is to analyse the duration of a mortgage offer as a composite dependent variable that accounts simultaneously for the fixation period and for the mortgage rate of individual mortgage tranche offers. Conceptually, mortgage duration on the individual mortgage level and the bank's IRRE – which is basically defined as a duration gap on the level of the bank balance sheet -- are related in that granting a mortgage potentially raises or lowers the bank's IRRE. In principle, duration can be considered as the interest rate risk or sensitivity on the mortgage level. As mortgage offers specify individual tranches of distinct fixation period and specific tranche-level mortgage rates, we compute the composite modified[10] mortgage duration along the lines of the portfolio duration of individual tranches. The modified mortgage duration (see Fabozzi, 2005) then measures the percentage change in the economic value of the mortgage that will occur given a small change in the level of interest rates. In our context, we use the offered mortgage rate on individual tranches as coupon payment and draw on the Swiss government bond of the corresponding fixation period to compute the present values. Given the tranche-level duration, we sum up across tranches while weighting them with their respective share in the overall mortgage. The following mechanisms apply: a longer fixation period attached to individual tranches or the mortgage as whole increases the modified portfolio duration, while a higher mortgage rate (applied to individual tranches or the mortgage as a whole) reduces the modified portfolio duration. To sum up, a mortgage offer with a higher duration will imply a greater additional Interest Rate Risk Exposure for the typical bank.

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[10] Modified duration is the standard Macaulay Duration divided by (1+r) where r is the level of the market interest rate.

2.4 Bank data

We complement the data on mortgage requests and offers with detailed information on the offering banks. Many of these are small, non-listed banks, so it is valuable that we can use supervisory data for that purpose obtained from the *Swiss Financial Market Supervisory Authority (FINMA)*. Our key variables of interest are three measures of the bank's pre-existing interest rate risk exposure (IRRE). All three measures specify the expected impact of a 100 bp positive interest rate shock on banks' equity capital. We have scaled the measures such that positive values imply a decrease in equity capital. The measures are based upon standards set by the Basel Committee on Banking Supervision, BCBS (2004). They use information on the amounts of assets and liabilities with different fixation periods. For assets and liabilities with indeterminate fixation periods, in particular sight deposits, banks must make assumptions. FINMA then obtains for each bank one IRRE measure based on each bank's own assumptions, one using for all banks the same sample average assumption in that period, and one assuming for all banks that the de facto fixation period of these assets and liabilities is 2 years. In our baseline analysis we focus on the 2 year fixed assumption, as this isolates differences in banks' maturity mismatch, while abstracting from differences in banks' assumptions. In the Online Appendix we also explore results with the other two measures. All three measures are computed after taking into account the use of interest rate swaps. Unfortunately we do not separately observe IRRE before hedging, but we do observe and use information on whether or not a bank did use any interest rate swaps.

Table 3 shows summary statistics on swap use and the three IRRE measures, as well as on the relevant other bank characteristics used in our analyses. The table displays for each measure both the overall variation and the variation across the 31 banks ("between") and the 16 quarters (4 quarters each for the years 2010-13, "within"). Thus it shows that interest rate swaps were used in 84% of all bank-quarters, with more variation between banks within a given quarter than within banks between different quarters. The average impact of the 100bp interest rate hike on banks' equity was 5% based on banks' assumptions, but 8% based on the fixed assumption of 2 years. The typical bank in our sample had total assets of about CHF 13 million and held equity worth about 24% of risk-weighted assets. For all these bank measures the larger part of the variation was cross-sectional, but there was always some inter-temporal variation as well.

3 Hypotheses and Empirical Strategy

In this section we outline our empirical strategies for four sets of analyses. In the first we investigate the determinants of households' fixation period choices before any bank action has taken place. Following that we investigate how banks' different channels of influence on the fixation period relate to three sets of factors: First to banks' pre-existing level of Interest Rate Risk Exposure, second to household characteristics and in particular their Payment-to-Income (PTI) ratios, and third to the "Bernanke shock" to interest rate expectations.

3.1 A household's choices

Given the focus of the existing literature on household considerations, we start by analyzing the determinants of households' requested fixation periods, before any bank involvement has taken place. We extend existing approaches, such as Ehrmann and Ziegelmeyer (2013), to our micro-level dataset on un-intermediated mortgage requests. We thus relate the requested fixation period to household, house and mortgage cost characteristics. Using individual requests, we estimate the following equation:

$$y_{i,t}^{R} = \alpha + \beta_1 RateDiff_t + \ ReqTraits_i{}'\theta + \varepsilon_{it} \quad (1)$$

where $y_{i,t}^{R}$ denotes the fixation period requested by household *i* at point in time *t*. Based on the findings of amongst others Paiella and Pozzolo (2007), Coulibaly and Li (2009) Koijen et al (2009) and Damen and Buyst (2013), our first explanatory variable is the difference between average rates on respectively 10-year and Libor mortgages as published on the SNB website as well as in the media. In a robustness check in our Online Appendix we also use the rates paid on Swiss government bonds with fixation periods of respectively 10 years and 1 year. [11] Based on the previous literature we posit:

> <u>Hypothesis 1:</u> *Households tend to request longer fixation periods when the difference between expected rates for long and short fixation periods is smaller.*

[11] Government bond rates are available at daily, SNB-published mortgage rates at monthly frequency.

More importantly, we can exploit the richness of our dataset and investigate the impact of the full set of household and house characteristics $ReqTraits_i$.[12] Of particular interest given the concept of "household risk management" drawn by Campbell and Cocco (2003) is the Payment-to-Income (PTI) ratio, because households with high PTI ratios will more easily see their PTI ratios reach unbearable levels when mortgage rates go up. Thus we posit:

> <u>Hypothesis 2:</u> *Households with higher Payment-to-Income (PTI) ratios are more likely to request longer fixation periods as an insurance against mortgage rate increases.*

As it is not clear a priori whether the effect of PTI will be linear, we include as regressors both the PTI ratio as a continuous variable, and a dummy for PTI > 33%. We control for all other household characteristics (the Loan-to-Value or LTV ratio, a dummy for LTV ratios exceeding 80%, household wealth, a dummy for holdings of other real estate, a dummy for the presence of other debt, age, age squared, and security holdings. We also control for the key characteristics of the property to be financed, including its zipcode, size, age, and type (single-family home, apartment, etc.). As there are only 11 different possible values of the fixation period (see data section above), we estimate the equation not only as a linear probability model, but also as respectively an ordered logit and an ordered probit model.

3.2 Banks' responses

In this subsection we explore how banks' responses to the requests depend on respectively the bank's own characteristics (especially its pre-existing Interest Rate Risk Exposure), the household's characteristics (especially the household's Payment to Income ratio), and to changes in the level and variability of interest rates.

3.2.1 Bank Characteristics, especially Interest Rate Risk Exposure

The earliest work on a bank's optimal choice of loan fixation periods we are aware of is Santomero (1983). He considers two types of loans with respectively fixed and variable rates, and two types of risk, credit risk and interest rate risk. Doing so, he shows that in its optimal loan portfolio the bank will shift some but not all interest rate risk to borrowers through the use of adjustable rate loans. In particular, bank' preference for adjustable rate loans is shown

[12] Note that each request just appears once in our dataset and is hence unique in time. For this reason, we can skip the time index as requests could be regarded as nested within any time period such as month, quarter or year. We keep the time index of the dependent variable to show that each request i pertains to a specific period of the time structure of interest rates.

to be higher when the rates of the banks' liabilities are more variable, or put differently when the bank's pre-existing exposure to interest rate risk is higher. We hence posit:

> <u>Hypothesis 3:</u> *Banks with higher pre-existing levels of Interest Rate Risk Exposure (IRRE) will on average prefer shorter mortgage rate fixation periods.*

To investigate how banks' responses depend on their own characteristics, most importantly on their own pre-existing interest rate risk exposure (IRRE), we estimate the following equation:

$$y^{O}_{i,j,t} = \alpha + \beta_1 IRRE_{j,t} + \beta_2 IRRE_{j,t} * y^{R}_{i,t} + \beta_3 y^{R}_{i,t} + ReqTraits_i'\theta + BankTraits_j'\varphi + YearMonthFE_t'\psi + \varepsilon_{i,j,t} \quad (2)$$

where $y^{O}_{i,j,t}$ denotes the banks' different channels of response: Indicators for respectively explicit and implicit (non-response) rejection, the offered fixation period and the implied offered duration, and finally the offered mortgage rate. Our key regressors of interest are the bank's pre-existing IRRE, the requested fixation period, and their interaction term. We control for household and house characteristics as well as for bank characteristics. We also control for year by month fixed effects to account for both the prevailing levels of market rates as well as for market sentiment and regulatory changes over time.

3.2.2 Household Characteristics, especially Payment to Income ratios

However, Santomero also makes it clear that "when loans with returns that are not highly correlated with nominal interest rate movements are offered variable rate contracts, the interest rate risk is converted into credit risk." In our data we can identify such loans by way of clients' Payment to Income (PTI) and Loan to Value (LTV) ratios: When lending to high-PTI households, an interest rate increase will not only cause a materialization of interest rate risk for the bank, but will also raise these households' PTI ratios to unbearable levels and hence cause lower project returns by way of mortgage defaults. Similarly, since house prices are more likely to fall after interest rate hikes, high-LTV households are particularly likely to get under water, increasing again the probability of lower project returns. Hence we posit:

> <u>Hypothesis 4:</u> *For borrowers with high Payment to Income (PTI) or high Loan to Value (LTV) ratios, banks will ceteris paribus prefer longer fixation periods.*

To investigate how banks' responses depend on household characteristics and most importantly on the household risk measures PTI and LTV, we estimate the following specification:

$$y^{o}_{i,j,t} = \alpha + \beta_1 PTI33_i + \beta_2 LTV80_i + \beta_3 y^{R}_{i,t} * PTI33 + \beta_4 y^{R}_{i,t} * LTV80 + \beta_5 y^{R}_{i,t} + ReqTraits_i{}'\theta + BankFE_j'\varphi + YearMonthFE_t'\psi + \varepsilon_{i,j,t} \qquad (3)$$

where $y^{O}_{i,j,t}$ denotes again the same responses of bank *j* to request *i* submitted at point in time *t* as discussed above. Now our key explanatory variables are the risk measures PTI33 (an indicator for a PTI ratio greater than 33%) and LTV80 (an indicator for an LTV ratio greater than 80%), the requested fixation period, and the interaction between the requested fixation period and the two risk measures. We control for all relevant other household and house characteristics, as well as for the complete set of year-by-month fixed effects. Specific to our setup, in which each household receives responses from multiple banks, we can also control for the complete set of bank fixed effects X_j . This allows us to control for possible selection effects of specific types of households to specific types of bank. We effectively estimate how the same bank responds to different household requests.

3.2.3 Changes in the Level and Variability of Interest Rates

Finally, Santomero writes that the shifting of interest rate risk to the borrower through shorter fixation periods becomes ceteris paribus more attractive when the cost of obtaining fixed rate liabilities or the variance of funding cost have gone up. To test this, we focus on the "Bernanke shock" to the level and variance of interbank interest rates and posit:

> <u>Hypothesis 5:</u> *An unanticipated increase in the level and variance of interest rates strengthens the bank's preference for shorter fixation periods.*

How can we best test this? Above we have analyzed the correlation between on the one hand bank balance sheet characteristics and households' PTI ratios and on the other hand mortgage offers as specified along several margins of adjustment. Yet, one challenge in identifying the effect of banks' pre-existing IRR exposure ($IRRE_{j,t}$) on its mortgage supply decisions is that this existing IRR is certainly not exogenous. Rather both its IRR exposure and its lending strategy are likely to be jointly determined by the bank's interest rate expectations and its willingness to bear risks.[13] But now we exploit a shock to the level and variance of interbank interest rates. Several such shocks occurred in the spring of 2013: After a long period of historically low interest rates and Quantitative Easing (QE), the Chairman of the Federal Reserve Board, Ben Bernanke, did voice the expectation that eventual interest rate increases were now coming closer in several public speeches. This triggered a positive shock to the term structure of interest rates across major currencies.

Figure 1.a. shows the evolution of swap rates in CHF and the corresponding CHF 3-month Libor rate between 20 February 2013 and 19 October 2013. The vertical line indicates Ben Bernanke's tapering speech in June 2013. This figure displays that Bernanke's speech is associated with a substantial increase in both 10 year and 5 year Swap rates in CHF; by contrast the CHF 3-month Libor rate stayed at relatively low levels.

Figure 1b shows the term structure of Swap rate on 01 June 2013 (before the tapering speech in June) and on 01 July 2013 (after this speech). This graph suggests that the speech led to an increase in those swap rates with fixation periods of 2 years or longer. This increase was relatively stronger for longer fixation periods, i.e. this tapering speech was not only associated with an increase in Swap rates, but also with an increase in the term premium.

Last, Figure 1.c. shows the volatility of Swap rates and the CHF 3-month Libor rate. We calculate the volatility by the standard deviation of swap rates within the 14 days preceding the observations. The spike in our volatility measure after Bernanke's speech on 20 June 2013 points to an immediate increase in the volatility of Swap rates in CHF. As the time series of interest rates show, the timing of this increase came as a surprise. Furthermore, the Fed's considerations underlying Bernanke's speeches were based on choosing the optimal monetary policy for the US, with rate changes in other countries occurring merely as "collateral damage". Therefore they can be considered and exploited as an exogenous shock to other markets. In this vein, Aizenman et al (2014), Eichengreen and Gupta (2014), Rai and Suchanek (2014) and Carrera et al (2014) have exploited these remarks as shocks to interest rates in different sets of emerging market economies. We exploit the same shocks, focusing in particular on the speech dated June 19, 2013, which had the greatest impact on the Swiss 10-year swap rates. To gauge the effect of changes in interest rate expectations, we estimate the

[13] In the period under consideration, higher IRR in the banking book does not lead to Pillar I capital requirements. The Swiss supervisor FINMA did impose Pillar II capital requirements on outlier banks, but this affected only very few banks. Hence choices about IRR were mostly about economic risk rather than about regulatory requirements.

following specification for mortgage requests submitted in the period ranging from 20 February 2013 until 19 October 2013.

$$y^{o}_{i,j,t} = \alpha + \beta_1 AfterShock_t + \beta_2 AfterShock_t * PTI33 + \beta_3 AfterShock_t * LTV80 + \beta_4 AfterShock_t * IRRE + \beta_5 AfterShock_t * y^{R}_{i,t} + \cdots + ReqTraits_i{}'\theta + BankFE_j'\varphi + YearMonthFE_t'\psi + \varepsilon_{i,j,t} \quad (4)$$

where $y^{O}_{i,j,t}$ again denotes the bank's different channels of response. Our main regressors of interest are the after-shock indicator, the requested fixation period, the bank's IRRE, and the household's PTI and LTV, as well as the interactions between the shock and each of these other regressors. As before, we control for request (i.e. both household and house) traits, year-by-month effects, and bank fixed effects.

