

NBER WORKING PAPER SERIES

THE RESPONSE OF DEBTORS TO RATE CHANGES

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Working Paper 34752
<http://www.nber.org/papers/w34752>

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
January 2026

We thank our partners at a bank for their collaboration and the data necessary to conduct this research. The bank data were obtained under a non-disclosure agreement. The bank did not review the results of the paper prior to public dissemination. We are also grateful for helpful comments from Claes Bäckman, João Cocco, Mattia Girotti (discussant), Ragnar Juelsrud (discussant), Lorenz Kueng (discussant), Lena Liebich (discussant), Pierre Mabilie, José-Luis Peydró, as well as from seminar and conference participants at Banco de España, Bundesbank, BYU Marriott School of Business, Leibniz Institute for Financial Research SAFE, Nanyang Technological University, National University of Singapore, Nova SBE, WHU, the 2025 Boulder Summer Conference, 2025 CEPR-Tilburg Finance Summit, 2025 Frankfurt Macro Seminar, 2025 Future of Finance Fest, 2025 Ghent University Workshop on Empirical Macroeconomics, 2025 ifo & BERD Workshop on “Financial Data for Research,” 15th ifo Conference on Macroeconomics and Survey Data, 11th IWH-FINFIRE Workshop on “Challenges to Financial Stability,” 2025 Paris December Finance Meeting, 2024 Research in Behavioral Finance Conference, 9th SAFE Household Finance Workshop, 8th Workshop on Subjective Expectations, and 1st Zurich-Bern Real Estate Finance and Economics Conference. The letter experiment received IRB approval from Goethe University Frankfurt and is preregistered in the AEA RCT Registry (ID: 14796). We gratefully acknowledge research support from the Swiss National Science Foundation. The views expressed herein are those of the authors and do not necessarily reflect the views of the National Bureau of Economic Research.

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JEL No. E21, E31, E44, E52, G21, G41, G51

ABSTRACT

How borrowers respond to future changes in the interest rate on their debt matters for the transmission of monetary policy and for household financial stability. Combining bank data, a letter RCT, and a survey, we study this question in the context of the German mortgage market, where since 2022 borrowers have faced high interest rates when their rate fixation period ends. We find that borrower actions substantially reduce the impact of higher rates on monthly payments. Survey responses corroborate high informedness and a strong propensity to prepare for rate changes. The letter intervention does not affect rate beliefs but increases awareness of available options and refinancing among borrowers close to expiration of their rate fixation.

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A randomized controlled trials registry entry is available at
<https://www.socialscisceregistry.org/trials/14796>

1 Introduction

The global surge in inflation that began in 2021 prompted many central banks to raise interest rates sharply. One key channel through which monetary policy transmits to the economy is household debt, of which mortgages are the dominant component. In many countries, including the US, Germany, and France, mortgages typically have fixed rates for five, ten, or even more years. Fixed rates slow the transmission of higher market rates to loan rates, but do not eliminate it, since households in many cases need to eventually roll over (or refinance) their loan.¹ In such a setting, the extent and timing of the transmission of rate changes to household finances then depends crucially on whether households are aware of and prepare for future increases in their mortgage rate. If borrowers respond ahead of having to refinance, their behavior may speed up or dampen monetary policy transmission, depending on the action taken. Conversely, a lack of preparation might lead to strains on household finances, with possible risks to financial stability that materialize with a considerable delay after the initial increase in market rates.

Our goal in this paper is to provide novel evidence on how households think about, prepare for, and ultimately react to increases in their mortgage rate. To do so, we rely on a unique combination of data from a large German bank, an experimental intervention to exogenously change borrowers' awareness and understanding of potential rate increases, and a survey of the bank's mortgagors to understand their beliefs and preparation. The overall takeaway from our analysis is that borrowers in Germany are mostly aware of the interest rate environment and take various actions before and at expiration of their loan to mitigate effects of higher rates on their monthly payments. This suggests that borrower preparations can shape the mortgage channel of monetary policy, and reduce financial-stability risks. However, awareness is not perfect, as our experimental intervention does affect borrowers' understanding of some of the options they have, and impacts refinancing activity for a subset of borrowers whose loan is close to expiration.

We begin our analysis by documenting patterns in the bank data over the last years. Overall, most mortgagors approaching the end of their fixation period either refinance early, switch lenders, or pay off their mortgage upon expiration. Only few borrowers wait until close to expiration to refinance "passively" with the current lender. A specific

¹In contrast to the US, where the interest rate is usually fixed for the entire term of the mortgage, in most other countries with fixed-rate mortgages the loan *term* is typically substantially longer than the *fixation period*. For instance, German mortgages typically have terms of 25 to 35 years (over which the loan is amortized), but a rate fixation of "only" 5 to 15 years.

option available to German borrowers to reduce interest-rate risk is to take out a “forward mortgage” that locks in current market rates up to four years prior to the expiration of the old rate fixation.² We show that many borrowers rush to take out such forwards when market rates increase rapidly in 2022 (see [Figure 1](#)). Once market rates reach a new higher level, the demand for forward loans dries up quickly. Instead, more borrowers switch lenders, pay off their mortgage, or wait until close to expiration before refinancing.

Aside from locking in rates early via forwards, borrowers take further actions that substantially mitigate the impact of higher rates on their monthly payments. In particular, borrowers frequently reduce the loan balance upon refinancing and, in the high-rate environment, become less likely to reduce the term of their mortgage (which would accelerate amortization and increase payments). Taken together, if borrowers passively rolled over their loans, the average annual payment increase since 2022 would be € 1,044. Instead, the realized increase averages only € 276. Thus, borrower actions substantially dampen the transmission of interest-rate hikes to mortgage payments.

While informative, the observational patterns only provide a partial view of borrower behavior and their drivers. For instance, passive refinancing when rates are high could reflect unawareness or that we do not observe all borrower activities. To provide a more complete view, we field two interventions in late 2024 with a subset of the borrowers we observe in the bank data: an online survey to elicit beliefs and actions, and a letter RCT to exogenously increase awareness of mortgage rates and possible actions, which in turn may affect behavior we can measure in the bank data.

The survey shows most respondents are well-informed about higher mortgage rates and state they take action to mitigate their impact. Specifically, respondents largely know about the recent evolution of interest rates, and they expect high rates to persist. Most borrowers explain they prepare for the end of the fixation period, suggesting more passive refinancing in the bank data when rates are high does not reflect greater inactivity. Acquiring information and saving constitute additional margins of preparation largely unobservable in the bank data. Among the small fraction of borrowers who do not prepare, we find that unawareness of rates increases might be one reason.

The survey also features a vignette experiment that provides causal evidence on that

²German mortgages generally do not have the same “free” full prepayment option as their US counterparts. However, an exception is that borrowers with loan fixations longer than 10 years can freely prepay after 10 years from origination. We show that, in cases when market rates are substantially below borrowers’ existing rates, a large share of them takes advantage of this free prepayment option.

borrower preparation depends on the size of the anticipated rate increase and on the distance to the fixation end.³ We randomly assign respondents into one of three hypothetical refinancing scenarios. A smaller rate increase (0.5 pp instead of 2 pp) reduces the propensity to meet an advisor and to raise income, while increasing the propensity to lock in the future rate early and for longer. A more distant reset (three years instead of one) similarly lowers information acquisition and income adjustments. These causal patterns match the bank data and respondents' open-text explanations.

We then turn to the letter RCT. The letter illustrates the recent increase in interest rates and its possible impact on mortgage payments after refinancing, and explains how borrowers can cope with higher rates (e.g., via repayments). The bank sent the letter to over 35,000 mortgagors who at some point have to refinance. We first study letter effects in the survey, completed around one month after letter receipt. 34% of recipients remember reading the letter.⁴ Letter receipt does not affect beliefs about mortgage rates, which is consistent with high ex-ante informedness and suggests letter effects are not due to shifts in rate beliefs. Instead, the letter increases familiarity with the option to make partial prepayments and to lock in rates early using forward loans.

In the bank data covering the six months following letter receipt, average treatment effects are small, but recipients close to loan expiration are more likely to meet a bank advisor, refinance, or both. The magnitudes are substantial—for instance, treated borrowers within this subsample are 40% more likely to meet an advisor and open a new loan shortly thereafter than corresponding borrowers in the control group. Limited options to act and belief shifts likely explain why most recipients do not respond, but for borrowers for whom refinancing is imminent, the letter can serve as an effective reminder to act.

Our final analysis shows that selection into reading the letter likely limits the effectiveness of such interventions in nudging uninformed borrowers. It is primarily borrowers with larger loans, high self-reported financial literacy and income, and accurate interest-rate beliefs who read the letter. The heterogeneity suggests that lender (or regulator) communication about mortgages disproportionately reaches borrowers who are better informed to begin with, while reaching the less aware is hard.

Related literature Our paper contributes to studies of the transmission of monetary pol-

³Our use of survey vignettes, or “strategic surveys,” follows [Fuster et al. \(2021\)](#), [Fuster and Zafar \(2021\)](#), and [Schnorpfel et al. \(2025\)](#), among others.

⁴This is an estimated treatment effect, since we similarly ask control-group respondents whether they have received a letter from the bank and whether they have read it.

icy through the housing and mortgage market (e.g., [Cloyne et al., 2020](#); [Flodén et al., 2021](#); [Jappelli and Scognamiglio, 2018](#)). Much of this literature focuses on the impact of realized reductions in monthly payments on household outcomes, given the secular decline in interest rates over recent decades (e.g., [Di Maggio et al., 2017](#); [Fuster and Willen, 2017](#)). Some recent papers study effects of rate increases, which may differ from those of decreases ([Kartashova and Zhou, 2023](#)).⁵ [Adelino et al. \(2025\)](#), [Bracke et al. \(2024\)](#), and [Elias et al. \(2025\)](#), like us, focus on the post-pandemic rate increases and study responses of Portuguese, UK, and Australian borrowers, respectively. Similar in spirit to our findings, these papers document channels that mitigate the impact of rate increases on monthly payments or spending, though institutional details vary substantially across countries.

While much of this work shows that mortgage-rate changes affect spending and other outcomes, our understanding of how and why households respond to *anticipated* and *persistent* changes in the interest rate on their debt, or in disposable income more broadly, remains limited.⁶ One challenge is to assess anticipatory behavior. Indeed, the event-study methodology typically employed implicitly “differences out” anticipation effects that have taken place before the start of the event window, and is thus only able to detect anticipation effects that happen in the months immediately preceding the payment changes. Another challenge is to distinguish between potential drivers of the effects that take place when payments change, as they could reflect not only limited anticipation or awareness, but also financial constraints or other frictions.

We advance knowledge in this area by explicitly studying different actions that borrowers in our setting can take in anticipation of a mortgage rate change, and by directly measuring borrower awareness and preparation via a survey. Furthermore, our large-scale RCT provides us with an exogenous information shock that allows us to study effects on borrower awareness and actions.⁷

⁵Also related is work on the effects of payment increases that occur when individual mortgages start amortizing ([Andersen et al., 2024](#); [Jørring, 2024](#)) or when households make final debt repayments ([Scholnick, 2013](#); [Stephens, 2008](#)), and work examining other margins of adjustment aside from spending ([Zator, 2024](#)).

⁶While we focus on changes in debt servicing, there is also work on effects of predictable and persistent changes in disposable income due to tax changes ([Kuang, 2018b](#)) or the exhaustion of unemployment benefits ([Ganong and Noel, 2019](#)). In addition, a large literature studies spending responses to *transitory* income changes or cash windfalls (e.g., [Agarwal and Qian, 2014](#); [Baker, 2018](#); [Baugh et al., 2021](#); [Fagereng et al., 2021](#); [Fuster et al., 2021](#); [Ganong and Noel, 2020](#); [Jappelli and Pistaferri, 2010](#); [Kuang, 2018a](#); [Parker, 2017](#)).

⁷The single closely related paper we are aware of is [Druehl et al. \(2022\)](#), who estimate spending responses to future expected changes in adjustable-rate mortgage payments of Danish borrowers, exploiting naturally occurring information shocks from letters sent by a partnering bank. In comparison, our contribution is to take a broader view at actions that borrowers can take ahead of the expiration of their rate fixation period; in that regard, the German setting offers borrowers a particularly rich set of options. Furthermore, we

Within the mortgage literature, we relate to work that documents sluggish refinancing behavior in response to rate decreases—see, for instance, [Campbell \(2006\)](#), [Keys et al. \(2016\)](#), [Fisher et al. \(2024\)](#), and [Gianinazzi \(2023\)](#) for evidence from the US and the UK. Various behavioral frictions contribute to sluggishness, including inattention ([Andersen et al., 2020](#)), low financial literacy ([Bajo and Barbi, 2018](#)), distrust of lender motives ([Johnson et al., 2019](#)), and unawareness of mortgage terms ([Bucks and Pence, 2008](#)). Our finding that most borrowers in our German data are aware of market rates and actively engage with future changes to their mortgage appears in contrast to much of the existing evidence; this could be driven by the low homeownership rate in Germany (leading to a more selected borrower population) or other differences in the institutional environment.

Recent work by [Byrne et al. \(2023\)](#) conducts an RCT in Ireland, where subsets of mortgagors with an incentive to refinance receive different types of letters that explain the possible savings from refinancing. The letters (and especially reminders) increase refinancing rates, suggesting many borrowers are otherwise inattentive. Our letter experiment takes place in a different context, where borrowers face higher rates upon expiration of their loan fixation, and we measure not only effects on actions but also on beliefs and awareness. We also find an effect of letter receipt on actions for the subset of borrowers close to expiration, perhaps reflecting the reminder effect documented by [Byrne et al. \(2023\)](#) (since our borrowers also receive regular communication by the bank). However, our survey additionally reveals that effects do not operate through borrower awareness of the rate environment, that a majority of borrowers was already preparing for the rate change, and strong selection exists in who reads such letters.

We also relate to the broader literature in economics that employs RCTs to study how consumers perceive and respond to the economic environment and policies, including monetary policy (e.g., [Coibion et al., 2022, 2023](#)).⁸ Much of this work relies on survey-based experiments that cannot be linked to realized household choices measured in administrative data; instead, the primary behavioral outcomes studied usually consist of intentions or plans. We overcome this limitation, uniquely combining a large-scale field experiment, a follow-up survey, and granular bank data. We can thus provide a comprehensive study of how debtors think about, prepare for, and react to rate changes.

measure directly how aware households are of likely future rate changes and how they plan for them.

⁸For reviews, see [Coibion and Gorodnichenko \(2026\)](#), [Fuster and Zafar \(2023\)](#), and [Haaland et al. \(2023\)](#).