3.2.4 Identification Issues in all three sets of bank response analyses

Starting from the last of our standardized set of bank response variables, the interest rate, the first identification issue that comes up is the fact that the offered fixation period and the mortgage rate are jointly determined. One way to address this is to use as outcome variable the offered duration, which already combines these two outcome variables into one, and this is one reason why we have included duration as one outcome variable. An alternative way is to regress the weighted interest rate not on the offered fixation period, which is jointly determined by the bank, but instead on the requested fixation period, which the bank must take as given. This can be seen as the reduced-form equation of an estimation in which the offered fixation period is instrumented with the requested fixation period. We will discuss this again in the Results section.

An additional concern however, is that both offered fixation period and offered mortgage interest rate are also jointly determined with the decision on whether to make an offer at all or reject the mortgage request. We present this decision as one of our outcomes, but it is conceivable that the decisions on offered fixation period and rate are conditional on the offer decision. To investigate whether this is the case, we have conducted a Heckman two-stage procedure, in which we instrument the offer decision with the distance between bank and household, exploiting the fact that –as we see in our data-- ceteris paribus banks prefer to offer closer to home where they have better knowledge of the local market. The results of this robustness check are presented and discussed in our Online Appendix.

4 Results

In this section we start, in Subsection 4.1, with a set of regressions to explain a household's requests for different Fixation Periods, thus relating to the vast literature that explains observed contracted FPs as being driven mostly by household preferences. Following that, Subsection 4.2 turns to the channels of response along which a bank can express its relative preferences for different fixation periods. Subsection 4.3 then analyzes how the bank's responses are influenced by respectively bank characteristics, household characteristics, and the prevailing interbank market environment.

4.1 A household's fixation period choice

Table 4 shows our results on the choice of a household's fixation period, based on respectively a Linear Probability Model (Column 1), an Ordered Logit (OL, Column 2) and an Ordered Probit (OP, Column 3). The different methodologies yield different coefficient sizes, but the signs and general pictures provided are consistent with each other. Across all three specifications, the difference between short- and long-FP mortgage rates comes out quite significant: A 1 percentage point larger difference reduces the requested fixation period by between 0.5 (OP) and 1.3 (LPM) years. This confirms our *Hypothesis 1* above and is in line with the findings in Paiella and Pozzolo (2007), Coulibaly and Li (2009), Koijen et al (2009) or Damen and Buyst (2013).

However, in contrast to the predictions of Campbell and Cocco (2003), we find no evidence of higher PTI ratios leading households to request longer fixation periods. If anything, we observe the opposite, although the economic size of the effects is small. Interestingly enough we see a larger effect of LTV ratios above 80%, but that as well goes *against* prudent risk management. Precisely households who would be most likely to be under water after a house price decrease are also those willing to run the highest levels of interest rate and hence affordability risk: Households with LTV ratios above 80% request between 0.15 years (OP) and 0.4 years (LPM) shorter fixation periods. We thus reject *Hypothesis 2*. Longer fixation periods are requested by households with higher wealth, shorter ones by those already holding real estate and those already holding other debt.

In the Online Appendix we also provide a number of robustness checks on these results. First we replace the difference between long- and short-FP mortgage rates with that between long-and short-FP Swiss government bond rates. The coefficients resulting from this are very slightly larger, but the difference is not significant. Otherwise results stay unchanged. In the second variation, we focus on the subsample of 4,089 new mortgage requests instead of all 7,338 mortgage requests. Again results do not change significantly compared to the baseline version with all requests, except that now age becomes significant: Older household heads seem to be slightly more risk averse and prefer longer fixation periods, although the size of the effect falls with age. Finally, we have also investigated how our standard errors change when we cluster by year-by-month. Overall this makes no large difference, however our results on high-PTI households requesting shorter FPs is strengthened.

Overall then, our households base their decisions not on principles of prudent household risk management but focus primarily on initial cost. If anything, those most vulnerable choose the highest level of risk, in line with Damen and Buyst (2013), who also found Belgian households with higher PTI or LTV ratios to request shorter FPs. That said, it will be interesting to see how banks respond to these preferences.

4.2 A bank‘s channels of response

We start our investigation by discussing a bank's margins of adjustment.: (i), banks can decide to more often reject requests for mortgages with inconvenient FPs; (ii), they can make an offer anyway but offer a fixation period that deviates from the one requested; (iii) banks can offer to each household the fixation period requested, but charge extra for the inconvenience on top of spreads over their refinancing costs for FPs.[14]

Table 5 provides our first results on how banks in our sample do use these different margins of adjustment. Note that this evidence remains purely descriptive as we are not controlling for any other request characteristics here and are furthermore simply averaging over all sample periods. These descriptive numbers in Column (3) reveal that overall banks are more likely to explicitly reject requests for respectively adjustable rates (32% rejections) or 1-year FRMs (42% rejections) than for FRMs with fixation periods of between 2 and 10 years (14-20% rejections). In Columns (4)-(6) furthermore we see that on top of this selective rejection behavior, banks choose to offer longer fixation periods than requested in 20% of all offers responding to ARM requests and in 7% of all offers responding to 1-year FRM requests. O

[14] In an offline context of the mortgage business, there is also the additional "advice channel" discussed in *Foa et al (2015)*, whereas in our online setup that channel is closed down.

the other hand, offers in response to requests for longer fixation periods lead in up to 8.5% of cases (requests for 10-year FRMs) to offers with shorter average fixation periods. Finally, Columns (7) and (8) look at offered rates: Column (7) shows that offers of longer fixation periods tend carry higher mortgage rates, on average across our sample period 2.4% for 10-year FRMs compared to 1.6% for ARMs. This is in line with a typical upward-sloping yield curve. However, Column (8) reveals that the spread between offered mortgage rates and term-adjusted refinancing costs (3-month interbank rates plus the term-specific swap rates) is significantly lower for 10-year FRMs (90bp) than for ARMs (150bp). So overall all 3 channels of response—selective rejections, fixation period deviation, and pricing—suggest that banks do at least as often prefer longer over shorter fixation periods, thus taking the credit risk implications at least as seriously as the interest rate risk implications. However, these results are purely descriptive. In what follows, we present regression results linking these different channels of response to relevant bank and household characteristics while controlling for possible biases.

4.3 Explaining a bank`s responses

4.3.1 Responses to bank characteristics

Table 6 relates the different channels of response to the bank's level of pre-existing Interest Rate Risk Exposure (IRRE). This is based on banks' reports to the supervisor, required by FINMA (2008), of the losses resulting from a 100 basis point increase in interest rates, expressed as a fraction of their regulatory capital. This simplified version of a duration gap measure follows the principles outlined in BCBS (2004) and BCBS (2006): In the Swiss implementation, the bank's on- and off-balance sheet items are classified into 18 time banks based on their remaining time to maturity for fixed-rate items or to their re-pricing maturity for adjustable rate items. Then assets and liabilities within each time band are offset against each other. Next, net positions are multiplied by weighting factors reflecting the modified duration, which approximates the sensitivity of the economic value of a net position to an interest rate shift for that time band. Finally the total interest rate risk is computed as the ratio of the sum of the net weighted positions to regulatory capital.[15] FINMA uses 3 variants of that measure that use different replication assumptions for assets and liabilities with unspecified maturity or repricing schedules such as sight deposits. The first uses each bank's own

[15] Esposito et al (2013) outline the Italian implementation, which is quite similar except that 14 instead of 18 time bands are used.

assumption, the second uses the average of all banks' assumptions in a given quarter, and the third uses a fixed assumption of 2 years. For our baseline analysis we rely on the third, most conservative variant, as that reflects entirely changes in banks' actual maturity mismatch rather than changes in the underlying assumptions. In the Online Appendix we also explore how our results change when we use either of the other two measures.

To start with, the table shows that high-IRRE banks do reject more often and offer shorter fixation periods, but also offer lower rates conditional on making an offer. More interestingly, the following two lines show that mortgage rates are not only increasing in the requested fixation (Requested FP line, Column 5), but are increasing more steeply with each year of requested fixation period for high- than for low-IRRE banks (IRRE*RFP line, Column 5). As discussed above, we can interpret our estimates of the effects of Requested FP (0.095) and IRRE*RFP(0.18) on the offered rate as reduced-form equations in an instrumental-variable regression of the rate on respectively offered FP and OFP*IRRE. Column (3) provides the corresponding first-stage coefficient of 0.88, from which we can compute instrumental variable effects of the Offered FP (0.88*0.095) and OFP*IRRE (0.88*0.18) on the weighted mortgage rate. All these effects have been estimated with the full set of household, house and bank controls as well as year-by-month fixed effects. Overall we can confirm *Hypothesis 3*: High-IRRE banks do indeed ceteris paribus prefer to provide shorter fixation periods.

In the Online Appendix we provide 6 different variations of our IRRE regressions to explore their robustness. The first focuses on the outcome variables Offered FP, Offered Duration and Offered Rate and estimates a Heckman two-step model to see how the effects of a bank's pre-existing IRRE on these outcomes differ when taking into account the selective rejection behavior we have discussed above. In the first step of that estimation, we instrument the rejection probability with the distance between the bank and the household, thus exploiting the fact that independently from other household or bank characteristics (for which we fully control) a bank is more likely to reject a request the further away the household. This is reflected in the last line and last column of the IRRE Variation 1 table. The table confirms all of our main results: High-IRRE banks still offer shorter FPs while making better rates, and rates are still increasing in the requested and hence also in the offered fixation periods. The table also confirms that high-IRRE banks charge higher term premiums than low-IRRE banks. In the second variation, we focus specifically on a bank's responses to requests for new mortgages, about half of all requests. Results here are quite similar to those in the full sample:

Again high-IRRE banks reject more often, offer shorter fixation periods, and charge higher term premiums than low-IRRE banks.

Much more interesting are the 3rd and 4th variations, in which we replace the IRRE measure based on the fixed 2 year assumptions with respectively bank-specific and period-average assumptions. In the 4th variation, assumptions vary only across quarters, whereas in the 3rd they vary also within each quarter across banks. Interestingly, we find that using average assumptions still produces all the same signs as using the fixed assumption of two years. However, using bank-specific assumptions turns around most signs in the effects of IRRE: Now we find that banks reporting higher IRRE are less likely to implicitly reject (but still more likely to explicitly reject), offer longer FP and offer high mortgage rates. How can we explain this? Now higher IRRE figures reflect not necessarily greater maturity transformation, but may also reflect more conservative assumptions in what is being reported to the supervisor. But apparently banks are aware that some of these higher figures are only due to more conservative assumptions and therefore the resulting IRRE figures need not lead them to go for shorter FP. By contrast, the more conservative assumptions may also reflect a generally more cautious bank risk management, causing also greater caution about the additional credit risk that would result from shifting more interest rate risk to households by way of offering them shorter fixation periods.

Variations 5 and 6 finally explore how the statistical significance of our results is affected by using clustered standard errors. Note that clustering by bank here would not make sense as we have only 31 banks in the sample. But since we now have several responses per request, we can now cluster by request, and like for the household choice regressions by year-by-month. In both types of clustering, the number of observations per cluster is rather heterogeneous, hence we prefer to use only heteroscedasticity robust standard errors for our baseline estimates, but report the two types of clustered standard errors as robustness checks. Analyzing the resulting tables, we see no relevant changes in statistical significance, except that the positive effect of IRRE on the probability of explicit rejections loses its statistical significance at the conventional levels.

4.3.2 Responses to household characteristics

If interest rate risk was the only relevant concern for a bank's risk management, it ought to try to shift all such risk to households, or charge sufficiently high risk premiums to households unwilling to bear the interest rate risk themselves. However, *Hypothesis 4* above made it clear that shifting the interest rate risk to households will increase banks' credit risk, and will do so in particular for households with already high initial PTI or LTV ratios. This suggests that for such households, banks should ceteris paribus prefer longer fixation periods.

Table 7 fully confirms *Hypothesis 4*: It shows that higher PTI or LTV ratios do not only increase rejection probabilities, but do also result in higher offered fixation periods and durations conditional on offering—over and above the fixation period requested, which we control for. In the same vein, while higher requested and hence higher offered fixation periods do in general lead to higher mortgage rates, these rates increase less steeply for high-PTI requests. So banks use both the offering and the pricing channel to nudge high-PTI or –LTV households toward longer fixation periods. All of these regressions control for bank fixed effects as well as for year-by-month fixed effects, as well as for the full set of household and house fixed effects. By use of the bank fixed effects, we can essentially compare the responses of the same bank to pairs of requests with different PTI or LTV ratios.

In the Online Appendix we have again explored the robustness of these PTI findings along four dimensions. The first variation uses again a two-step Heckman procedure analogous to that used to explore the robustness of the IRRE findings above. This table confirms all of our findings: Again high-PTI and high-LTV households are offered shorter fixation periods and durations, and are ceteris paribus charged lower term premiums than households with lower PTI or LTV ratios. Variation 2 focuses again on the subsample of new mortgages, Variation 3 uses standard errors clustered by request, and Variation 4 uses standard errors clustered by year*month. All three variations confirm our baseline results on the effects of PTI and LTV.

4.3.3 Response to changes in interest rate expectations

Above we have discussed how a bank's responses depend on bank and household characteristics, but the Santomero model discussed above also yields predictions about the effects of changes in the market, more specifically in the level and variance of a bank's funding costs. To test this, we exploit the shock to the level and variance of interbank interest rates caused by a series of speeches delivered in the spring of 2013 by F ed Chairman Ben Bernanke, as explained in Subsection 3.2.3 above.

Table 8 shows the results of regressing the a bank's different responses on an indicator for the post-shock period, the requested fixation period, the household's PTI and LTV ratios, the bank's IRRE, and the interaction between the post-shock indicator and all the other variables mentioned. The regressions control for bank fixed effects, year-by-month fixed effects, and the full set of household and house characteristics. For our baseline analysis, we use a time window of 8 months, 4 before and 4 after the speech. The pre-speech window of 4 months fits well with the activation of the Counter-Cyclical Capital Buffer on 20 February 2013, which has been analyzed in more detail in Basten and Koch (2015b): By starting our time window only after that activation we can ensure that there were no other relevant policy changes during or between our time windows. In robustness checks in the Online Appendix we shorten these windows further to respectively 4 and 6 months.

Table 8 shows that after the shock banks were between 5 and 9 percentage points more likely to reject a mortgage request, and offered about 3 months shorter fixation periods and durations. The term structure of mortgage rates did both shift upward by 15.6bbp and did become steeper: The additional marginal cost per year of fixation period increased from 8.9bp before the shock to 11.7bp afterward. We also find the marginal effect of PTI, LTV and IRRE on several of the bank's responses to have changed with the shock. Overall the shock appears to have strengthened banks' preferences for shorter fixation periods, i.e. for shifting more of the interest rate risk to the borrower side, thus confirming *Hypothesis 5* above.

In the Online Appendix we have again explored how the offered fixation period and pricing responses change when we account for selective rejection probabilities by use of a Heckman two-step procedure. Here as well we find that after the shock banks preferred shorter fixation periods and durations than before. There is also some evidence of a steeper term structure, however that effect loses its statistical significance at the conventional levels. In another variation there, we again focus specifically on the subsample of new mortgage requests: Here all three effects of interest (higher rejection probabilities, shorter offered fixation periods and durations, and a steeper term structure) remain intact. In two further variations, we have shortened the time window from 8 to respectively 4 and 6 months. Here the effect on pricing behavior remains fully intact, whereas the negative effect on offered fixation periods and durations remains present, but loses its statistical significance due to the lower number of observations used now. Finally, Bernanke Shock Variations 5 and 6 use standard errors clustered by respectively request and year-by-month. As discussed above, this is not our preferred specification, as in both cases the number of observations per cluster is rather heterogeneous, yet we report these estimates as robustness checks. When clustering by request, the steepening of the term structure remains significant at the 1% level. The negative effect on the offered duration remains significant only at the 10% level, whereas that on offered fixation periods loses its statistical significance at conventional levels. When clustering by year-by-month, only the effect on the steepness of the term structure remains fully significant at the 1% level.

5 Conclusion

In this paper we have investigated the determinants of mortgage fixation periods, which are a crucial determinant of interest rate risk and indeed credit risk for many retail banks. Previous researchers have at best observed final mortgage contracts and simply interpreted these as reflecting entirely the preferences of the borrowing households. We by contrast have been able to separately observe individual mortgage requests and individual mortgage offers, enabling us to distinguish between determinants of respectively mortgage demand and mortgage supply. We have even been able to fully control for possible self-selection of different households to different banks, as we observe responses from different banks to the same household.

On this basis, we have confirmed that households care a lot about the relative price between shorter and longer fixation periods. By contrast, the use of longer fixation periods as a means to insure the household against interest rate risk, which has also been found in some previous work and attributed to household choices, turns out in our setup to be driven by banks rather than households. To the contrary, we find that precisely those households most vulnerable to interest rate increases, those with high PTI or LTV ratios, are least likely to seek longer fixation periods insuring them against rate increases, because these are also more expensive and the most vulnerable households live on the tightest budgets.

Here the risk management of banks comes into play, for as we show that can influence contracted mortgage rate fixation periods through several channels: First they can selectively reject mortgage requests conditional on whether the requested fixation periods suit their strategy. Second, they can offer households fixation periods that are shorter or longer than those requested. And third they can offer the fixation periods requested but charge a higher mark-up above refinancing costs and interest rate swaps for fixation periods not in line with the bank's strategy. But which factors does a bank's fixation period strategy depend on?

Based on Santomero (1983) we recognize that for banks the choice of different fixation periods is essentially about how much of the interest rate risk to shift from the lender to the borrower. But interest rate risk shifted to the borrower turns into credit risk for the lender. The optimal degree of interest rate risk shifting therefore depends firstly on how much interest rate risk and credit risk the bank is already bearing . It depends secondly on the capability of the household to bear more interest rate risk and hence on its Payment to Income and Loan to

Value ratios. It depends finally on the prevailing level and variability of interbank interest rates. In this paper we have explicitly tested each of these three hypotheses. First, we enrich our unique data on mortgage demand and supply with supervisory data on bank balance sheets and show that ceteris paribus banks do indeed prefer shorter fixation periods when exhibit already high interest rate risk exposures. Second, we use household PTI and LTV ratios as proxies for a household's ability to bear interest rate risk and show that banks do indeed prefer longer fixation periods for those households least able to bear more interest rate risk. Since the Swiss legal system knows full recourse of lenders to a borrower's future stream of income in the case of mortgage default, this is an interesting case in which more careful bank risk management can ultimately benefit not only the bank's shareholders and creditors, but also all those liable to repay loans to the bank. Third, we exploit an unanticipated and exogenous shock to the level and variance of interbank interest rates and show that banks respond to that shock by shifting less interest rate risk to households.

With these findings we contribute both to the literature on mortgage choice and to that on a bank's management of its interest rate risk and credit risk. More practically, we have demonstrated how banks can use different channels to actively influence their mortgage fixation periods and thereby steer both their interest rate risk and their credit risk.

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6 Figures and Tables

Figure 1.a. Swap rates over time

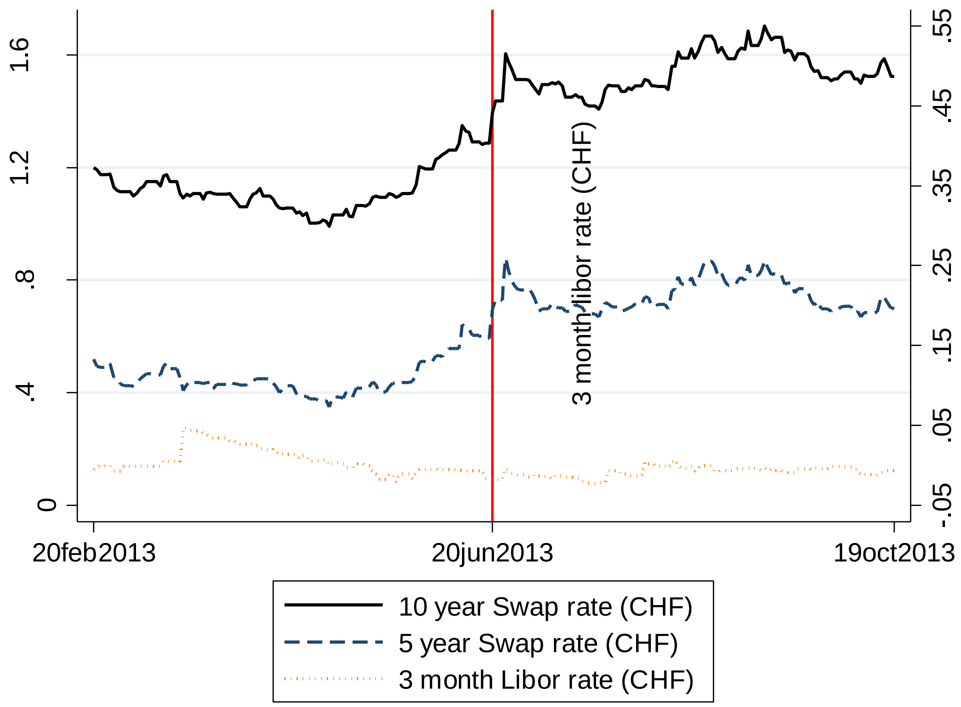

Figure 1.b. Term premia before and after Bernanke's speech

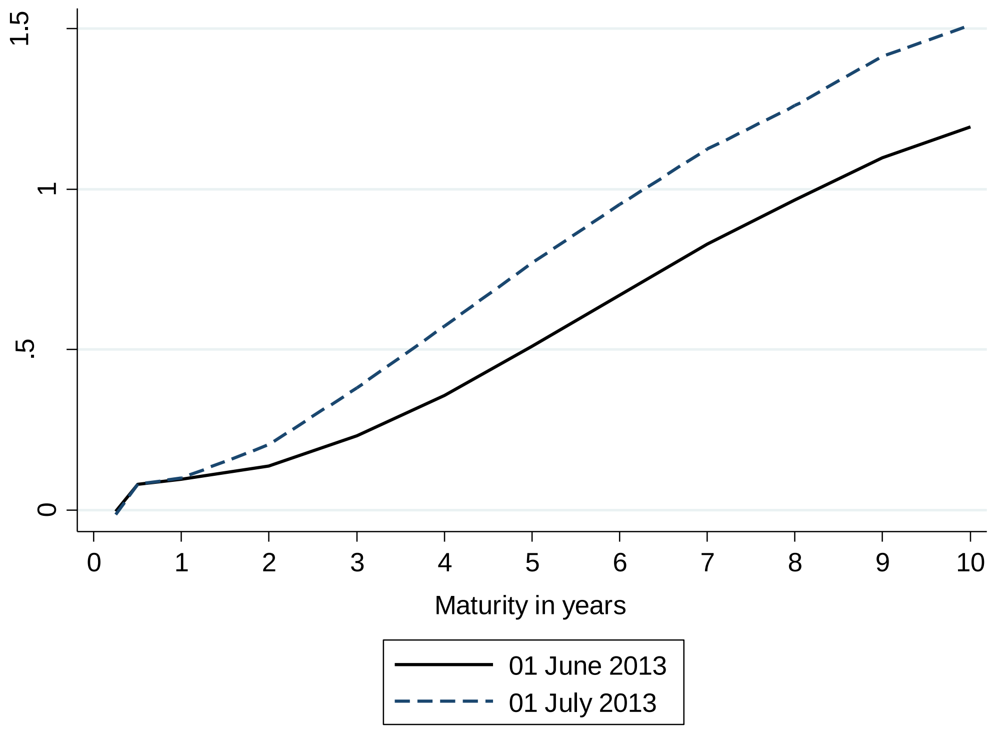

Figure 1.c. Volatility of Swap rates (CHF) before and after Bernanke speeches

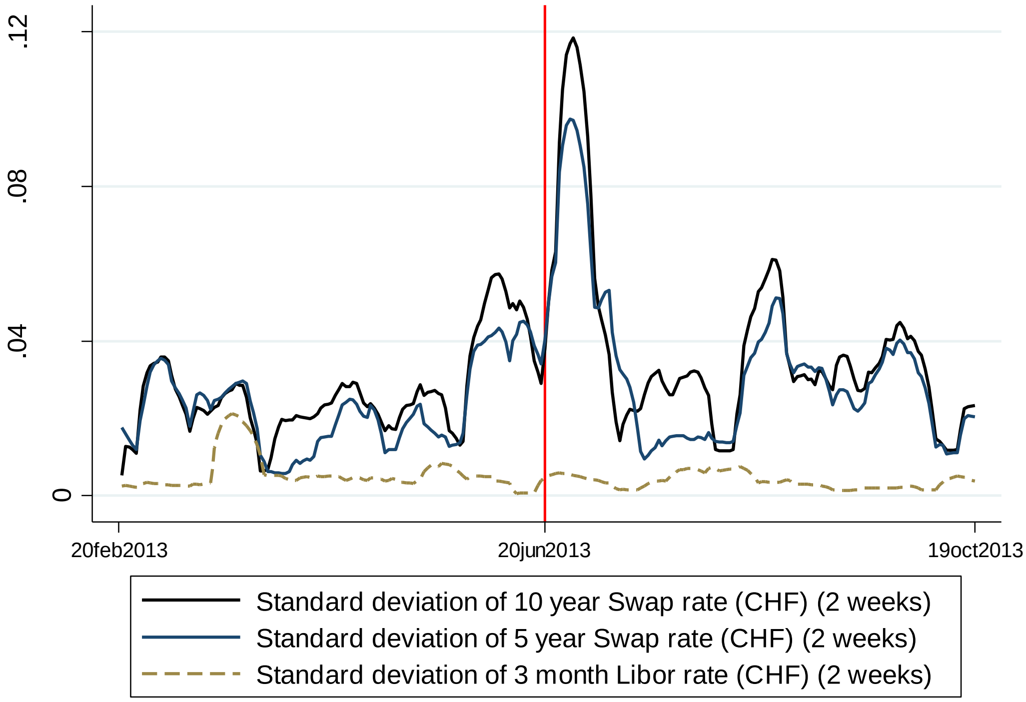

Table 1: Summary Statistics on Requests and Responses

Panel A of this table shows the characteristics of the 7'338 requests submitted between 2010 and 2013. Panel B shows those of the 227'474 possible responses (each bank-household combination), resulting in 28'535 explicit responses (offer or rejection), of which 23'347 are offers. Definitions of the variables are provided in the Online Appendix.