2 Institutional setting

In Germany, residential mortgages typically have initial rate fixation periods of 5–15 years, while the terms over which the loans amortize usually span 25–35 years. At the end of the fixation, borrowers have to refinance the residual amount at prevailing market rates, unless they choose full repayment. Refinancing can occur internally with the original lender or externally with a different bank.⁹ When refinancing, borrowers can freely reduce the loan balance and accelerate amortization by shortening the term. Increasing the balance or extending the term beyond the original contractual maturity is difficult.

Importantly for our analysis, German mortgages generally do not allow full prepayment during the fixation period, unlike fixed-rate mortgages in the US and Denmark.¹⁰ This identifies when borrowers face interest-rate risk: regardless of movements in market rates, they continue to pay the fixed rate until the end of the fixation period, providing a clean setting to study how borrowers prepare for upcoming changes in mortgage costs.

There are situations in which prepayments without penalties during the fixation period are possible. First, about half the mortgage contracts at our partner bank include an annual partial prepayment right (*Sondertilgung*), typically allowing 5% (or rarely 10%) of the original loan amount to be repaid early per year. Second, loans can be prepaid in case the property is sold. Third, loans with an initial fixed-rate period of more than 10 years can be prepaid without penalty after 10 years, with six months' notice.

An important product in the German mortgage market to mitigate interest-rate risk, borrowers can use a *forward mortgage* to lock in the subsequent fixed rate well ahead of expiration. For example, a borrower with a 10-year fixed-rate mortgage set to expire in 2025 could agree in 2022 on the fixed rate for a new 10-year fixation beginning in 2025, thus avoiding uncertainty about future market rates. This instrument allows us to study borrowers' anticipatory actions that affect future mortgage costs. Forwards can be originated from 3–5 years up to six months before the end of the fixation period. After that, internal refinancing occurs via a regular prolongation loan. Early rate fixation is priced directly through the interest rate to reflect prevailing market forward rates. For instance, fixing a 10-year interest rate one year in advance yields the current 10-year mortgage rate

⁹While refinancing internally is free, switching lenders incurs monetary costs (though these are typically less than 0.5% of the new loan amount; [Lukas and Nöth, 2019](#)) and nonmonetary search costs.

¹⁰Prepayment during the fixation period is subject to a penalty that compensates the lender for lost interest income (*Vorfälligkeitsentschädigung*). Exceptions are discussed below.

that the bank would offer for such a loan plus the one-year forward premium. Other than early lock-in and pricing, a forward does not differ from a regular prolongation loan.

Another mortgage-related instrument to manage interest-rate risk is the home savings contract. Contracts with immediate borrowing (*Bausparen mit Vorfinanzierung*) eliminate rate risk from origination. During an initial savings phase, borrowers build up savings and only pay interest on the loan. At expiration of the loan, accumulated savings and a new fixed-rate loan combine for repayment. There is no rate risk because the interest rate on the new loan is specified at origination of the initial loan.¹¹

Lender communication with the borrower happens at multiple stages during the fixation period. At the beginning of each year, the bank sends a letter with information on the outstanding mortgage balance as well as interest and principal payments made over the past year. Borrowers who have opted into receiving marketing material from the bank receive notifications about the end of the fixation three, two, and one year before expiry, together with the offer to take out a forward mortgage. Four months before expiration, the bank sends a letter reminding all borrowers that the fixed-rate period will soon end and informs about current interest rates. Six weeks before expiration, borrowers who have not yet refinanced internally receive a letter with two prolongation offers, valid for 10 days. Borrowers can simply select one offer and return the signed letter to the bank. Negotiating different terms (e.g., balance reduction or higher rate of amortization) requires meeting a bank advisor. Borrowers who at the end of the fixation period do not secure refinancing (or pay off) shift to a high variable rate.¹²

Several other market characteristics merit mention. First, online brokers facilitating mortgage comparisons are common. Second, mortgages are typically full recourse. Third, interest tax deductions are limited to buy-to-let properties. Fourth, publicly subsidized loans via Germany's state-owned development bank (KfW) are available for specific purposes, like purchases of green homes. These mortgages share the refinancing structures and interest-rate risks of standard mortgages. Fifth, mortgage lending is predominantly provided by banks without government guarantees or securitization; instead, similar to some other European countries, a covered bond system (*Pfandbriefe*) often supports fund-

¹¹Home savings contracts also exist without immediate borrowing (*Bausparen ohne Vorfinanzierung*). While they can be used to mitigate rate risk, these products are often purely used to accumulate savings. We omit this product from the analysis because only 9% of borrowers in our sample have had such a product at some point and less than one-third of those might have been used to manage rate risk.

¹²This rate was 5% pre-2022 and increased to 7–8% thereafter. Less than 3% of borrowers remain on variable rates for extended periods.

ing. Sixth, the home-ownership rate of German households is relatively low, at less than 45% (e.g., [Happel et al., 2024](#); [Malmendier and Wellsjo, 2024](#)).

3 Patterns from bank data

In this section, we study borrower activity over the period 2018–2025. [Section 3.1](#) describes the bank data. [Section 3.2](#) explores time variation in refinancing. [Section 3.3](#) studies how the change in monthly payments upon refinancing evolves over time, and which borrower actions explain this evolution.

3.1 Bank data

Our partner is among the largest banks in Germany, offering a full suite of banking services nationwide. We draw on the bank’s proprietary data that provides detailed information on its mortgage customers. Our sample includes all clients with a mortgage that is outstanding at some point between December 2017 and October 2024 and was originated through the bank’s main brand and distribution channel.¹³ The sample contains 240,000 mortgagors for which we get updates until May 2025, when the dataset ends. In total, the data cover 396,000 mortgage loans originated between 1997 and May 2025, with loans following refinancing recorded separately.

For each loan, we observe origination characteristics and annual updates on outstanding balances. In cases of internal refinancing, we link the original loan to the subsequent loan. This allows us to precisely study the timing of refinancing decisions, combining information on the expiration date of the fixed rate period, the origination date of the new loan, and the date at which the new interest rate becomes effective (the latter two dates differ in cases of early refinancing). Conditional on refinancing, we can also observe changes in interest rates, monthly payments, balances, and fixation periods. For loans that are repaid without internal refinancing, we cannot determine whether repayment reflects external refinancing or the use of own funds.

Demographic information includes borrower age, gender (male, female, or couple), and zip code, as well as the bank’s internal measure of borrower default risk and a proxy

¹³This distribution channel includes some mortgage brokers in addition to the bank’s retail business; it excludes independent asset managers that distribute customized bank products. Moreover, we disregard public-subsidy loans in the bank-data analysis because we lack detailed information about them.

for neighborhood quality. We also observe annual financial balances of clients' deposit accounts, securities accounts, and other debt holdings with the bank, as well as information on clients' meetings with bank advisors, including the meeting date and the stated purpose(s) of each meeting (e.g., mortgage financing, savings, or investments).

Sample characteristics Table 1 presents summary statistics for the main variables in the bank dataset. Panel A is on mortgage characteristics. The average borrower in the sample has € 168,630 in mortgage debt at loan origination, an interest rate of 2.8%, monthly payments of € 895, a fixation period of 11.6 years, and a total maturity of 20 years.¹⁴ On average, the residual balance at the end of the fixation period is € 105,770. About 56% of borrowers are allowed to make annual partial prepayments (*Sondertilgungen*) during the fixation period, typically capped at 5% of the original balance (rarely up to 10%). 32% of borrowers have a forward loan at some point during our observation period.

21% of borrowers have mortgage debt from home savings contracts (*Bausparen*). The outstanding balance on this debt is comparable to that of regular mortgages. However, these contracts are typically paired with a standard mortgage that is subject to interest-rate risk, so total debt tends to be relatively large for borrowers with home savings contracts. But, as we explain in Section 2 above, the debt portion coming from home savings contracts is not subject to interest-rate risk. The statistics imply that this institutional feature of the German mortgage market partially shields a significant fraction of mortgagors from interest-rate risk, and dampens the passthrough of monetary policy.

Panel B shows borrower characteristics. The average borrower is 51 years old and has been a client of the bank for 13 years. The bank's estimate of borrowers' probability of default (PD) is heavily right-skewed.¹⁵ 41% of borrowers have a deposit account at the partner bank. Among these, the average balance is € 27,350, while the median is much lower at € 6,540. 7% of borrowers have a brokerage account at the bank. Borrowers meet with a bank advisor 0.36 times per year on average.

Sample representativeness We compare our bank sample to mortgagors in the Bundesbank's representative Panel on Household Finances (PHF). The latest PHF data are from 2021, so we report 2021 mortgage characteristics for the subsample with a mortgage at

¹⁴This maturity may be shorter than the initial maturity, as the borrower may already have refinanced (in which case the remaining maturity is recorded). The same applies to the loan amount.

¹⁵The PD measure is as of December 2017, i.e. prior to our sample period, for most borrowers. We also have access to a PD measure as of October 2024, which we use when December 2017 is not available (18% of the borrowers). We prefer the earlier PD vintage when available to reduce potential endogeneity concerns. Given the skew in the measure, in our analysis we separate borrowers into PD deciles.

that time in our bank data; we only observe current customer characteristics otherwise.

Table A.1 shows summary statistics on both samples. The statistics indicate that on average, borrowers are of similar age, and their mortgage balance, fixation period, and interest rate are comparable. The property value is larger in the bank sample, but needs to be interpreted with caution.¹⁶ The monthly payment is larger in the PHF, which might reflect that some borrowers have mortgage debt with multiple lenders, as indicated by the larger fraction of borrowers with more than one source of collateral in the PHF. Overall, mortgages in our bank sample are broadly representative of German mortgages.

3.2 Refinancing activity

The refinancing options for German mortgage borrowers depend on the length of their fixed-rate period. Borrowers with fixation periods of up to 10 years can take out a forward loan up to four years before the end of their contract, allowing them to lock in market rates in advance. However, they cannot prepay their loan before expiration without facing a penalty. If they do not act before the fixation ends, they must refinance at the prevailing market rate at expiration, or repay in full then. Borrowers with longer fixations (typically 15 or 20 years) have more flexibility: they can prepay without penalty after 10 years, giving them a broader window to refinance or take out a forward loan, especially if market rates fall. If they do nothing, they continue paying the original fixed rate until the end of their fixation. Given the differential incentives to act, we analyze the refinancing choices of the two groups separately. Since almost two-thirds of loans have fixation periods up to 10 years, and since those borrowers' refinancing problem is conceptually more straightforward, we put more focus on this group.

3.2.1 Refinancing activity of borrowers with fixation up to 10 years

We begin by examining refinancing decisions for borrowers with fixed-rate periods of up to 10 years. To exclude loans that would naturally amortize by the end of the fixation period, we restrict the sample to loans with a (projected) remaining balance of at least

¹⁶We report the value of the property if bought after 2015, which makes it difficult to compare the number to other mortgage characteristics, reported independent of the year of purchase. In the PHF, respondents self-report the purchase price of the property. In our bank data, we report the initial value of the collateral.

€10,000. We additionally require that loans survive until at least two years prior to expiration to (partially) address left truncation.¹⁷

Figure 2 displays the cumulative share of borrowers who refinance their loan internally (either via a forward mortgage, or a regular prolongation), by year of expiration of the rate fixation. Several features stand out. First, less than 45% of borrowers refinance internally; the others either pay down the loan at expiration, or refinance with another provider.¹⁸ Second, a large share of internal refinancing happens over the last months prior to the expiration of the old loan, but there are also many borrowers that refinance their mortgage one year or more prior to expiration, via a forward contract.¹⁹ Third, looking at the expiration vintages 2023 to 2025, there is an unusual increase in refinancing activity around three years (2025), two years (2024) and one year (2023) prior to expiration. This increase can be ascribed to borrowers refinancing via forward mortgages once market rates started increasing rapidly in early 2022, as we explain below. Fourth, in more recent expiration vintages, fewer borrowers refinance internally—consistent with the higher market rates leading borrowers to seek alternatives.

Table 2 further quantifies the distribution of refinancing outcomes by expiration year of the old loan. The share of internal refinancing decreased by about 6-8 pp (or over 15%) from pre- to post-2022. Among internal refinancings, the share happening via forwards—as opposed to prolongation less than six months from expiration—is one-half overall, but fluctuates substantially over time (see below). Only 15% of borrowers overall do not refinance prior to the last six weeks of loan fixation; only 3% wait until after the expiration of the old loan (meaning they face the high variable rate for time). Thus, the share of borrowers that appear “passive” is low. However, we also note that the share of late prolongations substantially increases in 2024 and especially 2025, potentially suggesting more passive behavior when market rates are high.²⁰

The final column of Table 2 illustrates particularly high forward activity for the 2022 and 2023 expiration vintages, while forward originations are lower for later vintages. Figure 3 shows this pattern more directly by plotting monthly forward originations. As market interest rates rise sharply in the first half of 2022, forward-mortgage originations spike;

¹⁷For example, of all loans originated by the bank with expiration in 2019, we observe only those still outstanding in December 2017, i.e., loans that had not exited early due to property sales.

¹⁸The data contain a flag for external refinancing, but we do not rely on it, as it is not fully populated.

¹⁹Figure A.1 shows the precise distribution of internal refinance timing in the pooled data across years.

²⁰A lower share of internal refinancing overall and a higher share of post-offer internal refinancing in 2024–25 expiration vintages could partially reflect that borrowers take out a forward in 2022 at a different lender.

as rates increase further in the second half of 2022 and remain elevated from 2023 onward, forward originations decline substantially. Looking at forward spreads, the surge in originations in Q1 and Q2 of 2022 cannot be explained by a reduction in the cost of these contracts, nor do we observe an increase in forward premia that could account for the subsequent decline in forward originations (Figure A.2). We do not take a stance on whether taking out a forward mortgage is ex-ante optimal at a given point in time, as the optimal option exercise depends on borrower-specific parameters—such as risk aversion and subjective beliefs about future interest rates—that we cannot observe.