Panel A. Request characteristics

	mean	stdev	min	max	Observations
Fixation Period (FP) requested	7.02	3.53	0.00	10.00	7'338
Payment-to-Income (PTI) ratio	26.77	14.14	4.67	102.40	7'338
PTI >33% (0/1)	0.21	0.41	0.00	1.00	7'338
Loan-to-Value (LTV) ratio	65.37	18.02	0.00	100.00	7'338
LTV >80% (0/1)	0.10	0.30	0.00	1.00	7'338
Household Wealth (ln)	12.57	1.08	8.52	16.81	7'338
Other real estate (0/1)	0.24	0.43	0.00	1.00	7'338
Debt (0/1)	0.22	0.41	0.00	1.00	7'338
Applicant age	46.19	10.52	18.00	92.00	7'338
Securities holdings (ln)	4.84	5.57	0.00	16.12	7'338
Property age	28.61	35.91	-2.00	255.00	7'338
New mortgage (0/1)	0.56	0.50	0.00	1.00	7'338

Panel B. Response characteristics

	mean	stdev	min	max	Observations
Implicit Rejection	0.90	0.30	0.00	1.00	227'474
Explicit Rejection	0.18	0.39	0.00	1.00	28'535
Average FP offered	7.13	3.21	0.00	10.00	23'347
Weighted interest rate	2.16	0.56	0.10	6.91	23'347
Weighted Spread	0.94	0.33	-1.73	6.87	23'347
Duration offered	6.66	2.68	0.00	9.95	23'347

Table 2: Our sample and the Swiss mortgage market

(A) Sample vs. SNB Statistics of the distribution across cantons

	SNB	Sample	
	% of Volumes	% of Volumes	% of Number
	(1)	(2a)	(2b)
Zurich	19.19	24.54	21.48
Berne	10.77	12.29	14.02
Aargau	8.73	11.75	12.17
Vaud	8.07	9.42	8.67
St.Gallen	5.73	4.16	4.89
Geneva	5.06	3.91	2.55
Ticino	4.73	2.53	2.7
Lucerne	4.64	3.71	3.75
Basel Land	3.86	4.02	4.2
Valais	3.59	2.18	3.23
Thurgau	3.48	2.98	3.43
Solothurn	3.37	3.15	3.45
Graubünden	3.33	1.95	2.62
Fribourg	3.23	2.59	3.05
Schwyz	2.37	2.79	2.06
Zug	2.04	1.97	1.68
Basel Stadt	1.92	2.05	1.61
Neuchatel	1.53	0.88	1.01
Schaffhausen	0.94	0.86	0.99
Jura	0.75	0.33	0.45
Appenzell AR	0.62	0.33	0.48
Nidwalden	0.54	0.50	0.3
Obwalden	0.47	0.46	0.48
Glarus	0.44	0.32	0.42
Uri	0.40	0.28	0.27
Appenzell IR	0.18	0.05	0.05

(B) Comparison Sample vs. Seiler survey of the distribution across regions

	Seiler (2013)			Sample	
	Overall	Pension-financed	Not pension-financed	% of Volumes	% of No
	(1)	(2)	(3)	(4)	(5)
Zurich	28.28	27	31	25.40	22.47
Eastern Switzerland	16	16	16	9.81	11.89
Mittelland	17.72	19	15	27.18	29.64
Northwestern Switzerland	13.36	14	12	9.86	10.32
Lake Geneva Region	10.36	11	9	15.51	14.45
Ticino	4.28	3	7	2.53	2.70
Central Switzerland	8	8	8	9.70	8.54

Notes: Panel (A) compares the distribution of mortgage lending across cantons (states) between the entire Swiss mortgage market in Column (1) and our sample in Columns (2) and (3), based on statistics from SNB (2014). Panel (B) compares the distribution across market regions between Seiler (2013) on the one hand and our sample on the other hand.

Table 3: Summary Statistics on Banks

This table shows how the characteristics of the banks vary across the 31 banks ("between"), the 16 quarters ("within") and overall. Definitions of the variables are provided in the Online Appendix.

		mean	stdev	min	max	Observations
Bank*Quarter Level						
IRRE (bank assumptions)	overall	0.05	0.04	-0.08	0.18	496
	between		0.04	-0.04	0.14	31
	within		0.02	-0.01	0.09	16
IRRE (average assumptions)	overall	0.05	0.03	-0.04	0.15	496
	between		0.03	-0.01	0.11	31
	within		0.02	-0.01	0.10	16
IRRE (2 year assumption)	overall	0.08	0.04	-0.01	0.18	496
	between		0.03	0.01	0.15	31
	within		0.02	0.02	0.14	16
Total Assets in Mio. CHF	overall	13.03	24.75	0.34	147.63	496
	between		25.05	0.41	134.90	31
	within		2.05	-6.79	25.76	16
Interest swap use (0/1)	overall	0.84	0.36	0.00	1.00	496
	between		0.35	0.00	1.00	31
	within		0.12	0.16	1.34	16
Capital in % of RWA	overall	24.28	4.49	15.63	36.25	496
	between		4.30	17.48	33.77	31
	within		1.50	20.37	29.80	16
Return on Assets (ROA)	overall	0.22	0.42	0.00	1.00	496
	between		0.32	0.00	1.00	31
	within		0.27	-0.53	1.03	16
Deposits over loans	overall	0.88	0.09	0.75	1.19	496
	between		0.09	0.76	1.13	31
	within		0.03	0.74	0.98	16

Table 4: A household's fixation period choice

This table shows the point estimates relating the Fixation Period (FP) requested by a household to household & house characteristics, as well as to the difference between long- and short-term rates prevailing on the day of the request. Column (1) uses a Linear Probability Model (LPM), Column (2) an Ordered Logit Model, and Column (3) an Ordered Probit Model. The sample includes requests for mortgages filed between 2010 and 2013. Observations are on the request level. House variables are indicator variables for the property type, *Property age* . Heteroskedasticity robust standard errors are reported in brackets. ***, **, * denote statistical significance at the 0.01, 0.05 and 0.10-level respectively. Definitions of the variables are provided in the Online Appendix.

Methodology	OLS	Ordered Logit	Ordered Probit
Dependent variable	FP requested	FP requested	FP requested
	(1)	(2)	(3)
10y - Libor mortgage rates	-1.344***	-0.903***	-0.491***
	(0.099)	(0.057)	(0.034)
PTI	-0.003*	-0.001	-0.001*
	(0.002)	(0.001)	(0.000)
PTI >33% (0/1)	0.076	0.082	0.035
	(0.110)	(0.061)	(0.037)
LTV	0.002	0.002	0.001
	(0.003)	(0.001)	(0.001)
LTV >80% (0/1)	-0.422***	-0.238***	-0.146***
	(0.158)	(0.083)	(0.050)
Wealth (ln)	0.104**	0.080***	0.040***
	(0.043)	(0.023)	(0.014)
Other real estate (0/1)	-0.262**	-0.133**	-0.077**
	(0.103)	(0.055)	(0.033)
Debt (0/1)	-0.225**	-0.108*	-0.071**
	(0.104)	(0.055)	(0.033)
Age	-0.003	-0.018	-0.009
	(0.029)	(0.015)	(0.009)
Age*Age	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)
Securities (ln)	0.010	0.006	0.003
	(0.008)	(0.004)	(0.003)
Constant	8.785***	-1.495***	-0.880***
	(0.920)	(0.482)	(0.286)
Observations	7,338	7,338	7,338
R-squared	0.051		
House variables	Yes	Yes	Yes

Table 5: Fixation period choices by households and banks

This table shows bank responses depending on the Fixation Period (FP) requested by households. The sample includes only requests for mortgages filed between 2010 and 2013. Observations are on the request level. Definitions of the variables are provided in the appendix.

FP requested	All responses	Explicit Rejection in %	Average FP offered in %			Offers if Offered FP = Req. FP	
			shorter	equal	longer	Rate	Spread
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ARM	3'548	31.9	0.0	48.4	19.7	1.6	1.5
1	55	41.8	3.6	47.3	7.3	1.5	1.2
2	446	20.2	4.9	74.2	0.7	1.4	0.9
3	790	17.5	3.5	78.1	0.9	1.5	0.8
4	305	14.4	5.2	78.7	1.6	1.7	0.8
5	5'973	14.8	6.0	78.2	1.0	1.9	0.8
6	627	15.2	5.1	79.3	0.5	2.1	0.9
7	1'156	18.9	8.4	72.3	0.3	2.3	0.8
8	1'591	14.8	8.2	76.4	0.6	2.4	0.9
9	127	15.7	3.1	81.1	0.0	2.4	0.9
10	13'917	16.6	8.5	74.9	0.0	2.4	0.9
Total	28'535	18.2	6.6	72.5	2.8	2.1	0.9

Table 6: Banks' Response to IRRE

This table shows the point estimates relating banks' choices to bank characteristics, most importantly to their existing Interest Rate Risk Exposure (IRRE). The IRRE measure is based on the assumption that assets and liabilities with an unspecified duration, such as sight deposits, have an actual maturity of 2 years. Heteroskedasticity robust standard errors are reported in brackets. ***, **, * denote statistical significance at the 0.01, 0.05 and 0.10-level respectively.

	Implicit or Explicit Rejection	Explicit Rejection	Offered FP	Offered Duration	Weighted interest rate
	(1)	(2)	(3)	(4)	(5)
Interest Rate Risk Exposure	0.699***	0.350**	-4.485***	-2.670***	-1.357***
	(0.035)	(0.173)	(0.604)	(0.482)	(0.266)
(IRRE)*(Requested FP)	0.006	-0.032	0.421***	0.216***	0.180***
	(0.004)	(0.022)	(0.070)	(0.056)	(0.031)
Requested FP	-0.001***	-0.006***	0.881***	0.743***	0.095***
	(0.000)	(0.002)	(0.007)	(0.005)	(0.003)
PTI >33% (0/1)	0.044***	0.194***	0.031**	0.036***	0.027***
	(0.001)	(0.007)	(0.016)	(0.013)	(0.006)
LTV >80% (0/1)	0.048***	0.301***	-0.055**	-0.039*	0.034***
	(0.002)	(0.010)	(0.027)	(0.022)	(0.009)
Total Assets	-0.041***	-0.006***	-0.009**	-0.004	-0.014***
	(0.001)	(0.002)	(0.004)	(0.004)	(0.002)
Using IR Swaps	-0.022***	0.113***	0.038*	0.025	-0.052***
	(0.001)	(0.012)	(0.022)	(0.018)	(0.012)
Equity / RWA	0.793***	0.876***	-2.684***	-2.069***	-0.060
	(0.025)	(0.115)	(0.234)	(0.193)	(0.112)
ROA	0.036***	-0.005	0.003	0.020*	-0.080***
	(0.002)	(0.007)	(0.014)	(0.012)	(0.006)
Deposits/Loans	-0.226***	0.241***	-0.159**	-0.187***	0.094***
	(0.007)	(0.029)	(0.062)	(0.051)	(0.028)
Constant	1.707***	0.364***	0.914***	1.110***	2.678***
	(0.018)	(0.061)	(0.148)	(0.122)	(0.062)
Observations	227,474	28,535	23,342	23,342	23,342
R-squared	0.069	0.144	0.944	0.946	0.724
Household Finance Controls	0.068	0.144	0.944	0.946	0.724
House Controls	Yes	Yes	Yes	Yes	Yes
Bank Controls	Yes	Yes	Yes	Yes	Yes
Year-by-month FE	Yes	Yes	Yes	Yes	Yes

Table 7: Banks' Responses to Households' Payment-to-Income Ratios

This table shows the point estimates relating banks' choice variables to household & house characteristics, most importantly to their PTI ratios. Observations are on the offer level. The sample includes only offers for mortgages filed between 2010 and 2013. House variables are indicator variables for the property type and property age. Heteroskedasticity robust standard errors are reported in brackets. ***, **, * denote statistical significance at the 0.01, 0.05 and 0.10-level respectively. Definitions of the variables are provided in the appendix.

	Implicit or Explicit Rejection	Explicit Rejection	Average FP offered	Duration offered	Weighted interest rate
	(1)	(2)	(3)	(4)	(5)
PTI >33% (0/1)	0.044***	0.200***	0.155**	0.164***	0.057**
	(0.003)	(0.015)	(0.065)	(0.052)	(0.023)
LTV >80% (0/1)	0.049***	0.270***	0.148*	0.166**	0.063*
	(0.003)	(0.020)	(0.089)	(0.069)	(0.034)
Requested FP	-0.001***	-0.009***	0.920***	0.765***	0.111***
	(0.000)	(0.001)	(0.003)	(0.002)	(0.001)
(Requested FP)*I(PTI>33)	-0.000	-0.002	-0.018**	-0.018***	-0.005**
	(0.000)	(0.002)	(0.007)	(0.006)	(0.003)
(Requested FP)*I(LTV>80)	-0.000	0.004	-0.031***	-0.031***	-0.005
	(0.000)	(0.003)	(0.011)	(0.008)	(0.004)
Wealth (ln)	-0.005***	-0.020***	0.021***	0.024***	-0.004*
	(0.001)	(0.002)	(0.005)	(0.004)	(0.002)
Other real estate (0/1)	0.003**	-0.005	-0.022*	-0.028***	-0.007
	(0.001)	(0.005)	(0.012)	(0.010)	(0.005)
Debt (0/1)	0.012***	0.062***	0.002	0.006	0.015***
	(0.001)	(0.006)	(0.013)	(0.011)	(0.005)
Age	-0.001***	-0.004**	0.016***	0.014***	-0.006***
	(0.000)	(0.002)	(0.003)	(0.003)	(0.001)
Age*Age	0.000***	0.000***	-0.000***	-0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Securities (ln)	-0.000***	-0.001**	0.000	0.000	-0.001***
	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)
Constant	0.547***	0.589***	0.039	0.502***	2.555***
Observations	227,474	28,535	23,347	23,347	23,347
R-squared	0.353	0.163	0.946	0.948	0.731
House variables	Yes	Yes	Yes	Yes	Yes
Bank FEs	Yes	Yes	Yes	Yes	Yes
Year-by-month FE	Yes	Yes	Yes	Yes	Yes

Table 8: Banks' Responses to the "Bernanke Shock"

This table shows the point estimates relating banks' choices to the "Bernanke Shock", a speech by Fed Chairman Ben Bernanke on 20 June 2013 which led to (1) an upward shift of the yield curve, (2) a steepening of the yield curve, and (3) expectations of increased future interest rate volatility, in the US and by consequence also in Switzerland. The sample includes all offers for requests from 20 February 2013 until 19 October 2013. After shock (0/1) are requests on or after 20 June 2013. House variables are indicator variables for the property type, Property age. Heteroskedasticity robust standard errors are reported in brackets. ***, **, * denote statistical significance at the 0.01, 0.05 and 0.10-level respectively. Definitions of the variables are provided in the appendix.