Econometric analysis The evidence so far indicates that internal refinancing is less likely when the level of market rates is high compared to their historical level, but that activity spikes during the period of rapidly increasing rates. We next quantify these patterns more precisely. To do so, we estimate Cox proportional hazard models, which posit that the hazard rate of loan i refinancing t months prior to expiration is given by

$$h(t|R_t^m, R_i, \mathbf{X}_{it}) = h_0(t) \cdot \exp(\beta_1(R_t^m - R_i) + \beta_2\Delta R_t^m + \Gamma\mathbf{X}_{it}). \quad (1)$$

Our main variables of interest are $(R_t^m - R_i)$, which is the gap in pp between the market rate on a 10-year mortgage originated by the partner bank at time t and the interest rate a borrower pays on their old loan, and ΔR_t^m , which is the three-month change in the market rate. The coefficient β_1 indicates how sensitive borrowers' refinancing actions are to rate differences, and β_2 whether recent changes in market rates affect borrower behavior. Finally, \mathbf{X}_{it} covers borrower and loan characteristics, including the loan size, that could also influence refinancing decisions. In one specification, we include year-month fixed effects, which means that we absorb any aggregate effects that could influence refinancing. β_1 is identified from variation in R_i , but β_2 is not identified in that specification. The baseline hazard $h_0(t)$ is unrestricted, and we allow it to vary by origination year of the mortgage in some specifications to control for potential unobservable effects that differ across origination vintages. We cluster standard errors by calendar month. We include loans in the estimation sample from 48 months prior to the expiration of their fixation.

The results in Table 3 confirm that the refinancing patterns shown above are robust to the inclusion of control variables. The table reports hazard ratios, meaning multiplicative effects on the baseline hazard (such that ratios above/below 1 indicate positive/negative effects). Column 1 indicates that borrowers who pay a rate below the current market rate are less likely to refinance with the bank—per one-percentage-point increase in the

gap, the hazard of refinancing decreases by about 13%. Column 2 shows that refinancing hazards are higher when market interest rates have recently increased (which is the case in particular in 2022), consistent with borrowers rushing to refinance to lock in a rate before market rates increase further. The first two findings may appear to contradict each other, because increases in market rates, which we find to increase internal refinancing, lead to larger rate gaps, which in turn reduce refinancing. Column 3 shows that when we control for both of them jointly, both coefficients increase in magnitude (away from one), corroborating these countervailing effects.²¹ Finally, the remaining two columns show that these coefficients are stable when we add borrower- and loan-level controls, allow the baseline hazard to vary by origination vintage, and add year-month fixed effects.

Heterogeneity While the regressions above control for borrower and loan characteristics, we now use a more flexible and straightforward way to shed light on determinants of different refinancing outcomes. [Table A.2](#) reports regressions of the different outcomes seen in [Table 2](#) on characteristics, controlling for expiration-quarter fixed effects. Results indicate that the existing loan’s interest rate and residual balance correlate positively with the probability of refinancing internally, especially via a forward. Borrowers with a higher probability of default are more likely to refinance with the current lender, and tend to do so closer to expiration of the old loan, or even post-expiration. Thus, riskier borrowers appear more passive. Similarly, single borrowers appear more passive than couples, which are less likely to refinance internally and, conditional on doing so, take action earlier. Finally, the depth of borrowers’ relationship with the bank matters—borrowers with a checking/savings account or other mortgage debt at the bank are more likely to refinance internally and tend to do so earlier, while having a brokerage account is associated with higher tendency to pay off or refinance externally.

In sum, the refinancing patterns of borrowers with fixations up to 10 years suggest that most of them actively engage with future loan rate resets, as only a small share of loans are refinanced “passively” at the end of their original fixation. The rate environment strongly affects behavior—borrowers are less likely to refinance internally when market rates are higher, and forward activity shoots up when rates rise rapidly. At the same time, a minority of borrowers may be inattentive and passive, and this is correlated with some observable characteristics such as borrower risk.

²¹The magnitude of the estimated β_2 may appear very large—a one-percentage-point increase in the market rate increases the refinancing hazard by 69% (Column 3) or 83% (Column 4). Note though that these are changes relative to a low baseline hazard—about 0.5% monthly refinancing hazard up until six months prior to expiration, then increasing to about 2%.

3.2.2 Refinancing activity of borrowers with fixation above 10 years

While the results above suggest many borrowers are active leading up to loan expiration—for example, by seeking refinancing with a different lender or locking in rates in response to rising rates—quantifying the extent of awareness and activity prior to expiration is difficult. For instance, a borrower might observe rising rates in 2022, but choose to remain passive because of the belief that forward loans are priced accurately. We next shed more light on borrower awareness of the rate environment and of their options to act by examining refinancing without prepayment penalties. Borrowers in Germany with fixation periods longer than 10 years can freely refinance after a 10-year threshold. Thus, a borrower with a 15-year fixation period reaching that threshold in the low-rate period of 2019–21 could switch to a much lower mortgage rate already five years ahead of loan expiration. After rates rise in 2022, the incentive to refinance early diminishes.²²

Panel A of [Figure 4](#) shows the cumulative share of loan repayment, by year in which the loan can be prepaid penalty-free. Two results stand out. First, for the 2019–21 vintages that can refinance at much lower rates, around 70% repay within one year of reaching the threshold. Second, the repayment hazard drops strongly for loans that arrive at the threshold in or after 2022, as the gap between the market rate and the existing rate closes. For example, less than 30% of long-fixation loans that reach the threshold in 2024 pay off within one year. Note that these loan repayments could reflect either internal refinancing, external refinancing, paying off the loan using own funds, or a sale of the property.

In Panel B, we show the share that refinance internally, by when the refinancing occurs relative to the end of the prepayment-penalty period. For the 2019–21 vintages, about 30% of loans refinance internally. Strikingly, the figure shows that most of these refinancings are arranged prior to the threshold date, meaning that the borrowers take out forwards. For instance, almost all borrowers whose prepayment penalty ends in 2024 and who act early do so by taking out a forward by 2022, that is, while rates are still low. This implies that many of the loans repaid once they reach the threshold in 2024 in Panel A reflect forward loans secured earlier.²³ Overall, the results corroborate that many borrowers are

²²Loans on long fixation periods becoming penalty-free in 2019–21 carry interest rates well above prevailing market rates of 1–2% at that time (the average rate is 5.0%, 4.5%, and 4.4% for loans reaching the penalty-free threshold in 2019, 2020, and 2021, respectively). In contrast, most loans reaching the threshold in 2022–24 are on rates below the then-prevailing market rate of about 4% (average rate is 3.6%, 3.3%, and 3.2% for loans reaching the penalty-free threshold in 2022, 2023, and 2024, respectively).

²³Some borrowers who pay off their mortgage may have taken a forward with another lender, which we cannot observe.

aware of the rate environment and their available options—even in an environment of low interest rates—as they act when incentives to do so appear large.

3.3 Borrower actions and impact on monthly payments

In this section, we study the impact of borrower actions on monthly payment changes among borrowers who refinance internally, focusing on loans with original expiration up to 10 years. The evolution of monthly payments is relevant because of the possible impact on borrowers' spending responses to rate changes (via changes in monthly disposable income) and the possible added strain on household finances.

Payment changes Panel A of [Figure 5](#) reports the distribution of *realized* monthly payment changes upon refinancing, calculated as the difference between the monthly payment on the new contract and that on the old contract, by quarter of expiration of the fixed rate period. Despite interest rates post-2021 being substantially above their level 10 years before ([Figure 1](#)), we observe no significant increase in payments. Specifically, the median monthly payment change is €0 for loans expiring in 2022 and 2023, €11 for loans expiring in 2024, and €26 for loans expiring in 2025 (through March).

Actual vs. counterfactual payments To quantify the role of borrower actions in stabilizing monthly payments, we compare realized payment changes to a counterfactual scenario in which borrowers simply roll over the remaining debt at expiration, assuming no extra payments and no modifications to loan terms. In practice, this counterfactual corresponds to a borrower who waits to receive the bank's prolongation offers sent six weeks prior to expiration and accepts one of these offers. The bank generally provides one offer with a fixation for the remaining loan maturity and another with a shorter fixation period. Since borrowers may have time-invariant preferences for fixation lengths, we assume that they select the same fixation on the prolongation offer as on the expiring loan, when available. Finally, we estimate offered prolongation rates using a random forest model trained on observed prolongations in our sample. Crucially, the bank's offered rates are not tailored to individual borrowers but instead depend on observable loan characteristics (amount, term, fixation length), and prevailing market conditions. In [Appendix B](#), we provide further details on the estimation and show that the predictions closely match the rates on actual passive prolongations.

For each refinanced loan, we compute the change in monthly payments under this passive counterfactual and plot the average by expiration quarter in Panel B of [Figure 5](#)

(blue line), along with the average realized change (red line). For loans expiring after the second half of 2022, payments on average would rise by €87 per month (or €1,044 per year) if borrowers simply roll over their debt at expiration, compared to the €23 per month (€276 per year) actually realized. While not the focus of this paper, it is notable that during the low-rate period 2018–21, payments decrease little. This is also evident in Panel A, where the median and 75th percentile of payment changes are both close to zero over this period.²⁴

Decomposing impact on payments Actual monthly payments can deviate from counterfactual payments if the interest rate, loan term, or loan amount differ from the passive benchmark. In particular, the interest rate may differ if borrowers negotiate with the lender, anticipate refinancing (e.g., through forward agreements), or select a contract with a different fixation period. The loan term may change if borrowers extend or shorten the maturity at the time of refinancing. The loan amount may be reduced through voluntary repayments made during the fixation period (if contractually allowed) or at refinancing.

To assess the contribution to deviation of each action, we compute intermediate counterfactuals, varying only one component at a time. Let the passive counterfactual monthly payment be given by $f(L', r', T')$, where L' is the remaining loan balance, r' is the estimated passive rate, and T' is the residual term. We denote the actual new payment by $f(L_1, r_1, T_1)$, where L_1 , r_1 , and T_1 are the borrower's chosen loan amount, interest rate, and term, respectively. We define the individual effects as follows:

$$\begin{aligned}
 \text{Rate effect} &= f(L', r_1, T') - f(L', r', T') \\
 \text{Term effect} &= f(L', r', T_1) - f(L', r', T') \\
 \text{Amount effect} &= f(L_1, r', T') - f(L', r', T')
 \end{aligned} \tag{2}$$

Figure 6 plots the average effects by quarter of expiration along with the overall effect of borrowers' actions, that is, the difference between $f(L_1, r_1, T_1)$ and $f(L', r', T')$.²⁵ The average effect of term modifications is positive throughout, consistent with borrowers shortening maturities relative to the passive counterfactual and thereby increasing

²⁴This partly reflects that many borrowers, when able to refinance at a lower interest rate, speed up the amortization of their loan while keeping the monthly payment constant. The pattern is consistent with "monthly payment targeting" (Argyle et al., 2020). We explore the drivers behind it in separate work.

²⁵This exercise does not constitute an exact decomposition. Because mortgage payments are a nonlinear function, individual effects do not sum to the full effect, and the assumed other characteristics matter for the implied effects. For instance, the rate effect could instead be computed as $f(L_1, r_1, T_1) - f(L_1, r', T_1)$. While the two approaches deliver quantitatively different results, the qualitative conclusions remain unchanged.

monthly payments. While still positive, the magnitude of this effect starts to decline for loans expiring in 2022 and thereafter, suggesting that maturity reductions become less frequent as interest rates begin to rise. Interest rate effects play essentially no role until 2022 but then turn negative, indicating that borrowers obtain rates below those implied by the passive benchmark. Reductions in loan balances also contribute to lowering monthly payments, and this effect becomes slightly more pronounced after 2022.

Figure 7 shows more directly how different loan characteristics at refinancing change with the level of rates. Panel A illustrates that once rates increase, borrowers become much less likely to shorten the term of their mortgage by accelerating amortization. Panel B shows the evolution of the share of borrowers that reduces the loan balance by 5% or more upon internal refinancing. This share is broadly stable over time, between 12% and 16%. Finally, Panel C shows that with the rate increase, the average fixation period of the refinancing loan drops substantially, from over 7.5 years to around 5.5 years. In Table A.3, we present complementary regression evidence that studies the dependence of these actions on the change in the market rate between the time a borrower takes out their original loan and the refinancing loan, with and without additional controls and month-of-refinancing fixed effects.²⁶

To summarize, borrowers who refinance internally take various actions to mitigate effects of market rate changes on their monthly payments. In particular, many borrowers lock in a rate prior to mid-2022 to prevent a large increase in their loan rate. A consequence is a dampened transmission of higher rates. Furthermore, after rate increases, borrowers are less likely to reduce the term on their loan, hence cushioning the rate impact, and slightly more likely to reduce the loan balance, reducing rate exposure. The actions taken suggest the strain on household finances from higher rates is limited.

4 Survey

The patterns in the bank data suggest that most borrowers actively engage with their mortgage ahead of the expiration of its rate fixation. However, we do observe variation

²⁶For term adjustments, we robustly find that a more positive market rate change is associated with less term shortening. The association with balance reductions is zero without controls, but becomes significantly positive once controls are added. For rate fixation periods, the sign on the rate-change coefficient is unconditionally negative, in line with the graphical evidence, but turns positive once we include month-of-refinancing fixed effects, suggesting that the shorter fixation chosen after rates increased may reflect aggregate factors rather than individual circumstances.

over time and across borrower and loan characteristics that does not have an unambiguous interpretation. For instance, internal refinancing decreases once market rates reach a higher level (in 2024–25), which is consistent with more active external search and refinancing with other providers, or saving to pay off the loan. At the same time, the share of borrowers that do refinance very close to expiration of their loan also increases, which could reflect passive behavior. To shed further light on borrower awareness and planning, we next turn to a survey conducted on a subset of the partner bank’s mortgagors. [Section 4.1](#) describes the design of the survey. [Section 4.2](#) discusses survey administration, sample selection and representativeness, and reliability of responses. [Section 4.3](#) focuses on respondents’ beliefs about mortgage rates and preparation for rate changes. [Section 4.4](#) studies respondent behavior in a hypothetical refinancing situation.

4.1 Survey design

The survey consists of three sections: a pre-vignette section on beliefs about mortgage rates and preparing for the possibility of higher future rates; a vignette section in which respondents confront a hypothetical refinancing situation; and a post-vignette section on economic beliefs and preferences, household finances, and demographics. [Appendix C](#) contains the survey questions translated from German to English.

Pre-vignette section We begin with questions related to mortgage interest rates. The first asks qualitatively about how rates have changed over the past three years, and how this impacts respondents’ financial situation. We then elicit point estimates of current and future rates as well as a qualitative measure of uncertainty about future rates. Starting the survey with questions about mortgage rates allows us to test for effects of our letter intervention (described in [Section 5](#)) without the risk of priming respondents.

Respondents then answer questions about their preparation for a future rate change at the end of the rate-fixation period. We first ask whether respondents prepare for the expiration of their fixation period and the potential refinancing. Depending on the response, they are asked to explain how and why they already have prepared or plan to do so. If they do not prepare, they are also asked why. The response is in an open-text format, which provides a snapshot of what is on top of respondents’ mind and avoids priming on a specific set of response options (e.g., [Haaland et al., 2024](#)). We also ask about the timing of preparation and expected monthly payment changes.