	Implicit or Explicit Rejection	Explicit Rejection	Offered FP	Offered Duration	Weighted interest rate
	(1)	(2)	(3)	(4)	(5)
After shock	0.047***	0.071	-0.270	-0.277*	0.156**
	(0.007)	(0.064)	(0.201)	(0.159)	(0.066)
After shock (0/1)*PTI >33% (0/1)	-0.023***	-0.060	-0.108	-0.059	0.010
	(0.007)	(0.041)	(0.069)	(0.054)	(0.037)
After shock (0/1)*LTV >80% (0/1)	0.029**	0.240***	-0.050	-0.022	0.105**
	(0.012)	(0.071)	(0.188)	(0.148)	(0.043)
After shock (0/1)*IRRE	-0.199***	-0.480	0.538	0.226	-0.432
	(0.050)	(0.608)	(1.119)	(0.891)	(0.553)
After shock (0/1) * Requested FP	-0.000	-0.003	0.018	0.010	0.028***
	(0.001)	(0.004)	(0.015)	(0.012)	(0.005)
PTI >33% (0/1)	0.040***	0.188***	0.036	0.022	0.036*
	(0.005)	(0.027)	(0.052)	(0.041)	(0.021)
LTV >80% (0/1)	0.007	0.108***	-0.033	-0.066	-0.062**
	(0.009)	(0.040)	(0.122)	(0.101)	(0.025)
IRRE	1.965***	0.078	1.261	1.219	0.425
	(0.171)	(0.535)	(1.539)	(1.226)	(0.429)
Requested FP	-0.001**	-0.016***	0.891***	0.749***	0.089***
	(0.001)	(0.002)	(0.011)	(0.008)	(0.003)
Wealth (ln)	-0.003***	-0.014**	0.028*	0.037***	-0.008
	(0.001)	(0.006)	(0.014)	(0.012)	(0.005)
Other real estate (0/1)	0.002	-0.036**	-0.021	-0.010	-0.008
	(0.003)	(0.016)	(0.042)	(0.034)	(0.013)
Debt (0/1)	0.012***	0.081***	0.057	0.043	0.004
	(0.003)	(0.017)	(0.053)	(0.043)	(0.014)
Age	-0.000	-0.006	0.018*	0.015*	-0.005
	(0.001)	(0.004)	(0.011)	(0.008)	(0.004)
Age*Age	0.000	0.000	-0.000	-0.000*	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Securities (ln)	-0.000	-0.003**	-0.003	-0.003	-0.000
	(0.000)	(0.001)	(0.003)	(0.002)	(0.001)
Constant	0.733***	0.670***	0.870	1.352***	1.626***
	(0.033)	(0.164)	(0.585)	(0.480)	(0.151)
Observations	31,186	3,296	2,767	2,767	2,767
R-squared	0.397	0.144	0.940	0.945	0.685
Bank FEs	Yes	Yes	Yes	Yes	Yes
House variables	Yes	Yes	Yes	Yes	Yes
Household Finance Variables	Yes	Yes	Yes	Yes	Yes
Year-by-month FE	Yes	Yes	Yes	Yes	Yes

Online Appendix for:

Christoph Basten, Benjamin Guin & Catherine Koch

"The Demand and Supply of Mortgage Fixation Periods"

Appendix 1. Definition of variables

Variable name	Definition	Source
Request characteristics		
FP requested	Mortgage fixation period requested by the customer.	Comparis
PTI	Payment to income ratio: 7% of loan value over main household income (winsorized on 1 percent level).	Comparis
PTI >33% (0/1)	Indicator of whether the payment to income ratio exceeds the value of 33%.	Comparis
LTV	Loan to value ratio as specified by the customer (winsorized on 1 percent level).	Comparis
LTV >80% (0/1)	Indicator of whether the loan to value ratio exceeds the value of 80%.	Comparis
Wealth (ln)	Wealth including retirement savings as specified by the customer expressed in natural logarithm.	Comparis
Other real estate (0/1)	Indicator of whether the customer possesses furher real estate.	Comparis
Debt (0/1)	Indicator of whether the customer reports any kind of debt.	Comparis
Age	Age of the customer in years.	Comparis
Securities (ln)	Value of securities portfolio in CHF expressed in natural logarithm.	Comparis
Property age	Difference between the year of the request and the year of property construction.	Comparis
New mortgage (0/1)	Indicator of whether the mortgage is a new mortgage (refinance mortage otherwise).	Comparis
Bank characteristics		
Implicit Rejection	Indicator of whether the bank does not make an mortgage offer independent of whether the offer was sent.	Comparis
Explicit Rejection	Indicator of whether the bank does not make a binding mortgage offer given that the offer was sent.	Comparis
Average FP offered	Tranche-weighted mortgage fixation period offered by the bank.	Comparis
Weighted interest rate	Tranche-weighted mortgage interest rate offered by the bank.	Comparis
Duration offered	Duration offered by the bank.	Comparis
Interest Rate Risk Exposure (IRRE)	Impact of a positive interest rate shock of 100 basis points on banks' equity. As baseline we use a measure assuming for any assets and liabilities with unspecified maturity a replication of 2 years.	FINMA
IRRE (bank assumptions)	This variant of the IRRE measure uses each bank's own replication assumptions.	
IRRE (average assumptions)	This variant of the IRRE measure uses the average (in a quarter) of all banks' replication assumptions.	
Total assets (ln)	Total assets in 1'000 CHF expressed in natural logarithm.	FINMA
Interest swap (0/1)	Indicator of whether the bank uses interest rate swaps.	FINMA
Capital ratio	Total equity capital relative to required equity capital under Basel II	FINMA
ROA	Return on assets in percentage points.	FINMA
Deposits over loans	Ratio of deposits over loans.	FINMA
Time-varying characteristics		
Rate 10y-3m	Difference between average interest rate charged on 10-year fixed and 3-month variable mortgages in Switzerland (per month).	SNB
After shock (0/1)	Indicator of whether the request was submitted on or after 20 June 2013.	Comparis

Household Choice Variation 1: Government Bond instead of Mortgage Rates

This table repeats the analyses from the main Household FP Choice Table, but uses the difference between 10-year and Libor Swiss government bond rates, instead of that between published mortgage rates.

Methodology	Linear Probability Model	Ordered Logit	Ordered Probit
Dependent variable	FP requested	FP requested	FP requested
	(1)	(2)	(3)
10y - 1y government bond rates	-1.411***	-0.902***	-0.499***
	(0.094)	(0.051)	(0.031)
PTI	-0.003*	-0.001*	-0.001*
	(0.002)	(0.001)	(0.000)
PTI >33% (0/1)	0.054	0.068	0.027
	(0.110)	(0.061)	(0.037)
LTV	0.002	0.002	0.001
	(0.003)	(0.001)	(0.001)
LTV >80% (0/1)	-0.451***	-0.260***	-0.158***
	(0.157)	(0.083)	(0.050)
Wealth (ln)	0.109**	0.083***	0.042***
	(0.043)	(0.023)	(0.014)
Other real estate (0/1)	-0.261**	-0.133**	-0.076**
	(0.103)	(0.055)	(0.033)
Debt (0/1)	-0.245**	-0.123**	-0.078**
	(0.104)	(0.055)	(0.033)
Age	-0.004	-0.018	-0.009
	(0.029)	(0.015)	(0.009)
Age*Age	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)
Securities (ln)	0.010	0.005	0.003
	(0.008)	(0.004)	(0.003)
Constant	8.133***	-1.013**	-0.619**
	(0.911)	(0.477)	(0.283)
Observations	7,338	7,338	7,338
R-squared	0.056		
House variables	Yes	Yes	Yes

Household Choice Variation 2: New Mortgage Requests Only

This table repeats the analyses from the main Household FP Choice Table, but uses only requests for new mortgages and not those for roll-overs.

Methodology	Linear Probability Model	Ordered Logit	Ordered Probit
Dependent variable	FP requested	FP requested	FP requested
	(1)	(2)	(3)
10y - Libor mortgage rates	-1.341***	-0.912***	-0.508***
	(0.132)	(0.078)	(0.046)
PTI	-0.004*	-0.002	-0.001
	(0.003)	(0.001)	(0.001)
PTI >33% (0/1)	0.057	0.068	0.027
	(0.142)	(0.081)	(0.048)
LTV	-0.007	-0.003	-0.002
	(0.004)	(0.002)	(0.001)
LTV >80% (0/1)	-0.389**	-0.203*	-0.127**
	(0.198)	(0.104)	(0.062)
Wealth (ln)	0.045	0.064	0.026
	(0.073)	(0.040)	(0.024)
Other real estate (0/1)	-0.316**	-0.195**	-0.103**
	(0.146)	(0.079)	(0.048)
Debt (0/1)	-0.213	-0.098	-0.070
	(0.145)	(0.079)	(0.047)
Age	0.103**	0.048**	0.029**
	(0.045)	(0.023)	(0.014)
Age*Age	-0.002***	-0.001***	-0.000***
	(0.000)	(0.000)	(0.000)
Securities (ln)	0.008	0.005	0.003
	(0.011)	(0.006)	(0.004)
Constant	8.474***	-0.784	-0.594
	(1.359)	(0.729)	(0.427)
Observations	4,089	4,089	4,089
R-squared	0.053		
House variables	Yes	Yes	Yes

Household Choice Variation 3: Clustering Standard Errors by Year*Month

This table repeats the analyses from the main Household FP Choice Table, but uses standard errors clustered by year*month, rather than merely heteroskedasticity robust standard errors.

Methodology	Linear Probability Model	Ordered Logit	Ordered Probit
Dependent variable	FP requested	FP requested	FP requested
	(1)	(2)	(3)
10y - Libor mortgage rates	-1.348***	-0.905***	-0.492***
	(0.184)	(0.107)	(0.063)
PTI	-0.003**	-0.001*	-0.001*
	(0.001)	(0.001)	(0.000)
PTI >33% (0/1)	0.075	0.081	0.035
	(0.125)	(0.071)	(0.042)
LTV	0.002	0.002	0.001
	(0.002)	(0.001)	(0.001)
LTV >80% (0/1)	-0.422**	-0.238***	-0.146***
	(0.169)	(0.092)	(0.055)
Wealth (ln)	0.104**	0.080***	0.040***
	(0.042)	(0.023)	(0.014)
Other real estate (0/1)	-0.261**	-0.133**	-0.076**
	(0.099)	(0.052)	(0.031)
Debt (0/1)	-0.224**	-0.108**	-0.071***
	(0.084)	(0.044)	(0.026)
Age	-0.003	-0.018	-0.009
	(0.030)	(0.016)	(0.010)
Age*Age	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)
Securities (ln)	0.010	0.005	0.003
	(0.008)	(0.004)	(0.003)
Constant	8.775***	-1.489***	-0.877***
	(1.044)	(0.526)	(0.310)
Observations	7,338	7,338	7,338
R-squared	0.052		
House variables	Yes	Yes	Yes

IRRE Response Variation 1: Heckman Model

This table repeats the estimates of the IRRE Response Table of the paper, but uses a Heckman procedure: We first estimate the probability that an offer is made, using as exogenous regressor the distance between each household and each bank. In the second stage we then control for that selection probability. Heteroskedasticity robust standard errors are reported in brackets. ***, **, * denote statistical significance at the 0.01, 0.05 and 0.10-level respectively. Definitions of the variables are provided in the appendix.

	Offered FP	Offered Duration	Offered Rate	Selection
	(1)	(2)	(3)	(4)
Interest Rate Risk Exposure	-4.904***	-2.968***	-1.407***	-4.576***
	(0.386)	(0.315)	(0.148)	(0.258)
(IRRE)*(Requested FP)	0.405***	0.205***	0.178***	-0.037
	(0.048)	(0.039)	(0.019)	(0.031)
Requested FP	0.884***	0.744***	0.095***	0.009***
	(0.004)	(0.004)	(0.002)	(0.003)
PTI >33% (0/1)	-0.071***	-0.037***	0.015**	-0.308***
	(0.017)	(0.014)	(0.006)	(0.011)
LTV >80% (0/1)	-0.176***	-0.125***	0.020**	-0.377***
	(0.024)	(0.020)	(0.009)	(0.016)
Total Assets	0.067***	0.050***	-0.005**	0.223***
	(0.007)	(0.005)	(0.003)	(0.003)
Using IR Swaps	0.067**	0.046*	-0.049***	0.297***
	(0.030)	(0.025)	(0.012)	(0.016)
Equity / RWA	-4.061***	-3.053***	-0.223**	-8.558***
	(0.294)	(0.240)	(0.113)	(0.195)
ROA	-0.053***	-0.020	-0.087***	-0.182***
	(0.017)	(0.014)	(0.006)	(0.011)
Deposits/Loans	0.098	-0.003	0.124***	1.201***
	(0.072)	(0.058)	(0.028)	(0.045)
Distance HH Bank in km				-0.003***
				(0.000)
Constant	-1.280***	-0.418***	2.205***	-4.607***
	(0.193)	(0.157)	(0.074)	(0.103)
Observations	227,474	227,474	227,474	227,474
Household Finance Controls	Yes	Yes	Yes	Yes
House Controls	Yes	Yes	Yes	Yes
Bank Controls	Yes	Yes	Yes	Yes
Year-by-month FE	Yes	Yes	Yes	Yes

IRRE Response Variation 2: New Mortgages

This table shows the point estimates relating banks' choices to bank characteristics, most importantly to their existing IRRE. In contrast to the IRRE Response Table in the paper, we focus here on requests for new mortgages. Observations are on the offer level. The sample covers the years 2010-2013. Heteroskedasticity robust standard errors are reported in brackets. ***, **, * denote statistical significance at the 0.01, 0.05 and 0.10-level respectively. Definitions of the variables are provided in the appendix.

	Implicit or Explicit Rejection	Explicit Rejection	Offered FP	Offered Duration	Weighted interest rate
	(1)	(2)	(3)	(4)	(5)
Interest Rate Risk Exposure	0.733***	0.581**	-4.390***	-2.581***	-1.053***
	(0.048)	(0.236)	(0.917)	(0.727)	(0.393)
(IRRE)*(Requested FP)	0.002	-0.055*	0.385***	0.187**	0.146***
	(0.005)	(0.028)	(0.102)	(0.081)	(0.044)
Requested FP	-0.001	-0.003	0.877***	0.734***	0.089***
	(0.000)	(0.003)	(0.010)	(0.008)	(0.004)
PTI >33% (0/1)	0.047***	0.217***	0.040*	0.034*	0.032***
	(0.002)	(0.009)	(0.022)	(0.018)	(0.008)
LTV >80% (0/1)	0.048***	0.331***	-0.080**	-0.068***	0.003
	(0.002)	(0.012)	(0.032)	(0.026)	(0.012)
Total Assets	-0.041***	-0.019***	-0.010	-0.004	-0.018***
	(0.001)	(0.002)	(0.007)	(0.006)	(0.002)
Using IR Swaps	-0.021***	0.129***	0.032	0.016	-0.044**
	(0.001)	(0.016)	(0.033)	(0.026)	(0.018)
Tier 1 Capital / RWA	0.737***	0.923***	-3.323***	-2.627***	0.178
	(0.033)	(0.151)	(0.346)	(0.284)	(0.159)
ROA	0.033***	-0.012	0.021	0.041**	-0.093***
	(0.002)	(0.009)	(0.022)	(0.018)	(0.009)
Deposits/Loans	-0.216***	0.389***	-0.422***	-0.383***	0.146***
	(0.010)	(0.038)	(0.096)	(0.079)	(0.039)
Constant	1.730***	0.666***	0.853***	1.057***	2.753***
	(0.024)	(0.087)	(0.223)	(0.183)	(0.088)
Observations	126,758	15,544	12,669	12,669	12,669
R-squared	0.070	0.211	0.935	0.937	0.708
Household Finance Controls	Yes	Yes	Yes	Yes	Yes
House Controls	Yes	Yes	Yes	Yes	Yes
Bank Controls	Yes	Yes	Yes	Yes	Yes
Year-by-month FE	Yes	Yes	Yes	Yes	Yes

IRRE Response Variation 3: Bank Assumptions

This table repeats the analysis of the IRRE Response Table in the paper. However, the IRRE measure used here is based on each bank's own assumptions about the replication term for assets and liabilities with unspecified maturity, such as sight deposits. Heteroskedasticity robust standard errors are reported in brackets. ***, **, * denote statistical significance at the 0.01, 0.05 and 0.10-level respectively. Definitions of the variables are provided in the appendix.

	Implicit or Explicit Rejection	Explicit Rejection	Offered FP	Offered Duration	Weighted interest rate
	(1)	(2)	(3)	(4)	(5)
Interest Rate Risk Exposure	-0.167***	0.548***	6.727***	4.773***	0.216
	(0.028)	(0.167)	(0.585)	(0.471)	(0.248)
(IRRE)*(Requested FP)	-0.023***	-0.129***	-0.600***	-0.405***	0.019
	(0.003)	(0.020)	(0.065)	(0.052)	(0.028)
Requested FP	0.000**	-0.000	0.954***	0.786***	0.109***
	(0.000)	(0.001)	(0.004)	(0.003)	(0.002)
PTI >33% (0/1)	0.044***	0.195***	0.033**	0.037***	0.027***
	(0.001)	(0.007)	(0.016)	(0.013)	(0.006)
LTV >80% (0/1)	0.048***	0.301***	-0.060**	-0.042*	0.034***
	(0.002)	(0.010)	(0.027)	(0.022)	(0.010)
Total Assets	-0.033***	-0.005***	-0.021***	-0.013***	-0.015***
	(0.001)	(0.002)	(0.004)	(0.003)	(0.002)
Using IR Swaps	-0.012***	0.133***	-0.129***	-0.103***	-0.071***
	(0.001)	(0.013)	(0.023)	(0.019)	(0.013)
Tier 1 Capital / RWA	0.418***	0.757***	-2.074***	-1.590***	0.013
	(0.022)	(0.115)	(0.231)	(0.192)	(0.113)
ROA	0.052***	0.004	-0.076***	-0.041***	-0.089***
	(0.002)	(0.007)	(0.015)	(0.012)	(0.006)
Deposits/Loans	-0.242***	0.307***	-0.568***	-0.501***	0.028
	(0.007)	(0.034)	(0.066)	(0.054)	(0.032)
Constant	1.694***	0.292***	0.676***	1.004***	2.626***
	(0.017)	(0.061)	(0.142)	(0.117)	(0.062)
Observations	227,474	28,535	23,342	23,342	23,342
R-squared	0.065	0.146	0.945	0.947	0.723
Household Finance Controls	Yes	Yes	Yes	Yes	Yes
House Controls	Yes	Yes	Yes	Yes	Yes
Bank Controls	Yes	Yes	Yes	Yes	Yes
Year-by-month FE	Yes	Yes	Yes	Yes	Yes

IRRE Response Variation 4: Average Assumptions

This table repeats the analysis of the IRRE Response Table in the paper. However, the IRRE measure used here is based the average, for each quarter, of banks' assumptions about the replication term for assets and liabilities with unspecified maturity, such as sight deposits. Heteroskedasticity robust standard errors are reported in brackets. ***, **, * denote statistical significance at the 0.01, 0.05 and 0.10-level respectively. Definitions of the variables are provided in the appendix.

	Implicit or Explicit Rejection	Explicit Rejection	Offered FP	Offered Duration	Weighted interest rate
	(1)	(2)	(3)	(4)	(5)
Interest Rate Risk Exposure	0.837***	0.149	-4.202***	-1.758***	-2.220***
	(0.042)	(0.173)	(0.599)	(0.476)	(0.260)
(IRRE)*(Requested FP)	0.013***	-0.013	0.430***	0.128**	0.313***
	(0.005)	(0.021)	(0.069)	(0.055)	(0.030)
Requested FP	-0.001***	-0.008***	0.894***	0.754***	0.094***
	(0.000)	(0.001)	(0.005)	(0.004)	(0.002)
PTI >33% (0/1)	0.044***	0.194***	0.033**	0.038***	0.027***
	(0.001)	(0.007)	(0.016)	(0.013)	(0.006)
LTV >80% (0/1)	0.048***	0.301***	-0.054**	-0.038*	0.034***
	(0.002)	(0.010)	(0.027)	(0.022)	(0.009)
Total Assets	-0.041***	-0.005***	-0.015***	-0.009***	-0.014***
	(0.001)	(0.002)	(0.004)	(0.003)	(0.002)
Using IR Swaps	-0.024***	0.115***	0.027	0.017	-0.055***
	(0.001)	(0.012)	(0.022)	(0.017)	(0.012)
Tier 1 Capital / RWA	0.713***	0.865***	-2.521***	-1.960***	-0.041
	(0.023)	(0.116)	(0.235)	(0.195)	(0.113)
ROA	0.034***	-0.004	0.001	0.018	-0.081***
	(0.002)	(0.007)	(0.014)	(0.012)	(0.006)
Deposits/Loans	-0.216***	0.239***	-0.135**	-0.170***	0.100***
	(0.007)	(0.029)	(0.061)	(0.051)	(0.028)
Constant	1.706***	0.378***	0.816***	1.034***	2.671***
	(0.018)	(0.060)	(0.144)	(0.119)	(0.061)
Observations	227,474	28,535	23,342	23,342	23,342
R-squared	0.071	0.144	0.944	0.946	0.726
Household Finance Controls	Yes	Yes	Yes	Yes	Yes
House Controls	Yes	Yes	Yes	Yes	Yes
Bank Controls	Yes	Yes	Yes	Yes	Yes
Year-by-month FE	Yes	Yes	Yes	Yes	Yes

IRRE Response Variation 5: Clustering Standard Errors by Request

This table repeats the analysis of the IRRE Response Table in the paper, but now standard errors are clustered by request, rather than being merely heteroskedasticity robust.

	Implicit or Explicit Rejection	Explicit Rejection	Offered FP	Offered Duration	Weighted interest rate
	(1)	(2)	(3)	(4)	(5)
Interest Rate Risk Exposure	0.837***	0.149	-4.202***	-1.758***	-2.220***
	(0.034)	(0.166)	(0.588)	(0.462)	(0.255)
(IRRE)*(Requested FP)	0.013***	-0.013	0.430***	0.128**	0.313***
	(0.004)	(0.021)	(0.067)	(0.053)	(0.031)
Requested FP	-0.001***	-0.008***	0.894***	0.754***	0.094***
	(0.000)	(0.001)	(0.005)	(0.004)	(0.002)
PTI >33% (0/1)	0.044***	0.194***	0.033*	0.038**	0.027***
	(0.002)	(0.009)	(0.019)	(0.016)	(0.009)
LTV >80% (0/1)	0.048***	0.301***	-0.054*	-0.038	0.034**
	(0.002)	(0.014)	(0.030)	(0.026)	(0.015)
Total Assets	-0.041***	-0.005***	-0.015***	-0.009***	-0.014***
	(0.000)	(0.002)	(0.004)	(0.003)	(0.002)
Using IR Swaps	-0.024***	0.115***	0.027	0.017	-0.055***
	(0.001)	(0.011)	(0.021)	(0.016)	(0.011)
Tier 1 Capital / RWA	0.713***	0.865***	-2.521***	-1.960***	-0.041
	(0.020)	(0.114)	(0.224)	(0.184)	(0.102)
ROA	0.034***	-0.004	0.001	0.018	-0.081***
	(0.001)	(0.007)	(0.014)	(0.011)	(0.005)
Deposits/Loans	-0.216***	0.239***	-0.135**	-0.170***	0.100***
	(0.006)	(0.029)	(0.062)	(0.050)	(0.025)
Constant	1.706***	0.378***	0.816***	1.034***	2.671***
	(0.016)	(0.073)	(0.151)	(0.131)	(0.091)
Observations	227,474	28,535	23,342	23,342	23,342
R-squared	0.071	0.144	0.944	0.946	0.726
Household Finance Controls	Yes	Yes	Yes	Yes	Yes
House Controls	Yes	Yes	Yes	Yes	Yes
Bank Controls	Yes	Yes	Yes	Yes	Yes
Year-by-month FE	Yes	Yes	Yes	Yes	Yes

IRRE Response Variation 6: Clustering Standard Errors by Year*Month

This table repeats the analysis of the IRRE Response Table in the paper, but now standard errors are clustered by year*month, rather than being merely heteroskedasticity robust.

	Implicit or Explicit Rejection	Explicit Rejection	Offered FP	Offered Duration	Weighted interest rate
	(1)	(2)	(3)	(4)	(5)
Interest Rate Risk Exposure	0.837***	0.149	-4.202***	-1.758*	-2.220***
	(0.067)	(0.221)	(1.078)	(0.893)	(0.412)
(IRRE)*(Requested FP)	0.013	-0.013	0.430***	0.128	0.313***
	(0.008)	(0.025)	(0.121)	(0.103)	(0.047)
Requested FP	-0.001**	-0.008***	0.894***	0.754***	0.094***
	(0.000)	(0.002)	(0.007)	(0.007)	(0.004)
PTI >33% (0/1)	0.044***	0.194***	0.033**	0.038**	0.027***
	(0.003)	(0.013)	(0.016)	(0.014)	(0.009)
LTV >80% (0/1)	0.048***	0.301***	-0.054	-0.038	0.034**
	(0.002)	(0.014)	(0.038)	(0.032)	(0.015)
Total Assets	-0.041***	-0.005***	-0.015**	-0.009	-0.014***
	(0.002)	(0.002)	(0.007)	(0.005)	(0.002)
Using IR Swaps	-0.024***	0.115***	0.027	0.017	-0.055***
	(0.005)	(0.015)	(0.024)	(0.018)	(0.014)
Tier 1 Capital / RWA	0.713***	0.865***	-2.521***	-1.960***	-0.041
	(0.089)	(0.120)	(0.242)	(0.183)	(0.145)
ROA	0.034***	-0.004	0.001	0.018	-0.081***
	(0.006)	(0.009)	(0.019)	(0.016)	(0.010)
Deposits/Loans	-0.216***	0.239***	-0.135*	-0.170***	0.100***
	(0.034)	(0.025)	(0.074)	(0.055)	(0.035)
Constant	1.706***	0.378***	0.816***	1.034***	2.671***
	(0.028)	(0.073)	(0.163)	(0.137)	(0.093)
Observations	227,474	28,535	23,342	23,342	23,342
R-squared	0.071	0.144	0.944	0.946	0.726
Household Finance Controls	Yes	Yes	Yes	Yes	Yes
House Controls	Yes	Yes	Yes	Yes	Yes
Bank Controls	Yes	Yes	Yes	Yes	Yes
Year-by-month FE	Yes	Yes	Yes	Yes	Yes

PTI Response Variation 1: Heckman Model

This table repeats the estimates of the PTI Response Table of the paper, but uses a Heckman procedure: We first estimate the probability that an offer is made, using as exogenous regressor the distance between each household and each bank. In the second stage we then control for that selection probability. Heteroskedasticity robust standard errors are reported in brackets. ***, **, * denote statistical significance at the 0.01, 0.05 and 0.10-level respectively. Definitions of the variables are provided in the appendix.