The final question in this block is on whether respondents have received a letter on mortgage-rate increases from their bank over the past two months.²⁷ We offer four response options: (i) no letter received, (ii) letter received but not read, (iii) letter received and read, (iv) do not remember. The question is important because we can study directly how many and which respondents state that they read the letter, allowing us to tell apart ex-ante informedness from not reading the letter if we find no effects. We can also use the share of readers to “rescale” any treatment effects.

Vignette section The second part of the survey contains the vignette. Respondents imagine they have a €100,000 mortgage that needs refinancing in one or three years, with the interest rate increasing to 3.5% (from a level of 1.5% or 3%). We then ask how likely they would be to take the following actions to prepare for the rate reset: (i) meet an advisor from their current lender, (ii) compare loan offers from different lenders, (iii) reduce the mortgage balance, (iv) lock in the future interest rate before the reset, (v) reduce their expenses, and (vi) increase their income. Following (i) and (iii), structured questions try to get at their reasoning. Finally, respondents choose a fixation period for the new loan.

There are two main reasons for integrating the vignette into the survey. First, the hypothetical scenario applies to everyone, so all respondents make hypothetical choices and convey the reasoning behind them. In reality, instead, mortgage setups are very heterogeneous. This heterogeneity means many borrowers do not face each decision, such as those who are close to repayment. The second, related reason is that the hypothetical loan mitigates idiosyncratic factors that contribute to noise, such as the size of the loan. The structured questions about the hypothetical refinancing situation also complement our open-ended question about the preparation for borrowers’ real-world refinancing.

We randomly assign each respondent to one of three vignette variants. All three cover the €100,000 mortgage that will reset to a 3.5% interest rate. In the baseline scenario, the current rate is 1.5% and the reset is one year away. We choose this scenario because respondents face a realistic rate increase of 2 pp. Moreover, the fixation ends soon, so respondents should care about the reset. In the second vignette, the distance to the reset increases to three years. We choose the greater distance to reset to gauge the sensitivity of preparation to the reset distance. In the third vignette, we reduce the rate hike by setting the current rate to 3%. This variant speaks to the role of the size of the rate increase. We hold constant the future rate across scenarios to mitigate concerns about beliefs about

²⁷We refer to rate increases in the question to be specific about which letter we have in mind, but avoid details on the letter content, which might confound subsequent responses.

general-equilibrium effects.

Post-vignette section The third part of the survey elicits additional respondent characteristics and beliefs. Specifically, we cover risk tolerance as a driver of exposure for interest-rate risk (e.g., [Campbell and Cocco, 2003](#)); debt aversion; beliefs about the current lender (e.g., [Johnson et al., 2019](#)); recent consumption-savings decisions, which we observe only for a subset of mortgagors in the bank data; and financial literacy. Finally, we ask about the household balance sheet and income, educational attainment, and the perceived direct effect of an unexpected increase in interest rates on various economic outcomes. These beliefs might capture sentiment about rate changes more broadly.

4.2 Survey administration, sample selection, and representativeness

Survey administration We run the survey in partnership with the same German bank, allowing us to combine bank data, letter RCT, and survey for the same set of mortgage customers. In November 2024, the bank sent a short email to around 46,000 customers, inviting them to participate in a survey on mortgages run by Goethe University Frankfurt. The bank sent a reminder email 1.5 weeks after the initial invitation. The survey remained open for 2.5 weeks. Overall, 2,004 customers completed the survey. The response rate is 4.3%, which is slightly above other surveys of the bank. The median response time is 14.2 minutes. Participants received a €10 online-shopping voucher for survey completion.

Sample selection We set minimum restrictions for survey participation: all customers with a mortgage who consent to receiving emails from the bank get the survey invitation. Among those who complete the survey, we omit the respondents who take less than six minutes (around 1.5% of the sample) and more than 120 minutes (around 0.5%). This step leaves 1,958 respondents in the baseline survey sample.

Sample representativeness We compare our survey sample to the average mortgagor in the bank data (see [Section 3.1](#)) and the Bundesbank’s PHF to assess representativeness. [Table A.1](#) shows summary statistics on each sample. Comparing the PHF mortgagors with the mortgagors from our partner bank who complete the survey, we find they are of roughly similar age, but our sample, on average, is better educated and has higher household net income. Mortgage characteristics are in the same ballpark; for example, the current amount is slightly higher and the payment is slightly smaller in our sample. Comparing the bank samples, mortgagors invited to the survey and particularly those

who complete it are younger on average and more likely to be male. Mortgages are larger in the survey sample than in the full bank sample (current amount: €176k vs. €148k), though the collateral value is smaller. Most noticeably, survey respondents tend to have a closer relation to the partner bank. For example, 61% of respondents also have a checking account with the bank, whereas only 41% of all mortgagors do. Overall, mortgages in our survey sample are broadly comparable to representative mortgages, but our sample is positively selected in terms of education and income, and we document selection into the survey based on the customer relation to the bank.

Importantly, receiving the letter as part of our RCT does not affect the propensity to participate in the survey—see [Table A.4](#) for regressions of participation indicators on letter dummies with and without additional controls.

Reliability of survey responses We try to alleviate possible concerns about inaccurate reporting in our survey by testing for the reliability of responses using the bank data ([Dutz et al., 2022](#); [Schnorpfeil et al., 2023](#)). [Table A.5](#) shows plausible associations between choices we observe in the bank data and choices as part of the hypothetical refinancing situation. Specifically, respondents who have made prepayments, that is, voluntary, extra payments, are more likely to state they would likely prepay in the vignette; forward and home-savings (Bausparen) loans in the bank data predict a forward-loan preference in the vignette; and forward loans—which imply fixing rates early—and rate-fixation periods in the bank data explain the fixation choice in the vignette.

4.3 Beliefs about interest rates and preparation for rate changes

Interest rate perceptions and expectations While the bank-data analyses suggest many borrowers are aware of the rate environment and active, the survey allows us to test for rate awareness directly. [Figure 8](#) reports statistics for respondents’ beliefs about mortgage rates.²⁸ The first stacked bar from the left shows beliefs about how mortgage rates have changed relative to three years ago (in 2021), which we elicit on a five-point scale ranging from “today’s rates are much lower” to “much higher.” 83% of respondents believe mortgage rates are somewhat or much higher than they were three years ago. Less than 10% of respondents perceive rates to have decreased.

²⁸We study beliefs of all respondents, including letter recipients, because the letter treatment does not have significant effects on interest-rate beliefs on average, as discussed in [Section 5.2](#) below. Nonetheless, all regression analyses in this section control for letter-group dummies.

The second bar documents the distribution of respondents' point estimates of the current rate on a new mortgage with a 10-year fixation period. Actual rates at the time of the survey in November/December 2024 are around 3.5%, and the median perceived rate in our survey is 3.5%. Dispersion is limited: 4% of respondents perceive rates to be below 2.5%, and 8% perceive rates of 5% or higher. The dispersion of mortgage rate "nowcasts" is considerably tighter than for mortgagors in the US, based on data from the NY Fed Survey of Consumer Expectations.²⁹

The third and fourth bars report mortgage-rate expectations. We ask for point predictions of rates in two and five years, which we contrast with perceived current rates, respectively. Expected rates are close to the perceived rate on average. 14% of respondents expect rates in two years to deviate more than 1 pp from their current perception. The five-year median expectation is similar to the median perceived current rate, but dispersion in the forecast increases. In sum, most respondents are aware of the recent increase in rates, have accurate perceptions of current mortgages rates, and expect rates to remain at a similar level; however, some heterogeneity in awareness exists.

Preparation for rate reset We next study whether and how mortgagors prepare for the future interest-rate reset. Our objective is twofold. First, we speak to the question of what is behind the relatively large fraction of late/passive refinancing when rates are high (shown in [Section 3.2](#)). Second, we shed light on margins of adjustment beyond those observable in the bank data. To focus on respondents subject to rate risk, we require at least € 10,000 expected debt at reset. We develop a coding scheme that classifies the open-text responses into nine categories and apply the scheme using both a human coder and a large language model (GPT-4o). 79% of responses can be classified into at least one category, in line with existing work (e.g., [Link et al., 2025](#)).

[Figure 9](#) plots the categorized open-text explanations of whether and how mortgagors prepare for the rate reset. 18% of borrowers select that they do not prepare (top-left panel). Among them, 22% explain they will actively pay off (prepay) their loan, which could also be interpreted as a preparation. 26% say they repay without mentioning active repayment.³⁰ That is, nearly half of respondents who do not prepare will repay their loan at

²⁹This point is illustrated in [Figure A.3](#), which shows that the gap between the 10th and 90th percentile of mortgage rate nowcasts among mortgagors in the US in 2024 is 2.75 pp; it averages 2.5 pp over 2014–24 and never falls below 2 pp. In contrast, in our survey data, the corresponding gap is 1.6 pp.

³⁰Many of these answers are ambiguous (such as "loan will be fully repaid"), so they could indicate active or natural repayment. Natural repayment should not happen given the minimum-debt restriction we impose. Some responses indicate natural repayment nonetheless, but the overall fraction is small (<5%).

the end of the fixation period. 6% do not prepare because they perceive the outstanding loan to be small. 30% state they take no action, at least until they are close to the reset.

44% of borrowers plan to prepare in the future (top right panel). Among them, the most common form of preparation is information acquisition (63% of responses), which for many borrowers entails searching for the best loan offers or consulting a mortgage advisor. Apart from that, some respondents consider fully or partially paying off the loan (11% respectively), locking in the future mortgage rate ahead of the rate reset using a forward loan or Bausparen (13%), or increasing savings (20%).

38% of borrowers state they have prepared already (bottom left panel). There is more heterogeneity in how they prepare. A significant fraction has locked in their rate (38%), which is consistent with the surge in demand for forward loans once rates started to increase (Figure 3). Many borrowers fully (26%) or partially (12%) pay off their mortgage, which again aligns with actual behavior, such as the increased likelihood of loan-balance reductions (Table A.3). 17% mention they have increased savings.

Finally, we plot the frequency of categorized responses for borrowers pooled across types of preparation (bottom right panel), which illustrates the heterogeneity in how borrowers prepare: they rely on (partial) repayments, locking in interest rates ahead of the reset, increased savings, and acquiring information. Overall, the open-text explanations on preparing for higher future interest rates indicate most borrowers actively prepare, often taking steps to mitigate the payment impact of higher rates. These data thus suggest a larger fraction of late refinancing in the high-rate environment observed in the bank data does not reflect greater inactivity. Instead, passive refinancing might rather be due to a lack of attractive options (e.g., locking in high rates using a forward). Moreover, acquiring information and saving constitute additional common margins of preparation. Nonetheless, a non-negligible minority indicates either no preparation, or preparation through information acquisition, which is rather vague.

Heterogeneity What determines whether borrowers prepare for the rate reset and awareness of recent interest-rate increases? Column 1 of Table 4 shows results of regressing an indicator for whether borrowers prepare—by selling the property, partially or fully repaying, locking in rates, or saving—on a large set of correlates. Most noteworthy, awareness of rate increases between 2021–24 predicts preparing. While most borrowers are aware of the rate environment and prepare for the rate reset, this correlation suggests some borrowers might not prepare because they are unaware of rate increases. We also find higher expected rates, proxies for financial literacy, and income predict preparation. When we

omit respondents who state they fully prepay from the estimation sample—which is naturally less common for large mortgages—the outstanding balance has no predictive power (Column 2). Patterns are more pronounced for borrowers closer to the end of the fixation period (Column 3), and comparable when the dependent variable indicates whether borrowers prepare in any way (Column 4).

Column 5 reports determinants of awareness of recent increases in mortgage rates. Importantly, respondents with a larger outstanding balance are better informed, but distance to reset does not predict awareness. The former is consistent with the literature on endogenous information acquisition: borrowers more exposed to interest rates pay more attention (e.g., [Link et al., 2025](#); [Maćkowiak et al., 2023](#)). Moreover, financial literacy and following a savings plan correlate positively with rate awareness, whereas trust in banks, borrower age, and current interest rate paid on the mortgage correlate negatively.

4.4 Hypothetical refinancing situation

Refinancing choices In the baseline scenario (vignette 1), borrowers have a hypothetical € 100,000 mortgage with an interest rate of 1.5% that resets in one year to a rate of 3.5%. In this scenario, 71% of respondents state they would “very likely” compare loan offers from multiple lenders, and 16% would “rather likely” compare offers. Relatedly, 78% would likely meet an advisor from their current lender. Prepayments of any form are common as well (71% would likely prepay), consistent with their prominence in the bank data. We find similar likelihoods of reducing expenses, raising income, and taking out a forward loan, of around 47%. Respondents would hence consider various actions to prepare for the higher-rate reset. See [Figure A.4](#) for details.

Varying the refinancing situation We study between-respondent effects of varying the hypothetical refinancing situation. To ease the interpretation of the effects, the outcomes are indicators equal to one if an action is very or rather likely, and zero otherwise. Because we randomize assignment into the vignettes, controls help with precision but have no material effect on the estimates. Nonetheless, we include a wide array of controls from both the survey and bank data, listed in the table notes.

[Table 5](#) shows the results. First, we study how increasing the distance to reset from one year (vignette 1) to three years (vignette 2) affects the likelihood of action over the next 12 months. A reset in three years reduces the likelihood of consulting a bank advisor

by 15 pp (20%) and searching for loan offers by 6 pp (7%). Respondents are also 6 pp (or 12%) less likely to reduce expenses and 7 pp (15%) less likely to try to raise income. However, a later rate reset does not affect the likelihood of prepayments—for which we do not reduce the choice horizon to 12 months in vignette 2—and taking out a forward. The results indicate respondents become more active as they approach the rate reset.

Second, varying the size of the hypothetical increase in interest rates at reset matters for choices as well. Specifically, vignette-3 respondents confront a smaller rate increase, from 3% to 3.5%. This smaller increase lowers significantly the likelihood of consulting a bank advisor by 5 pp (6%) and of raising income by 6 pp (12%). Instead, vignette-3 respondents are 10 pp (21%) more likely to lock in the 3.5% already using a forward loan. The results corroborate that borrowers are sensitive to increases in interest rates, in particular in the context of locking in the post-reset interest rate early.

We also ask for how long respondents would want to fix the new 3.5% interest rate, with possible options of one, five, 10 years and “as long as possible.” We define a dummy equal to one for those that select 10 years or longer. The last column of [Table 5](#) shows that in vignette 3 (smaller rate increase), respondents are about 6 pp (11%) more likely to choose such a long fixation, suggesting they are less willing to lock in a rate for a long time when that rate represents a larger increase to their old rate.

The results support three additional interpretations. First, while not the focus of the paper, changes to consumption-savings decisions appear as another relevant margin of adjustment of borrowers ahead of higher-rate refinancing. Decreasing spending could speed up the transmission of monetary policy. Second, borrower preparations intensify with the size of the rate increase. Both interpretations are also consistent with borrowers’ open-text explanations of refinancing preparation. Third, the interest rate on the existing loan shapes the perception of the rate on the new loan, in line with the hazard analysis.

Reasoning behind choices We document how respondents in vignette 1 reason about their hypothetical refinancing choices.³¹ [Figure A.5](#) is on meeting an advisor from the current lender. For the 78% of respondents who would likely arrange a meeting, the most important reasons are to negotiate a better mortgage deal and better understand mortgage options (Panel A). The remaining 22% who are unlikely to meet often state they are well-informed already or want to acquire information themselves (Panel B).

³¹Effects of varying the hypothetical refinancing situation on reasoning are insignificant. The single exception is that respondents who confront a smaller rate increase (vignette 3) are more likely to view “tolerating higher monthly payments due to higher rates” as an important reason for being unlikely to prepay.

Figure A.6 reports on the reasons for (not) making prepayments, defined as voluntary, extra reductions in the loan balance. 71% would likely prepay, mostly to reduce the impact of higher interest rates on payments, particularly the interest burden (Panel A). This finding is consistent with the limited passthrough from higher rates to payments we observe in the bank data (Figure 5). The 29% unlikely to prepay mostly subscribe to reasons based on opportunity costs: they have other priorities for their savings (e.g., durables purchase) or prefer to invest their savings differently (Panel B).

5 Letter RCT

In this section, we present results from the letter experiment. Section 5.1 describes the letter objective, sample, and content. Section 5.2 shows effects of the letter intervention on survey outcomes. Section 5.3 reports intervention effects on bank-data outcomes. Section 5.4 explores selection into reading the letter.

5.1 Letter setup

We ran an RCT in November 2024 in which the partnering bank sent a letter to a random subset of mortgagors. The letter reached recipients approximately two weeks before a subset of them received an email invitation to participate in the survey. This allows us to test for letter effects in survey and bank data. We designed the letter, but the bank sent it, with official letterhead and signature. Mortgage customers regularly receive letters from the bank. The letter features information about the recent increase in market interest rates, how these rates might feed into monthly mortgage payments once a mortgage's rate resets (upon refinancing), and how borrowers can cope with higher rates.

Objectives We pursue three objectives with the letter intervention. First, in combination with the survey, we try to understand mortgagors' awareness of mortgage rates and how these rates translate into monthly payments. Second, we aim to assess how treatment-induced awareness of the potential increase in mortgage rates and hence required payments affects mortgagors' beliefs and choices. Third, we investigate one possibly important source of heterogeneity in awareness: who engages with lender communication.

Sample Three criteria need to be met to enter the sample of possible letter recipients, selected in October 2024. First, the customer must have consented to receiving promotional

or informational letters from the bank. This consent applies to non-mandatory communication, such as marketing content. The bank sends official communications via standard mail, as required by law. Second, we require the customer to have a mortgage originated before June 2022. We thereby focus on borrowers not yet subject to higher mortgage rates. Third, the expected mortgage amount at the end of the interest-rate fixation period needs to be at least € 10,000. This restriction excludes borrowers not subject to significant interest-rate risk. Among the 140,000 active mortgagors, 48,000 fulfill the criteria. The first and third criteria contribute the most to the drop in the number of mortgagors.

We randomly divide the sample of possible letter recipients into four equally-sized groups. Three groups receive different letter variants, as explained below, and one control group does not get any letter. We vary some of the letter contents across groups to study whether specific letter features drive effects, if any, while still being able to pool together all recipients. [Table A.6](#) documents the four groups are largely well-balanced for a wide array of loan and borrower characteristics.

Content The letter comprises four sections (see [Appendix D](#)). We strive for brevity and clarity throughout to minimize costs of engaging with the letter content ([Stantcheva, 2023](#)). In the first section, we state that market interest rates have increased substantially since early 2022. We then explain that the bank collaborates with Goethe University Frankfurt to understand how borrowers respond to the rate increase and that as part of this study, the bank would like to provide their customers with relevant information. We then add a figure, shown in Panel A of [Figure A.7](#), that illustrates the recent surge in mortgage rates, making it a salient feature of the letter.³²

The second section states that the current average interest rate on new mortgages in Germany is 4%. This statistic is for July 2024 and reported by Bundesbank in September, when the letter was finalized for printing.³³ We explain prolongation interest rates might differ from this rate given rate uncertainty. We then cite a Bundesbank study that shows large heterogeneity in interest-rate expectations of German households. This part on future rate uncertainty is not included in letter variant 2, which allows us to assess whether information about high rate uncertainty drives effects, in light of the importance of macro uncertainty for household behavior ([Coibion et al., 2024](#)).

The third section sketches how higher interest rates can impact monthly payments.

³²The partner bank asks us not to show the original letter, so letter graphics are separate from the text.

³³We state above that actual rates at the time of the survey in November/December are around 3.5%. Rates had fallen between July and the survey date (see [Figure 1](#)).

An increase in rates by 2 pp—which resembles a plausible rate change—on a €100,000 loan initially raises interest expenses by €2,000 per year or €167 per month. We embed the numbers in a small graphic that makes them more salient to the reader. The graphic is in Panel B of [Figure A.7](#). This section is not included in letter variant 3 to gauge whether information about concrete payment changes matters: households aware of higher rates might not consider their payment impact.

The fourth section lists options to cope with higher interest rates. We mention (i) voluntary deleveraging through annual partial repayments (Sondertilgungen) or repayments at reset, (ii) locking in future interest rates using a forward loan or a home savings contract (Bausparen) to have certainty about future payments, and (iii) increasing savings to be able to afford higher future payments. The letter concludes noting that the bank would be available to advise what actions might be best.

5.2 Letter effects in survey data

We use the survey to study the extent to which the letter reaches its recipients and affects beliefs about interest rates and mortgage features. Reporting these results helps with the interpretation of the size of the treatment effects and the channels through which the letter might induce actions. We regress different outcomes on letter dummies and include a parsimonious set of controls given randomized treatment assignment and the possibility of disparate letter effects.³⁴ Respondents not eligible to receive the letter are not in the sample, which reduces its size to 882. [Table A.4](#) shows that the letter does not affect selection into the survey, mitigating concerns possible differences in survey responses across letter groups reflect selection effects.

[Table 6](#) reports the results. Column 1 captures whether respondents state they have read a letter from their lender over the past two months concerning mortgage-rate increases. Letter provision increases the probability of reporting to have read a letter by 30–37 pp, depending on the letter variant. We cannot reject the null of identical treatment effects across letter variants. In the control group, 12% report to have received and 8% to have received and read a letter, as the bank regularly sends out marketing and contract

³⁴Controls from the survey are log age, obtaining university education, an indicator for vignette assignment if the outcome variable is from the vignette section, and household net income. Bank-data controls are log total debt outstanding, as well as indicators for which loans are active, living in East Germany, meeting an advisor (past 12 months), and online-banking login (past month), measured prior to the intervention in October 2024.

material.³⁵ While it may seem obvious that many letter recipients state they have read our letter, being able to quantify this is helpful for “rescaling” any measured treatment effect: we can multiply estimated regression coefficients on letter dummies by a factor of three when trying to assess the actual effect of reading the letter.

Columns 2–3 show insignificant letter effects on beliefs about mortgage rates. We ask for the perceived rate change over the past three years on a five-point scale, from “much lower” to “much higher,” and the point estimate of the current rate on a new mortgage in Germany with a 10-year fixation period.³⁶ For the latter, we define an indicator equal to one if the estimate is 3–4%. We treat estimates within that range as accurate: as we explain above, whereas the letter states the current average rate is 4%, rates had fallen to around 3.5% at the time of the survey. Insignificant letter effects suggest high ex-ante awareness of mortgage rates.³⁷ Indeed, as we show in [Figure 8](#), most respondents have well-calibrated rate beliefs. Any letter effects on actions are hence unlikely to reflect increased awareness of the rate environment.

Column 4 presents letter effects on expected changes in monthly payments upon refinancing. We ask for euro-amount changes (in buckets of 50) if respondents expect a change; the change is zero if they expect payments to remain roughly the same (42% of respondents); and we exclude respondents who report they will not need to refinance. We scale the expected payment change by the current payment. The letter does not affect expectations about payment changes, despite explicitly outlining how higher rates can feed into payments. Insignificant effects are consistent with high ex-ante awareness.

Columns 5–8 document letter effects on awareness of and hypothetical choices involving prepayments and forward loans. We elicit awareness on a four-point scale spanning “completely unknown” to “completely known.” The letter increases awareness of both prepayments and forwards by about 0.15 standard deviations, although statistical significance is marginal. The likelihood of prepaying as part of the hypothetical refinancing situation described earlier is also positively affected, while the same is not the case for the likelihood of taking out a forward.

In sum, the survey-based results indicate that letter recipients do not differentially update beliefs about mortgage rates and payment changes, but the letter does shift aware-

³⁵The effect on reporting to have received a letter, including cases of not reading it, is 33–38 pp.

³⁶The letter does not affect the first and second moment of expected mortgage rates either.

³⁷We follow the existing literature that uses the extent of learning from exogenously provided information as a measure of attention and knowledge (see, e.g., [Weber et al., 2025](#)). We also find no significant effects if we instead use the perceived level of the mortgage rate (winsorized) as dependent variable.

ness of mortgage-related features, suggesting that borrowers may otherwise be imperfectly aware of them. Any letter effects on actual behavior are hence unlikely to reflect exogenous increases in awareness of the rate surge, and instead more likely driven by increased awareness of mortgage options or a reminder effect.

5.3 Letter effects in bank data

We next examine effects of the letter intervention on realized borrower actions using bank data. The sample ends in May 2025, allowing us to observe actions over a six-month period following the information treatment. Borrowers could respond in several ways: by acquiring more information (e.g., by contacting a bank advisor or seeking offers from other providers), locking in rates early (if possible), making additional loan repayments (if possible), or increasing their savings.

To test whether the letter causally changes such actions, we use as outcome variables in our regressions whether the borrower (i) has at least one meeting with a bank advisor; (ii) refinances with the bank, including whether refinancing occurs ahead of the bank's standard prolongation offer (six weeks before expiration) or immediately after meeting an advisor; (iii) makes an extra partial prepayment; and (iv) opens a new savings product at the bank (savings account, brokerage account, or home-savings contract). In each case, we first regress the outcome on a letter dummy (pooling the different letter variants), and relevant borrower- and loan-level controls, including expiration-year fixed effects.³⁸

Panel A of [Table 7](#) presents average letter effects. Column 1 shows no effect on meeting a bank advisor. Columns 2 and 3 suggest a higher probability of internal refinancing and of refinancing internally before receiving the bank's prolongation offers for treated borrowers, though these effects are statistically insignificant. However, the letter does significantly increase the joint outcome of meeting an advisor and refinancing shortly thereafter (Column 4). Economically, the effect on the probability of meeting an advisor and refinancing is 0.23 pp, a 33% increase relative to the mean in the control group. We find no effects on the probability of making extra payments and opening a new savings product (Columns 5 and 6).

³⁸The controls are: current interest rate, expected loan balance at expiration, fixation period, borrower age, whether the borrower is a single male, whether the borrower is a couple, borrower probability of default, neighborhood quality, whether the borrower has checking or savings accounts, an investment account, and multiple mortgage loans with the bank. For borrowers with multiple loans, loan-level characteristics refer to the loan with the earliest expiration date.

We then examine heterogeneity in treatment effects by distance to expiration. While advisor meetings, extra payments (when permitted), and savings products are available to all borrowers, refinancing options vary with distance to expiration. We thus classify borrowers into three groups based on the actions they could take post-letter. The first group consists of borrowers whose fixed rate expires by May 31, 2025. These borrowers are less than six months from expiration at the time they receive the letter, and by the end of our observation window (May 31) their fixation period has ended. Absent any action, they transition to the high variable rate. The second group includes borrowers with expiration dates between June 1, 2025 and May 31, 2029. These borrowers are more than six months from expiration when they receive the letter and do not yet face expiration by May 31. Any refinancing therefore reflects early action (early prolongation or forward). The third group contains borrowers whose fixation expires after May 31, 2029 and who, by design, cannot refinance or pay off their loan during the post-letter period. 2,178 belong to the first group, 15,387 to the second, and 29,857 to the third.

Panel B of [Table 7](#) reports results. We find economically large letter effects on meeting advisors and refinancing only for borrowers whose fixed-rate period expires within the six-month post-letter window. Specifically, the treatment increases the probability of meeting an advisor by 4.4 pp (a 12% increase relative to borrowers with expiration until May 2025 that are in the control group), refinancing internally by 3.5 pp (a 16% increase), and refinancing before receiving the regular letter offers from the bank by 2.0 pp (almost twice as likely). Similarly, the treatment increases the probability of the joint outcome of meeting an advisor and originating a loan shortly thereafter by 4.5 pp (or 40%). Effects on extra payments or the origination of savings products are insignificant. The effects on refinancing are particularly large given that we show earlier that letter assignment increases the probability of remembering reading the letter by about one third. If indeed only one third of recipients read the letter, this would imply that for the estimated treatment effect of *reading* the letter, the regression coefficients should be multiplied by three.

What can we infer from these results? The combination of limited options to act and limited effects on beliefs likely explains why borrowers for whom loan expiration is not imminent do not respond to the letter—including group 2 that needs to refinance in six months to four years. Because distance to loan expiration does not predict informedness, borrowers that had not taken action prior to receiving the letter and are close to expiration possibly respond to the intervention because it serves as a reminder to act ([Byrne et al., 2023](#)) rather than due to a shift in beliefs. Moreover, we next highlight the difficulty of

reaching borrowers more likely to benefit from such an information intervention.

5.4 Selection into reading the letter

We explore who reads the letter, and whether limited effects on beliefs partly reflect selection into reading. [Table 8](#) reports heterogeneity in the propensity to read the letter by loan (Columns 1–3) and borrower characteristics (Columns 4–7). The dependent variable is one if the respondent states to have read a letter and zero for all other responses (no letter received, letter received but not read, does not remember). We regress the variable on an indicator for receiving any of our letters, which we interact with one of the loan or borrower traits.