	Offered FP	Offered Duration	Offered Rate	Selection
	(1)	(2)	(3)	(4)
PTI >33% (0/1)	0.149***	0.160***	0.058***	-0.515***
	(0.033)	(0.027)	(0.013)	(0.030)
LTV >80% (0/1)	0.141***	0.161***	0.064***	-0.621***
	(0.048)	(0.039)	(0.019)	(0.042)
Requested FP	0.920***	0.765***	0.111***	0.011***
	(0.002)	(0.001)	(0.001)	(0.002)
(Requested FP)*I(PTI>33)	-0.018***	-0.018***	-0.005***	0.001
	(0.004)	(0.003)	(0.002)	(0.004)
(Requested FP)*I(LTV>80)	-0.031***	-0.031***	-0.005**	0.004
	(0.006)	(0.005)	(0.002)	(0.005)
Wealth (ln)	0.022***	0.024***	-0.004*	0.048***
	(0.005)	(0.004)	(0.002)	(0.006)
Other real estate (0/1)	-0.022*	-0.028***	-0.007	0.023*
	(0.013)	(0.010)	(0.005)	(0.013)
Debt (0/1)	0.001	0.005	0.015***	-0.121***
	(0.013)	(0.011)	(0.005)	(0.013)
Age	0.016***	0.014***	-0.006***	0.007**
	(0.004)	(0.003)	(0.001)	(0.004)
Age*Age	-0.000***	-0.000***	0.000***	-0.000**
	(0.000)	(0.000)	(0.000)	(0.000)
Securities (ln)	0.000	0.000	-0.001***	0.000
	(0.001)	(0.001)	(0.000)	(0.001)
Distance HH Bank in km	0	0	0	-0.010***
	0	0	0	(0.000)
Constant	-0.160	0.449***	1.976***	-1.783***
	(0.132)	(0.108)	(0.052)	(0.118)
Observations	227,474	227,474	227,474	227,474
House variables	Yes	Yes	Yes	Yes
Bank FEs	Yes	Yes	Yes	Yes
Year-by-month FE	Yes	Yes	Yes	Yes

PTI Response Variation 2: New Mortgages Only

This table shows the point estimates relating banks' choice variables to household & house characteristics, most importantly to their PTI ratios. In contrast to the IRRE Response Table in the paper we now focus only on requests for new mortgages. House variables are indicator variables for the property type and property age. Heteroskedasticity robust standard errors are reported in brackets. ***, **, * denote statistical significance at the 0.01, 0.05 and 0.10-level respectively. Definitions of the variables are provided in the appendix.

	Implicit or Explicit Rejection (1)	Explicit Rejection (2)	Average FP offered (3)	Duration offered (4)	Weighted interest rate (5)
PTI >33% (0/1)	0.042***	0.189***	0.166*	0.150**	0.068**
	(0.004)	(0.020)	(0.091)	(0.072)	(0.033)
LTV >80% (0/1)	0.053***	0.333***	-0.034	-0.017	-0.064
	(0.004)	(0.025)	(0.103)	(0.079)	(0.043)
Requested FP	-0.001***	-0.009***	0.913***	0.753***	0.101***
	(0.000)	(0.001)	(0.004)	(0.003)	(0.002)
(Requested FP)*I(PTI>33)	0.001	0.003	-0.018*	-0.016**	-0.006
	(0.000)	(0.002)	(0.010)	(0.008)	(0.004)
(Requested FP)*I(LTV>80)	-0.001	0.000	-0.007	-0.008	0.009*
	(0.000)	(0.003)	(0.012)	(0.009)	(0.005)
Wealth (ln)	-0.007***	-0.028***	0.050***	0.050***	-0.021***
	(0.001)	(0.004)	(0.009)	(0.007)	(0.004)
Other real estate (0/1)	0.004**	-0.002	-0.045**	-0.051***	-0.023***
	(0.002)	(0.008)	(0.019)	(0.015)	(0.007)
Debt (0/1)	0.010***	0.065***	-0.012	-0.012	0.015*
	(0.002)	(0.008)	(0.020)	(0.016)	(0.008)
Age	-0.001**	-0.009***	0.017***	0.015***	-0.003
	(0.001)	(0.002)	(0.005)	(0.004)	(0.002)
Age*Age	0.000***	0.000***	-0.000***	-0.000***	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Securities (ln)	-0.000**	0.000	-0.002	-0.001	0.000
	(0.000)	(0.001)	(0.002)	(0.001)	(0.001)
Constant	0.622***	0.788***	-0.286	0.261	2.761***
Observations	126,758	15,544	12,668	12,668	12,668
R-squared	0.347	0.237	0.938	0.940	0.715
House variables	Yes	Yes	Yes	Yes	Yes
Bank FEs	Yes	Yes	Yes	Yes	Yes
Year-by-month FE	Yes	Yes	Yes	Yes	Yes

PTI Response Variation 3: Clustering Standard Errors by Request

This table repeats the analyses of the main PTI analyses table, but now clusters standard errors by request.

	Implicit or Explicit Rejection	Explicit Rejection	Average FP offered	Duration offered	Weighted interest rate
	(1)	(2)	(3)	(4)	(5)
PTI >33% (0/1)	0.044***	0.200***	0.155**	0.164***	0.057
	(0.003)	(0.020)	(0.066)	(0.056)	(0.039)
LTV >80% (0/1)	0.049***	0.270***	0.148	0.166**	0.063
	(0.004)	(0.027)	(0.096)	(0.080)	(0.056)
Requested FP	-0.001***	-0.009***	0.920***	0.765***	0.111***
	(0.000)	(0.001)	(0.003)	(0.003)	(0.002)
(Requested FP)*I(PTI>33)	-0.000	-0.002	-0.018**	-0.018***	-0.005
	(0.000)	(0.002)	(0.008)	(0.007)	(0.004)
(Requested FP)*I(LTV>80)	-0.000	0.004	-0.031***	-0.031***	-0.005
	(0.000)	(0.004)	(0.012)	(0.009)	(0.006)
Wealth (ln)	-0.005***	-0.020***	0.021***	0.024***	-0.004
	(0.001)	(0.003)	(0.006)	(0.005)	(0.004)
Other real estate (0/1)	0.003**	-0.005	-0.022	-0.028**	-0.007
	(0.001)	(0.007)	(0.014)	(0.012)	(0.008)
Debt (0/1)	0.012***	0.062***	0.002	0.006	0.015*
	(0.001)	(0.007)	(0.015)	(0.013)	(0.009)
Age	-0.001***	-0.004*	0.016***	0.014***	-0.006**
	(0.000)	(0.002)	(0.004)	(0.003)	(0.003)
Age*Age	0.000***	0.000**	-0.000***	-0.000***	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Securities (ln)	-0.000***	-0.001*	0.000	0.000	-0.001**
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	0.547***	0.589***	0.039	0.502***	2.555***
Observations	227,474	28,535	23,347	23,347	23,347
R-squared	0.353	0.163	0.946	0.948	0.731
House variables	Yes	Yes	Yes	Yes	Yes
Bank FEs	Yes	Yes	Yes	Yes	Yes
Year-by-month FE	Yes	Yes	Yes	Yes	Yes

PTI Response Variation 4: Clustering Standard Errors by Year*Month

This table repeats the analyses of the main PTI analyses table, but now clusters standard errors by year*month

	Implicit or Explicit Rejection	Explicit Rejection	Average FP offered	Duration offered	Weighted interest rate
	(1)	(2)	(3)	(4)	(5)
PTI >33% (0/1)	0.044***	0.200***	0.155**	0.164***	0.057*
	(0.003)	(0.019)	(0.071)	(0.060)	(0.033)
LTV >80% (0/1)	0.049***	0.270***	0.148	0.166*	0.063
	(0.003)	(0.022)	(0.105)	(0.091)	(0.054)
Requested FP	-0.001***	-0.009***	0.920***	0.765***	0.111***
	(0.000)	(0.001)	(0.004)	(0.003)	(0.005)
(Requested FP)*I(PTI>33)	-0.000	-0.002	-0.018**	-0.018**	-0.005
	(0.000)	(0.002)	(0.008)	(0.007)	(0.004)
(Requested FP)*I(LTV>80)	-0.000	0.004	-0.031**	-0.031***	-0.005
	(0.000)	(0.003)	(0.012)	(0.010)	(0.006)
Wealth (ln)	-0.005***	-0.020***	0.021***	0.024***	-0.004
	(0.001)	(0.003)	(0.007)	(0.006)	(0.004)
Other real estate (0/1)	0.003**	-0.005	-0.022	-0.028**	-0.007
	(0.001)	(0.007)	(0.014)	(0.013)	(0.009)
Debt (0/1)	0.012***	0.062***	0.002	0.006	0.015
	(0.002)	(0.007)	(0.014)	(0.013)	(0.010)
Age	-0.001**	-0.004*	0.016***	0.014***	-0.006**
	(0.000)	(0.002)	(0.004)	(0.003)	(0.002)
Age*Age	0.000***	0.000**	-0.000***	-0.000***	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Securities (ln)	-0.000***	-0.001	0.000	0.000	-0.001**
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	0.547***	0.589***	0.039	0.502***	2.555***
Observations	227,474	28,535	23,347	23,347	23,347
R-squared	0.353	0.163	0.946	0.948	0.731
House variables	Yes	Yes	Yes	Yes	Yes
Bank FEs	Yes	Yes	Yes	Yes	Yes
Year-by-month FE	Yes	Yes	Yes	Yes	Yes

Bernanke Shock Variation 1: Heckman

This table repeats the estimates of the Bernanke Response Table in the paper, but uses a Heckman procedure: We first estimate the probability that an offer is made, using as exogenous regressor the distance between each household and each bank. In the second stage we then control for that selection probability. Heteroskedasticity robust standard errors are reported in brackets. ***, **, * denote statistical significance at the 0.01, 0.05 and 0.10-level respectively. Definitions of the variables are provided in the appendix.

	Offered FP	Offered Duration	Offered Rate	Selection
	(1)	(2)	(3)	(4)
After shock	-0.263*	-0.274**	0.172***	-0.770***
	(0.154)	(0.124)	(0.051)	(0.124)
After shock (0/1)*PTI >33% (0/1)	-0.110	-0.060	0.005	0.298***
	(0.097)	(0.079)	(0.032)	(0.090)
After shock (0/1)*IRRE	0.492	0.202	-0.514	4.843***
	(1.451)	(1.172)	(0.478)	(1.086)
After shock (0/1) * Requested FP	0.018**	0.010	0.028***	0.008
	(0.009)	(0.007)	(0.003)	(0.009)
Requested FP	0.891***	0.749***	0.089***	0.022***
	(0.006)	(0.005)	(0.002)	(0.006)
PTI >33% (0/1)	0.041	0.024	0.045**	-0.565***
	(0.064)	(0.052)	(0.021)	(0.060)
LTV >80% (0/1)	-0.043	-0.071	-0.028	-0.340***
	(0.085)	(0.069)	(0.028)	(0.079)
Wealth (ln)	0.027*	0.037***	-0.009*	0.047***
	(0.016)	(0.013)	(0.005)	(0.015)
Other real estate (0/1)	-0.021	-0.010	-0.009	0.049
	(0.040)	(0.032)	(0.013)	(0.040)
Debt (0/1)	0.058	0.044	0.006	-0.099**
	(0.041)	(0.034)	(0.014)	(0.041)
Age	0.018*	0.015*	-0.005	0.003
	(0.011)	(0.009)	(0.003)	(0.011)
Age*Age	-0.000	-0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Securities (ln)	-0.003	-0.003	-0.000	0.000
	(0.003)	(0.003)	(0.001)	(0.003)
Distance household bank in km				-0.011***
				(0.000)
Constant	-0.375	0.395	1.311***	0.601
	(0.396)	(0.320)	(0.130)	(0.383)
Observations	31,186	31,186	31,186	31,186
Bank FEs	Yes	Yes	Yes	Yes
House variables	Yes	Yes	Yes	Yes
Household Finance Variables	Yes	Yes	Yes	Yes
Year-by-month FE	Yes	Yes	Yes	Yes

Bernanke Shock Variation 2: New Mortgages Only

This table repeats the analyses of the Bernanke Response Table in the paper, but focuses on requests for new mortgages.