We observe systematic heterogeneity in which borrowers read the letter. Borrowers with one-standard-deviation higher debt outstanding relative to the mean are 7 pp (or 21%) more likely to read the letter, while and those who have engaged in past prepayments are 11 pp (35%) more likely. In contrast, the distance to loan expiration does not predict reading. These patterns align with our results on who is aware of the recent rate increases ([Table 4](#)): outstanding debt predicts informedness, but distance to having to re-finance does not. Borrowers whose self-reported financial literacy is above the median and those with above-median household income net of general expenses are 18 pp (76%) and 15 pp (60%) more likely to read the letter, respectively. Finally, letter recipients who correctly perceive mortgage rates to have gone up since 2021 and the current mortgage rate to be 3–4% are 17 pp (88%) and 13 pp (57%) more likely to state to have read the letter, respectively.³⁹ Thus, ex-ante awareness of the letter content determines the propensity to read, reducing the scope of the intervention to alter beliefs and ultimately choices.

6 Conclusion

Based on a unique combination of loan-level data from a German bank, a survey of its borrowers, and a letter RCT, we study how borrowers prepare for and respond to changes in the interest rate on their mortgage. Our results indicate that borrowers are generally well-informed about the interest-rate environment, and often prepare for the expiration

³⁹To be clear, this reflects selection, not a treatment effect from the letter—[Table 6](#) shows that estimated treatment effects on rate awareness are directionally negative and far from statistically significant.

of their rate fixation. Their various actions mitigate the impact of rate changes on monthly payments, resulting in much smaller variation in payments than in a counterfactual world with passive refinancing. Thus, the transmission of monetary policy changes to monthly payments is substantially dampened, and strains on household finances appear limited.

Borrower awareness of the many options the German institutional setting provides is not perfect, however, as indicated by the significant effects of the letter RCT intervention on some survey responses and on the refinancing behavior of the selected subsample of borrowers that had not taken action until shortly before expiration of their old loan. Nevertheless, we interpret our findings as contrasting to some extent with many results in the literature that emphasize limits to borrower awareness and understanding. It is an interesting open question to what extent these seemingly different results reflect cross-country variation in institutional settings, the time period studied, or the selection of households that own homes with a mortgage (since German homeownership is lower than in most other advanced economies).

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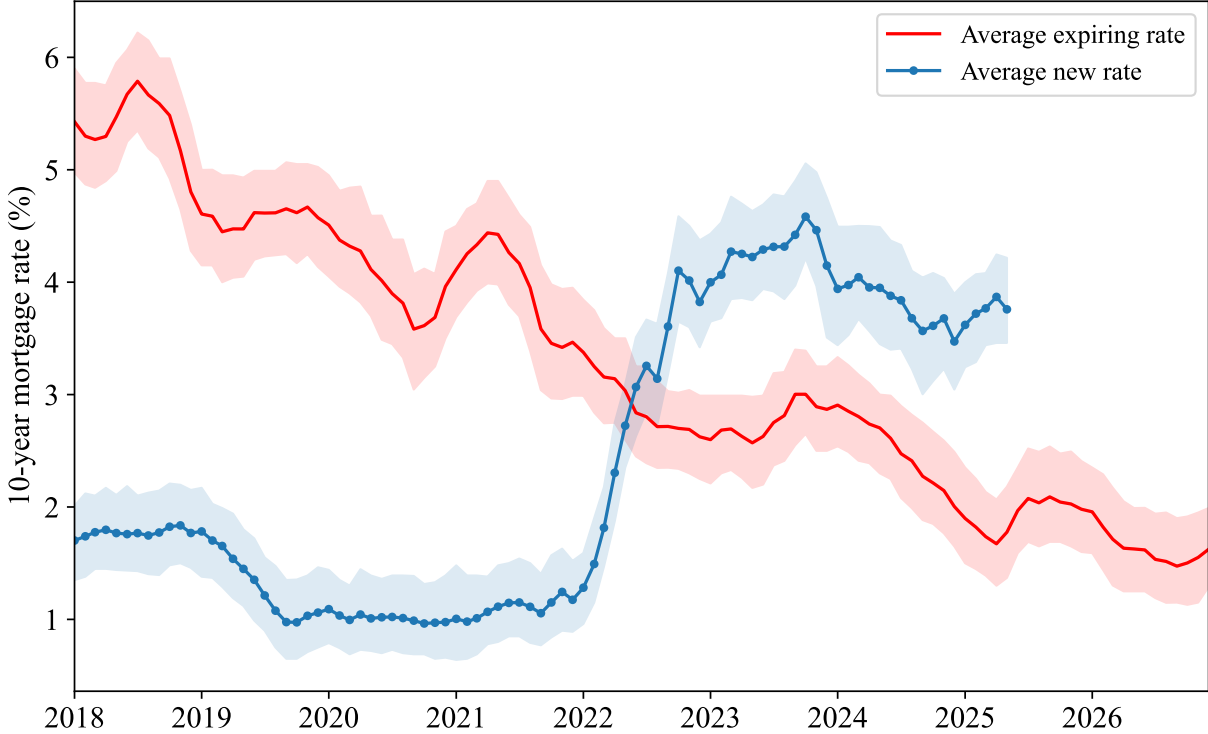
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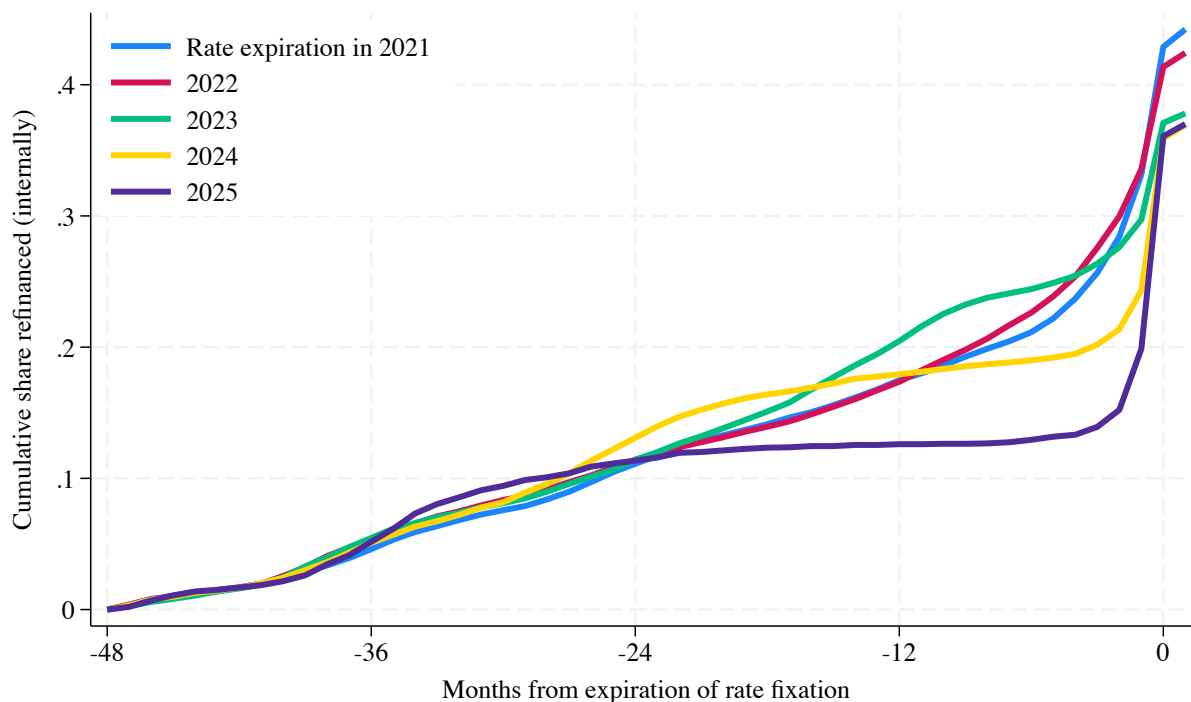
Figures and Tables

Figure 1: Rates on new and expiring mortgages at our partner bank



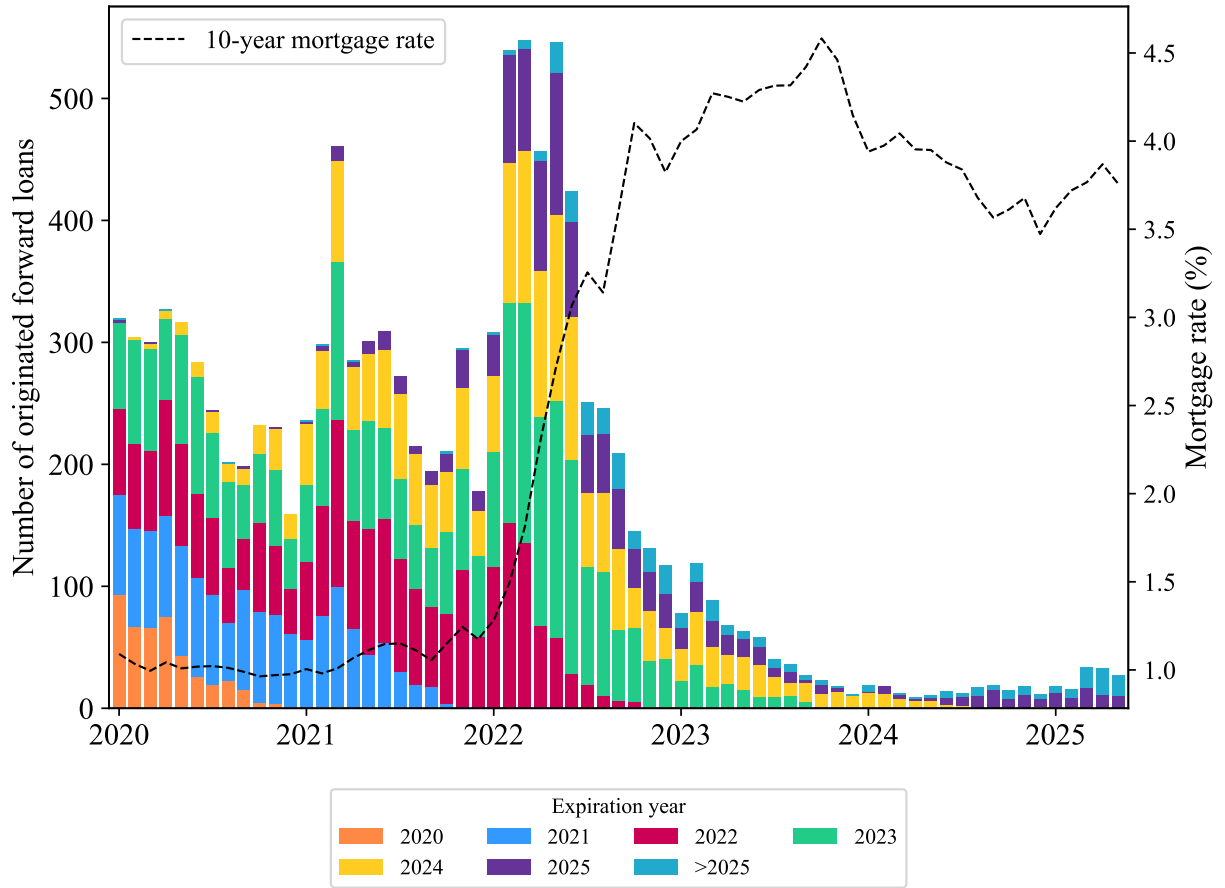
Notes: The figure plots average interest rates on 10-year fixed-rate mortgages at the partner bank. The blue dotted line shows the average interest rate on mortgages originated in a given month, while the red solid line shows the average interest rate on mortgages whose fixed-rate period expires in that month. The shaded area denotes the 10th and 90th percentiles. The horizontal axis reports calendar months, and the vertical axis reports interest rates in percent.

Figure 2: Cumulative hazard of internal refinancing across rate expiration vintages



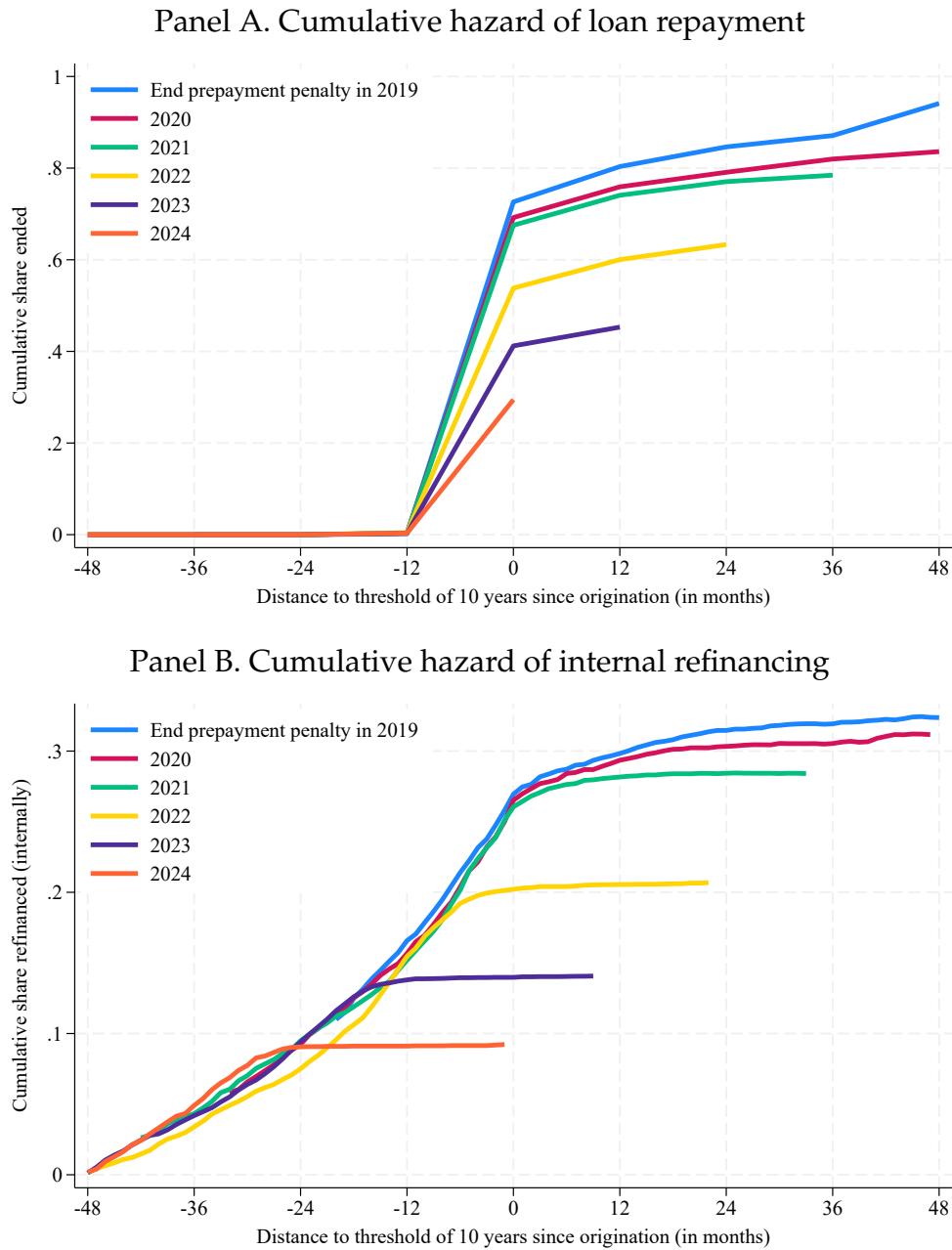
Notes: The figure plots the cumulative share of mortgages that refinance internally at our partner bank (via a forward mortgage or a regular prolongation) as a function of distance from expiration of the rate fixation, separately for different rate expiration vintages. The sample is restricted to loans with fixation period of up to 10 years, an expected residual balance of at least € 10,000 at expiration, and expiration between January 2018 and March 2025.

Figure 3: Origination of forward mortgages over time



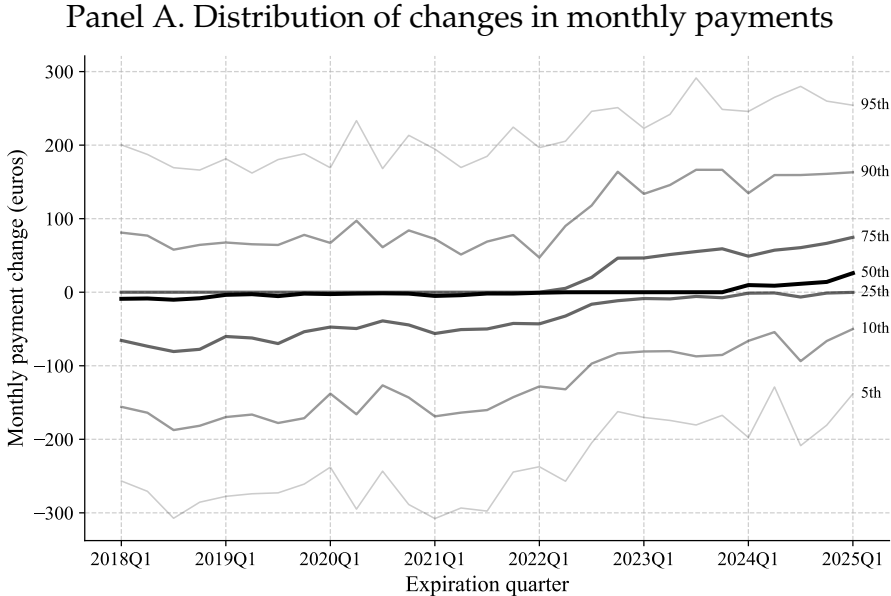
Notes: The figure shows the time series of forward loan originations at monthly frequency. Bars represent the total number of forward loans originated by the partner bank for internal refinancing, with colors indicating the expiration year of the old loan. The sample is restricted to forward loans used to refinance mortgages with a fixed-rate period of 10 years or less. The black dashed line shows the evolution of the mortgage rate, calculated as the average rate on newly originated 10-year fixed-rate mortgages at the partner bank.

Figure 4: Cumulative hazard of acting around 10-year threshold for long fixations

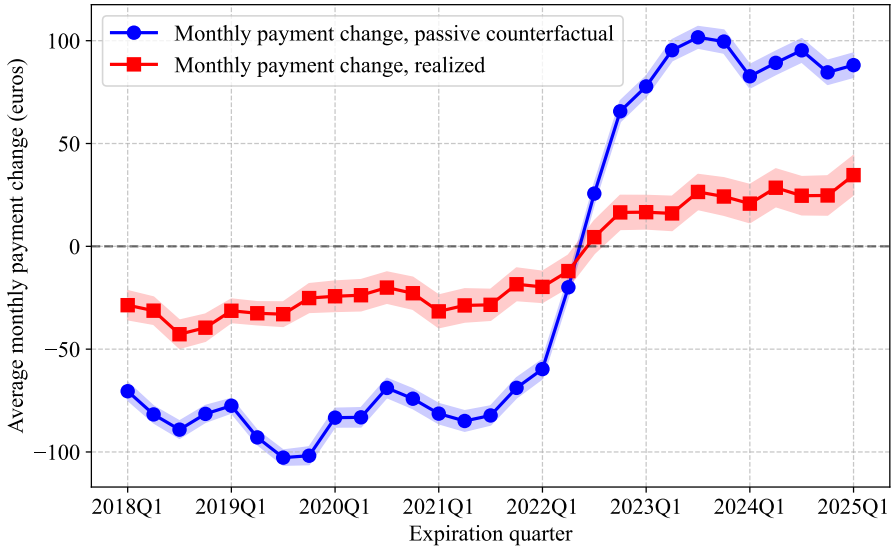


Notes: The figure shows the cumulative hazard to act of borrowers with loans that have fixation periods of 15 years or longer around the threshold when refinancing without penalty becomes available (10 years plus a six-month notice period after the loan is fully paid out to the borrower). We study the hazard by year in which the prepayment penalty ends. The sample contains 29,631 such loans. Panel A plots the share of loans that are fully repaid, either through refinancing (internal or external), or using own funds. Panel B plots the share of mortgages that refinance internally, by months since the 10-year mark. Loans can be refinanced up to four years in advance via forward contracts. While we observe the date at which a loan is refinanced internally, loan repayment is observed only annually.

Figure 5: Changes in monthly payments following internal refinancing

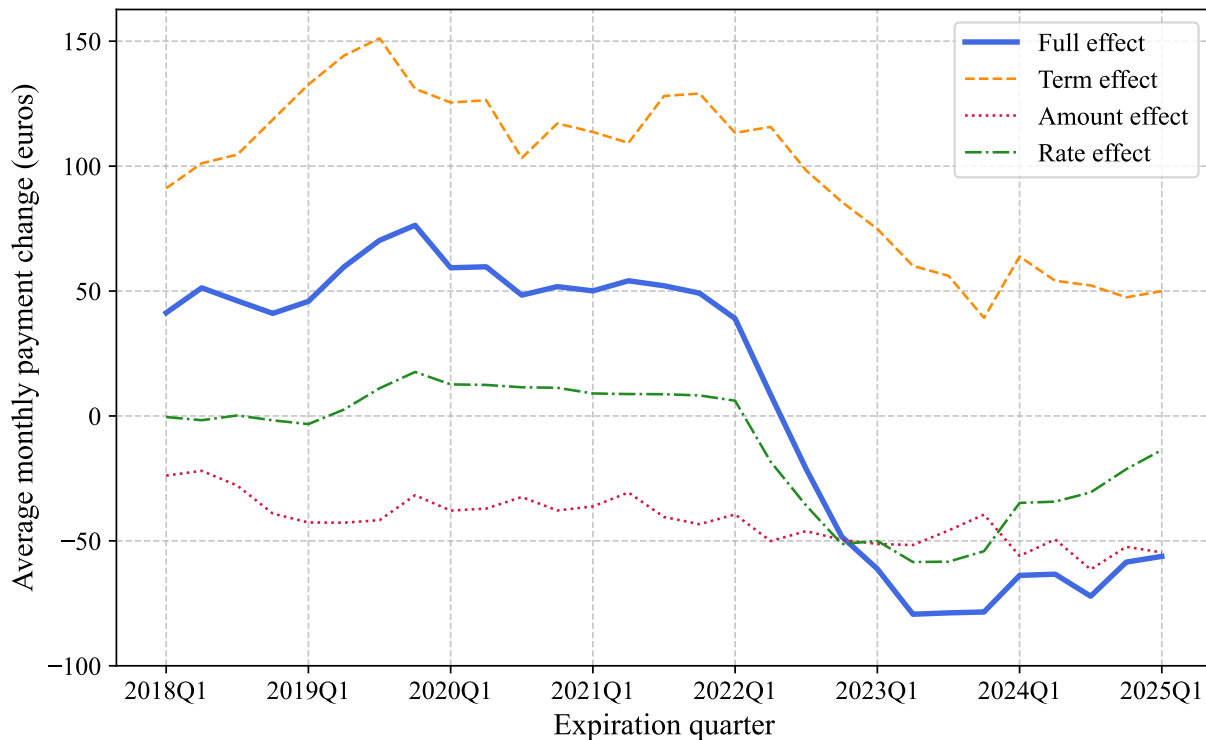


Panel B. Average actual vs. counterfactual monthly payment changes



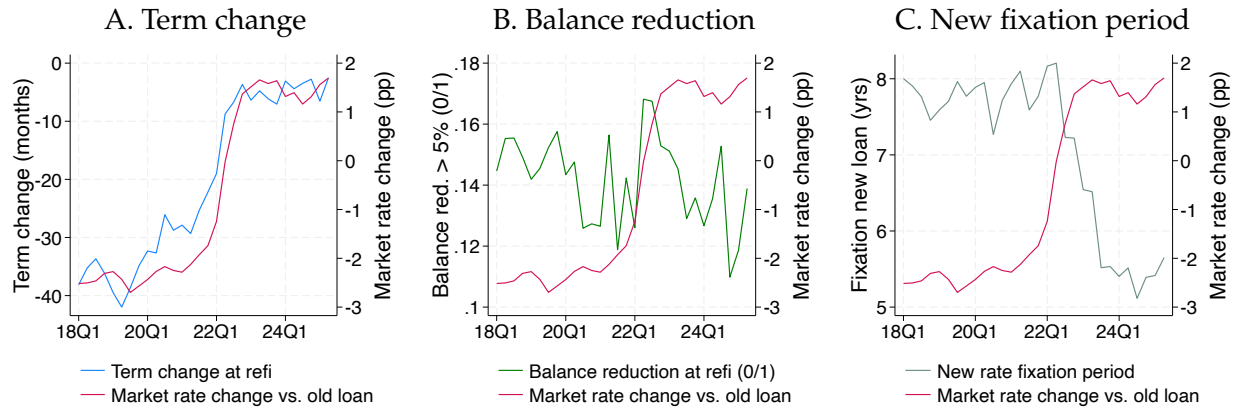
Notes: The figure shows the change in monthly payments upon internal refinancing. The sample is restricted to loans refinanced internally with fixation periods of up to 10 years and an expected residual balance of at least €10,000 at expiration. Panel A plots the distribution of the realized change in monthly payments, the difference between the new loan and the old loan, by quarter of fixation expiration. Panel B plots the average realized change in payments (red) together with the average estimated change in payments under a passive counterfactual scenario in which borrowers simply roll over the remaining debt at expiration, assuming no extra payments and no modifications to loan terms (blue). The shaded area represents the 95% confidence interval.

Figure 6: Decomposition of contributors to mitigated change in payments



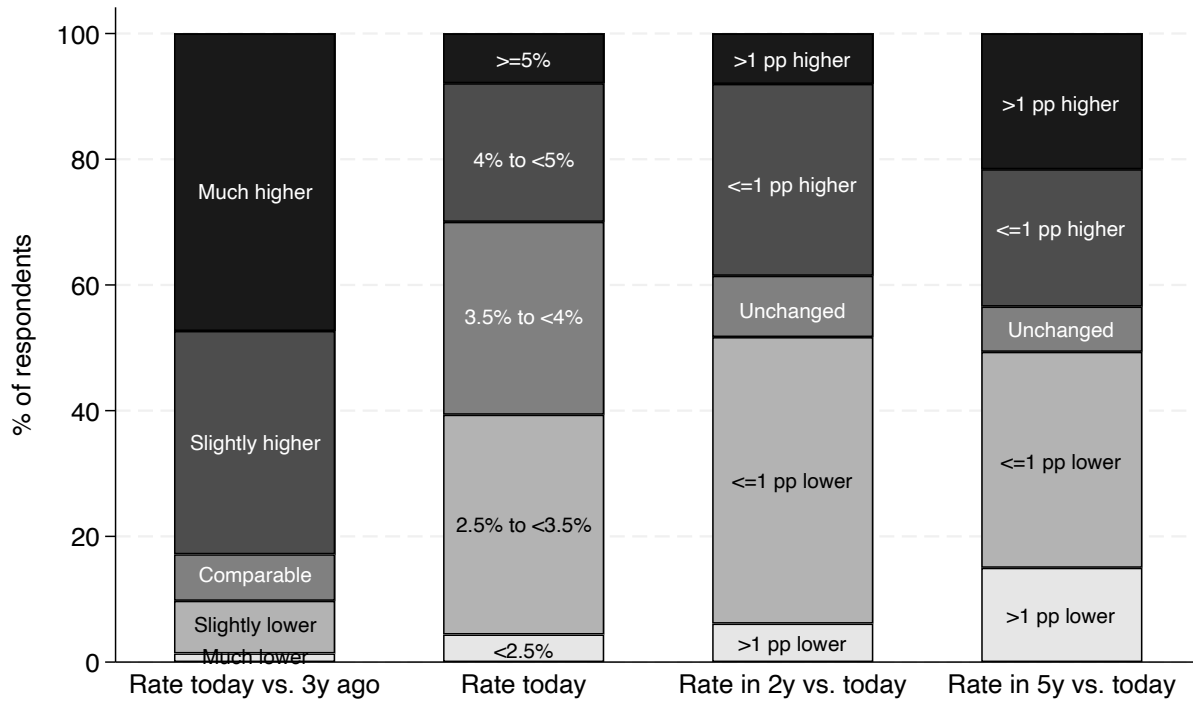
Notes: This figure shows how modifications to interest rate, loan amount, and loan term contribute in isolation to the deviation between realized and counterfactual changes in monthly payments. The thick blue line plots the average difference between actual monthly payments after refinancing and the counterfactual scenario where borrowers passively roll-over their debt at expiration of the fixed rate. The other lines plot the average effects of modification to the term of the loan, the loan amount, and the interest rate, as defined in [Equation 2](#).