	Implicit or Explicit Rejection	Explicit Rejection	Offered FP	Offered Duration	Weighted interest rate
	(1)	(2)	(3)	(4)	(5)
After shock	0.062***	0.154*	-0.374	-0.336*	0.241***
	(0.010)	(0.084)	(0.249)	(0.195)	(0.093)
After shock (0/1)*PTI >33% (0/1)	-0.031***	-0.118**	-0.004	0.034	0.042
	(0.009)	(0.051)	(0.083)	(0.063)	(0.049)
After shock (0/1)*LTV >80% (0/1)	0.036**	0.250***	-0.079	-0.050	0.124**
	(0.015)	(0.085)	(0.214)	(0.165)	(0.059)
After shock (0/1)*IRRE	-0.285***	-1.055	-0.557	-0.794	-0.427
	(0.069)	(0.786)	(1.556)	(1.244)	(0.844)
After shock (0/1) * Requested FP	-0.001	-0.008	0.034*	0.021	0.014*
	(0.001)	(0.005)	(0.019)	(0.015)	(0.008)
PTI >33% (0/1)	0.048***	0.229***	-0.017	-0.011	0.069**
	(0.006)	(0.033)	(0.055)	(0.042)	(0.028)
LTV >80% (0/1)	-0.006	0.086**	-0.058	-0.080	-0.108***
	(0.011)	(0.040)	(0.090)	(0.073)	(0.030)
IRRE	2.062***	0.113	2.508	2.170	0.917
	(0.228)	(0.712)	(2.031)	(1.602)	(0.663)
Requested FP	-0.001	-0.013***	0.897***	0.751***	0.082***
	(0.001)	(0.003)	(0.014)	(0.011)	(0.004)
Wealth (ln)	-0.009***	-0.031***	0.100***	0.098***	-0.050***
	(0.002)	(0.010)	(0.022)	(0.017)	(0.011)
Other real estate (0/1)	-0.001	-0.051**	-0.050	-0.038	-0.039*
	(0.005)	(0.022)	(0.053)	(0.042)	(0.021)
Debt (0/1)	0.011***	0.092***	0.006	0.008	-0.003
	(0.004)	(0.022)	(0.059)	(0.047)	(0.020)
Age	0.000	-0.017**	0.008	0.005	0.009
	(0.002)	(0.008)	(0.016)	(0.012)	(0.008)
Age*Age	0.000	0.000**	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Securities (ln)	-0.000	-0.001	-0.005	-0.005	0.001
	(0.000)	(0.002)	(0.004)	(0.003)	(0.002)
Constant	0.709***	0.804***	-0.257	0.426	1.808***
	(0.050)	(0.238)	(0.842)	(0.693)	(0.258)
Observations	17,484	1,857	1,581	1,581	1,581
R-squared	0.402	0.202	0.948	0.952	0.612
Bank FEs	Yes	Yes	Yes	Yes	Yes
House variables	Yes	Yes	Yes	Yes	Yes
Household Finance Variables	Yes	Yes	Yes	Yes	Yes
Year-by-month FE	Yes	Yes	Yes	Yes	Yes

Bernanke Shock Variation 3: 4-month window

This table repeats the analyses of the Bernanke Response Table in the paper, but uses a window of 4 instead of 8 months

	Implicit or Explicit Rejection	Explicit Rejection	Offered FP	Offered Duration	Weighted interest rate
	(1)	(2)	(3)	(4)	(5)
After shock	0.046***	0.026	-0.129	-0.164	0.052
	(0.011)	(0.088)	(0.248)	(0.191)	(0.085)
After shock (0/1)*PTI >33% (0/1)	-0.023**	-0.060	-0.105	-0.060	-0.043
	(0.009)	(0.054)	(0.091)	(0.072)	(0.048)
After shock (0/1)*LTV >80% (0/1)	0.031*	0.279***	-0.006	0.015	0.131***
	(0.016)	(0.091)	(0.211)	(0.170)	(0.049)
After shock (0/1)*IRRE	-0.148**	0.379	0.372	0.012	-0.457
	(0.072)	(0.843)	(1.453)	(1.164)	(0.724)
After shock (0/1) * Requested FP	-0.002	-0.007	0.005	0.002	0.036***
	(0.001)	(0.006)	(0.020)	(0.016)	(0.007)
PTI >33% (0/1)	0.038***	0.208***	0.040	0.022	0.069**
	(0.006)	(0.037)	(0.067)	(0.053)	(0.028)
LTV >80% (0/1)	0.009	0.139***	-0.050	-0.087	-0.047
	(0.011)	(0.051)	(0.105)	(0.084)	(0.031)
IRRE	2.161***	-0.934	3.742	3.750	-0.930
	(0.306)	(1.284)	(3.092)	(2.504)	(1.059)
Requested FP	-0.001*	-0.018***	0.909***	0.764***	0.085***
	(0.001)	(0.003)	(0.013)	(0.010)	(0.005)
Wealth (ln)	-0.004**	-0.019**	0.040**	0.048***	-0.019***
	(0.002)	(0.010)	(0.016)	(0.012)	(0.007)
Other real estate (0/1)	-0.004	-0.065***	0.043	0.051	-0.030
	(0.005)	(0.023)	(0.058)	(0.046)	(0.019)
Debt (0/1)	0.008*	0.051**	-0.007	-0.023	0.020
	(0.005)	(0.024)	(0.061)	(0.048)	(0.018)
Age	0.001	0.006	0.016	0.015*	0.006
	(0.001)	(0.005)	(0.011)	(0.009)	(0.004)
Age*Age	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Securities (ln)	-0.000	-0.002	-0.006*	-0.006*	0.001
	(0.000)	(0.002)	(0.004)	(0.003)	(0.001)
Constant	0.756***	1.064***	-0.519	0.070	1.649***
	(0.055)	(0.377)	(0.523)	(0.431)	(0.241)
Observations	15,624	1,675	1,381	1,381	1,381
R-squared	0.384	0.186	0.956	0.960	0.704
Bank FEs	Yes	Yes	Yes	Yes	Yes
House variables	Yes	Yes	Yes	Yes	Yes
Household Finance Variables	Yes	Yes	Yes	Yes	Yes
Year-by-month FE	Yes	Yes	Yes	Yes	Yes

Bernanke Shock Variation 4: 6-month window

This table repeats the analyses of the Bernanke Response Table in the paper, but uses a window of 6 instead of 8 months

	Implicit or Explicit Rejection	Explicit Rejection	Offered FP	Offered Duration	Weighted interest rate
	(1)	(2)	(3)	(4)	(5)
After shock	0.040***	0.048	-0.016	-0.097	0.062
	(0.009)	(0.074)	(0.239)	(0.191)	(0.074)
After shock (0/1)*PTI >33% (0/1)	-0.026***	-0.038	-0.101	-0.053	-0.007
	(0.008)	(0.047)	(0.079)	(0.062)	(0.044)
After shock (0/1)*LTV >80% (0/1)	0.036***	0.266***	0.054	0.053	0.127***
	(0.014)	(0.079)	(0.198)	(0.150)	(0.042)
After shock (0/1)*IRRE	-0.161***	-0.052	-0.101	-0.326	-0.364
	(0.059)	(0.701)	(1.278)	(1.025)	(0.623)
After shock (0/1) * Requested FP	-0.000	-0.004	-0.002	-0.004	0.037***
	(0.001)	(0.005)	(0.019)	(0.015)	(0.006)
PTI >33% (0/1)	0.041***	0.183***	0.059	0.047	0.051**
	(0.005)	(0.031)	(0.061)	(0.048)	(0.026)
LTV >80% (0/1)	0.003	0.119***	-0.081	-0.109	-0.047*
	(0.010)	(0.045)	(0.092)	(0.075)	(0.027)
IRRE	2.092***	-1.000	4.522*	4.159*	0.266
	(0.228)	(0.818)	(2.657)	(2.158)	(0.677)
Requested FP	-0.002***	-0.015***	0.906***	0.760***	0.086***
	(0.001)	(0.003)	(0.012)	(0.009)	(0.004)
Wealth (ln)	-0.004***	-0.018**	0.020	0.030**	-0.026***
	(0.002)	(0.007)	(0.018)	(0.015)	(0.006)
Other real estate (0/1)	-0.002	-0.038**	0.040	0.036	-0.028*
	(0.004)	(0.019)	(0.050)	(0.040)	(0.015)
Debt (0/1)	0.010***	0.070***	0.057	0.033	0.009
	(0.004)	(0.020)	(0.064)	(0.052)	(0.017)
Age	0.000	-0.003	0.028***	0.024***	-0.002
	(0.001)	(0.005)	(0.011)	(0.008)	(0.004)
Age*Age	-0.000	0.000	-0.000**	-0.000***	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Securities (ln)	-0.001*	-0.002*	-0.004	-0.003	0.003**
	(0.000)	(0.001)	(0.003)	(0.003)	(0.001)
Constant	0.809***	0.643***	0.307	0.859	1.920***
	(0.038)	(0.197)	(0.761)	(0.628)	(0.203)
Observations	22,754	2,405	2,017	2,017	2,017
R-squared	0.394	0.162	0.941	0.944	0.695
Bank FEs	Yes	Yes	Yes	Yes	Yes
House variables	Yes	Yes	Yes	Yes	Yes
Household Finance Variables	Yes	Yes	Yes	Yes	Yes
Year-by-month FE	Yes	Yes	Yes	Yes	Yes

Bernanke Shock Variation 5: Clustering Standard Errors by Request

This table repeats the analyses of the Bernanke Response Table in the paper, but clusters standard errors by request.

	Implicit or Explicit Rejection	Explicit Rejection	Offered FP	Offered Duration	Weighted interest rate
	(1)	(2)	(3)	(4)	(5)
After shock	0.047***	0.071	-0.270	-0.277*	0.156*
	(0.008)	(0.068)	(0.195)	(0.159)	(0.085)
After shock (0/1)*PTI >33% (0/1)	-0.023***	-0.060	-0.108	-0.059	0.010
	(0.008)	(0.054)	(0.074)	(0.061)	(0.055)
After shock (0/1)*LTV >80% (0/1)	0.029**	0.240**	-0.050	-0.022	0.105*
	(0.014)	(0.101)	(0.167)	(0.145)	(0.059)
After shock (0/1)*IRRE	-0.199***	-0.480	0.538	0.226	-0.432
	(0.051)	(0.610)	(1.072)	(0.841)	(0.551)
After shock (0/1) * Requested FP	-0.000	-0.003	0.018	0.010	0.028***
	(0.001)	(0.005)	(0.015)	(0.013)	(0.008)
PTI >33% (0/1)	0.040***	0.188***	0.036	0.022	0.036
	(0.006)	(0.037)	(0.048)	(0.039)	(0.028)
LTV >80% (0/1)	0.007	0.108	-0.033	-0.066	-0.062
	(0.011)	(0.069)	(0.115)	(0.107)	(0.041)
IRRE	1.965***	0.078	1.261	1.219	0.425
	(0.167)	(0.500)	(1.552)	(1.257)	(0.327)
Requested FP	-0.001**	-0.016***	0.891***	0.749***	0.089***
	(0.001)	(0.003)	(0.010)	(0.008)	(0.005)
Wealth (ln)	-0.003**	-0.014*	0.028*	0.037***	-0.008
	(0.001)	(0.008)	(0.015)	(0.014)	(0.008)
Other real estate (0/1)	0.002	-0.036*	-0.021	-0.010	-0.008
	(0.004)	(0.019)	(0.041)	(0.036)	(0.018)
Debt (0/1)	0.012***	0.081***	0.057	0.043	0.004
	(0.004)	(0.021)	(0.054)	(0.047)	(0.020)
Age	-0.000	-0.006	0.018*	0.015	-0.005
	(0.001)	(0.006)	(0.011)	(0.009)	(0.006)
Age*Age	0.000	0.000	-0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Securities (ln)	-0.000	-0.003*	-0.003	-0.003	-0.000
	(0.000)	(0.002)	(0.003)	(0.003)	(0.002)
Constant	0.733***	0.670***	0.870	1.352***	1.626***
	(0.035)	(0.192)	(0.576)	(0.485)	(0.212)
Observations	31,186	3,296	2,767	2,767	2,767
R-squared	0.397	0.144	0.940	0.945	0.685
Bank FEs	Yes	Yes	Yes	Yes	Yes
House variables	Yes	Yes	Yes	Yes	Yes
Household Finance Variables	Yes	Yes	Yes	Yes	Yes
Year-by-month FE	Yes	Yes	Yes	Yes	Yes

Bernanke Shock Variation 6: Clustering Standard Errors by Year*Month

This table repeats the analyses of the Bernanke Response Table in the paper, but clusters standard errors by year*month.

	Implicit or Explicit Rejection	Explicit Rejection	Offered FP	Offered Duration	Weighted interest rate
	(1)	(2)	(3)	(4)	(5)
After shock	0.047***	0.071	-0.270	-0.277	0.156
	(0.009)	(0.056)	(0.203)	(0.180)	(0.084)
After shock (0/1)*PTI >33% (0/1)	-0.023***	-0.060	-0.108	-0.059	0.010
	(0.005)	(0.066)	(0.066)	(0.061)	(0.049)
After shock (0/1)*LTV >80% (0/1)	0.029*	0.240**	-0.050	-0.022	0.105
	(0.013)	(0.082)	(0.139)	(0.127)	(0.058)
After shock (0/1)*IRRE	-0.199***	-0.480	0.538	0.226	-0.432
	(0.054)	(0.514)	(0.889)	(0.718)	(0.509)
After shock (0/1) * Requested FP	-0.000	-0.003	0.018	0.010	0.028***
	(0.001)	(0.004)	(0.014)	(0.012)	(0.007)
PTI >33% (0/1)	0.040***	0.188***	0.036	0.022	0.036
	(0.003)	(0.043)	(0.065)	(0.057)	(0.027)
LTV >80% (0/1)	0.007	0.108	-0.033	-0.066	-0.062
	(0.011)	(0.060)	(0.085)	(0.076)	(0.036)
IRRE	1.965***	0.078	1.261	1.219	0.425
	(0.338)	(0.642)	(1.075)	(0.783)	(0.477)
Requested FP	-0.001	-0.016***	0.891***	0.749***	0.089***
	(0.001)	(0.002)	(0.013)	(0.011)	(0.005)
Wealth (ln)	-0.003*	-0.014	0.028	0.037**	-0.008
	(0.002)	(0.008)	(0.016)	(0.013)	(0.012)
Other real estate (0/1)	0.002	-0.036*	-0.021	-0.010	-0.008
	(0.004)	(0.019)	(0.042)	(0.036)	(0.024)
Debt (0/1)	0.012**	0.081***	0.057	0.043	0.004
	(0.004)	(0.024)	(0.083)	(0.072)	(0.022)
Age	-0.000	-0.006	0.018*	0.015*	-0.005
	(0.001)	(0.006)	(0.008)	(0.007)	(0.005)
Age*Age	0.000	0.000	-0.000	-0.000*	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Securities (ln)	-0.000	-0.003	-0.003	-0.003	-0.000
	(0.000)	(0.002)	(0.003)	(0.002)	(0.002)
Constant	0.733***	0.670**	0.870	1.352*	1.626***
	(0.047)	(0.233)	(0.713)	(0.594)	(0.209)
Observations	31,186	3,296	2,767	2,767	2,767
R-squared	0.397	0.144	0.940	0.945	0.685
Bank FEs	Yes	Yes	Yes	Yes	Yes
House variables	Yes	Yes	Yes	Yes	Yes
Household Finance Variables	Yes	Yes	Yes	Yes	Yes
Year-by-month FE	Yes	Yes	Yes	Yes	Yes