Figure 7: Refinancing choices by quarter of refinancing



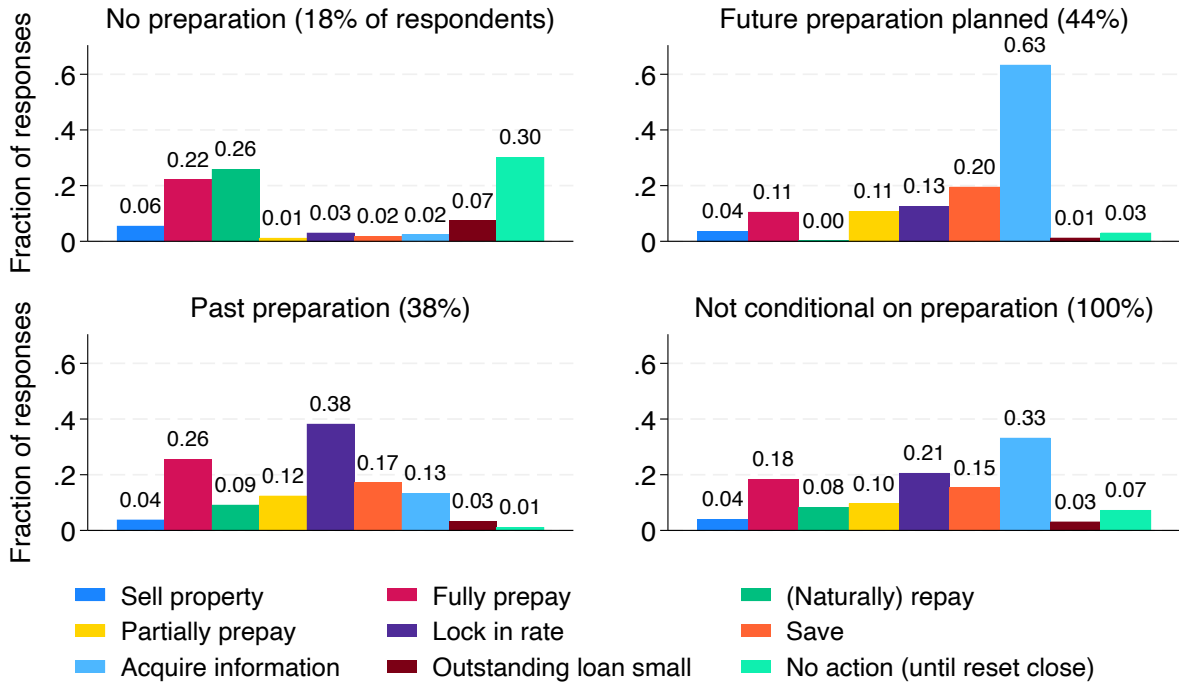
Notes: The figure plots modifications to loan characteristics upon refinancing. We restrict the sample to loans refinanced internally with fixation periods of up to 10 years and an expected residual balance of at least € 10,000 at expiration. The x-axis indicates the refinancing quarter, i.e., when the refinancing loan is originated, which may differ from the end of the fixation period. In each panel, the red line is the difference in the 10-year market rate between refinancing and origination quarter, averaged across loans refinancing in a quarter. The market rate is the average rate on loans originated by the partner bank. Panel A plots the average difference between the term on the new loan and that implied by passive refinancing absent loan modifications. Panel B plots the share of internally refinanced loans that involve a large balance reduction upon refinancing, defined as a reduction by more than 5% of the original loan amount. Panel C plots the average length of the new fixation period in years.

Figure 8: Perceptions and expectations of mortgage rates



Notes: The figure shows the distribution of beliefs about mortgage rates. The first stacked bar chart from the left plots responses to “How do you estimate the current mortgage rate in Germany compared to three years ago (i.e., in 2021)?” The remaining three charts show beliefs elicited based on the question: “How do you estimate the current rate on a new mortgage with a 10-year fixation period? And which interest rates do you expect in the future?” We ask respondents for point estimates, which we group into five buckets each for illustrative reasons. For the last two charts, we subtract the perceived current rate from the expected future rate, respectively.

Figure 9: Frequency of preparation types for prolongation, from open-text responses



Notes: The figure shows the frequency of categorized open-text explanations of whether and how mortgagors prepare for the interest-rate reset of their mortgage. We restrict the sample to respondents with at least €10,000 expected non-Bausparen debt at reset and whose responses we can classify, reducing the sample size to 887. We split the sample into three groups: categorized responses of those who state they have not prepared and will not do so are in the top-left figure, those who plan to prepare in the future are in the top-right, and those who have already prepared for a future reset are in the bottom-left. We pool across types of preparation in the bottom-right figure. Classified responses fall into the following categories: *sell property*; *fully prepay* in case of active payoff rather than through natural amortization alone; *(naturally) repay* if the borrower mentions paying off the mortgage without alluding to active repayment; *partially repay* for active repayment that reduces but not eliminates the loan balance; *lock in rate* through Bausparen or forward mortgage; *save*; *acquire information*, e.g., by comparing bank offers or seeking advice; *outstanding loan small* as a reason for not preparing; and *no action (until reset close)* to indicate no preparation, at least until being close to the rate reset. Each response can fall into more than one category.

Table 1: Summary statistics

	N	Mean	SD	P25	P50	P75
Panel A. Mortgage debt						
Original amount (€ k)	240,422	168.63	233.74	60.00	108.90	198.00
Outstanding amount (€ k)	240,422	132.42	205.27	35.74	79.08	156.00
Monthly payments (€)	240,422	895.00	1,195.42	400.00	641.55	1,022.05
Interest rate (%)	240,422	2.84	1.21	1.90	2.65	3.62
Fixation period (years)	240,422	11.64	4.41	10.00	10.08	15.00
Term (years)	240,422	19.99	9.03	12.65	19.25	26.94
Residual amount at expiration (€ k)	240,422	105.77	171.25	22.83	62.03	129.97
Residual term at expiration (years)	240,422	10.74	8.44	3.69	9.81	17.25
Ever on forward loan (0/1)	240,422	0.32	0.46	0.00	0.00	1.00
Allowed prepayments (0/1)	240,422	0.56	0.48	0.00	1.00	1.00
Outstanding home savings debt (€ k)	49,564	130.24	267.57	24.00	73.59	161.94
Panel B. Borrower characteristics						
Borrower age	239,991	51.14	11.55	42.50	51.00	58.50
Years at bank	199,486	12.72	9.55	5.00	10.50	18.00
Male (vs. female or couple) (0/1)	240,180	0.25	0.44	0.00	0.00	1.00
Couple (vs. female or male) (0/1)	240,180	0.62	0.49	0.00	1.00	1.00
Neighborhood quality (1–9)	220,572	5.91	2.44	4.00	6.00	8.00
Probability of default (%)	240,180	1.06	3.85	0.15	0.35	0.80
Deposits (€ k)	98,719	27.35	121.35	1.86	6.54	21.14
Has brokerage account (0/1)	240,422	0.07	0.25	0.00	0.00	0.00
Advisor meetings (yearly)	240,422	0.36	0.66	0.00	0.20	0.45
Simultaneously active loans	240,422	1.29	0.61	1.00	1.00	1.29

Notes: This table presents summary statistics for the main variables in the bank data at the borrower level. All variables are calculated as averages by borrower across all years in which the borrower has outstanding debt. In case of multiple active loans in a given year for the same borrower, variables expressed in euros correspond to the total across loans; for all other variables, values are constructed as loan-amount-weighted averages. In Panel A, *residual amount at expiration* and *residual term at expiration* are the projected residual balance and the term at the end of the fixed rate period, respectively, assuming no extra payments. For loans with fixation period longer than 10 years, residual amount and residual term are those expected 10 years after origination. *Allowed prepayments* is equal to one for loans that allow partial prepayments during the fixation period (mostly 5% of the original amount). *Outstanding home savings debt* is the outstanding balance on home savings contracts with immediate borrowing, net of accumulated savings, for borrowers who hold such product. In Panel B, *borrower age* is average age when the borrower is a couple. Both *neighborhood quality* (nine-point scale) and *probability of default* are from proprietary bank calculations. Probability of default is as of December 2017, or October 2024 when missing (18% of observations). *Deposits* is the total balance in checking and savings accounts at the bank, for borrowers who hold such accounts. *Has brokerage account* is equal to one if the borrower has a brokerage account with the bank. *Advisor meetings* is the average number of times a borrower meets with a bank advisor in a year.

Table 2: Refinancing outcomes over time

Expiration year	N	Internal refi (FW)	Forward	Prolong	Prolong post-offer	Prolong post-expiry	Ratio FW/prolong
2018	20,402	0.47	0.21	0.26	0.17	0.04	0.82
2019	25,634	0.45	0.23	0.22	0.14	0.03	1.05
2020	15,644	0.47	0.22	0.25	0.17	0.03	0.87
2021	14,943	0.45	0.22	0.23	0.16	0.03	0.93
2022	15,200	0.43	0.23	0.20	0.13	0.02	1.19
2023	14,898	0.39	0.24	0.15	0.11	0.02	1.56
2024	12,078	0.38	0.18	0.21	0.17	0.02	0.87
2025	2,778	0.39	0.12	0.27	0.22	0.02	0.46
Total	121,577	0.44	0.22	0.22	0.15	0.03	0.99

Notes: This table reports, by year of expiration, the distribution of refinancing outcomes. We restrict the sample to loans with a fixation period of up to 10 years and an expected residual balance of at least € 10,000 at expiration of the fixed rate period. To account for attrition due to loan extinction following property sales, we impose that loans be outstanding two years prior to expiration. Since our sample ends in May 2025, we only consider loans with expiration dates up to the end of March 2025. *Internal refi* is the fraction of loans refinanced internally; *forward* is the fraction refinanced at least six months before expiration, via a forward loan; *prolong* is the fraction refinanced less than six months before expiration, via a regular prolongation; *prolong post-offer* is the fraction refinanced internally six weeks or less before expiration (i.e., after receiving the prolongation offers) or after expiration; *prolong post-expiry* is the fraction refinanced internally after expiration; *ratio FW/prolong* reports the ratio of loans refinanced through forward loans to those refinanced through prolongation.

Table 3: Proportional hazard model of internal refinancing

	(1)	(2)	(3)	(4)	(5)
$R_t^m - R_i$	0.870*** (0.010)		0.848*** (0.007)	0.794*** (0.015)	0.862*** (0.013)
ΔR_t^m		1.262** (0.137)	1.689*** (0.115)	1.825*** (0.098)	
Controls	N	N	N	Y	Y
Vintage baseline hazard	N	N	N	Y	Y
Year-month FE	N	N	N	N	Y
Observations	3,503,760	3,503,760	3,503,760	3,502,325	3,502,325

Notes: $(R_t^m - R_i)$ is the percentage-point gap between the market rate on a 10-year mortgage originated by the partnering bank at time t and the interest rate a borrower pays on their old loan. ΔR_t^m is the 3-month change in the market rate. Table shows exponentiated coefficients; >1 means increased hazard while <1 means decreased hazard. The sample is restricted to loans with fixation periods of up to 10 years and an expected residual balance of at least €10,000 at expiration. Sample includes 130,550 loans with fixation ending between 2018 and 2027, of which 50,432 have refinanced internally. *Controls* include: expected residual loan balance at expiration (log), rate fixation period, borrower age, gender, couple status, proxy for neighborhood quality (9-point scale), indicator for missing neighborhood quality information, probability of default (deciles), whether the borrower has checking or savings accounts (0/1), an investment account (0/1), or other mortgage debt (from another regular mortgage loan or home savings contract with immediate borrowing) outstanding with the bank (0/1); the last three variables are measured four years before expiration or at the earliest available observation. *Vintage baseline hazard* means the baseline hazard is allowed to vary across origination vintages. *Year-month FE* are fixed effects capturing the calendar year and month of an observation. Standard errors (clustered at calendar month level) in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 4: Determinants of preparation for end of rate fixation and awareness of rates

<i>Dependent variable:</i>	Preparation for rate-fixation end			Any prep	Perc. rates
		No prepay	<5y fix		
<i>Specification:</i>	(1)	(2)	(3)	(4)	(5)
Perceived rate change 3y (0–4)	0.040** (0.019)	0.037* (0.020)	0.086*** (0.027)	0.002 (0.010)	
Perceived rate today (%)	0.016 (0.014)	0.020 (0.015)	0.015 (0.016)	0.014** (0.006)	
Mortgage rate in 2y vs. today (%)	0.041** (0.019)	0.041** (0.020)	0.062** (0.027)	–0.002 (0.009)	
Uncertainty about 2y f/cast (0–4)	–0.004 (0.019)	–0.010 (0.021)	–0.011 (0.030)	0.010 (0.012)	
Risk tolerance (0–4)	0.001 (0.017)	–0.009 (0.019)	–0.024 (0.027)	–0.008 (0.011)	0.021 (0.025)
Debt aversion (0–4)	0.008 (0.016)	–0.010 (0.018)	0.001 (0.025)	–0.015** (0.007)	–0.023 (0.021)
Trust in bank (0–4)	–0.024 (0.015)	–0.034** (0.016)	–0.018 (0.024)	0.009 (0.007)	–0.052** (0.022)
Follow savings plan (0–4)	0.035** (0.014)	0.032** (0.015)	0.019 (0.022)	0.014* (0.008)	0.034* (0.020)
Financial literacy (0–4)	0.007 (0.022)	0.007 (0.023)	0.000 (0.034)	–0.001 (0.012)	0.113*** (0.030)
Higher-rate effect on prices (0–4)	–0.035** (0.014)	–0.033** (0.015)	–0.041* (0.022)	–0.013 (0.008)	–0.025 (0.020)
Higher-rate effect on RE (0–4)	–0.004 (0.015)	–0.001 (0.016)	0.024 (0.024)	0.003 (0.008)	–0.046** (0.022)
Own stocks (0/1)	0.032 (0.041)	0.017 (0.043)	0.123* (0.067)	0.041* (0.023)	0.006 (0.057)
Investment property (0/1)	–0.013 (0.037)	0.006 (0.041)	0.061 (0.059)	0.030 (0.019)	0.021 (0.052)
Income net of all expenses (0–8)	0.020** (0.009)	0.016* (0.009)	0.020 (0.014)	0.005 (0.005)	0.000 (0.011)
University completed (0/1)	–0.022 (0.038)	–0.008 (0.042)	0.038 (0.058)	–0.003 (0.021)	0.084 (0.056)
Borrower age (log)	–0.057 (0.090)	–0.189** (0.096)	–0.166 (0.148)	0.013 (0.049)	–0.229* (0.123)
Probability of default (deciles)	0.000 (0.007)	0.005 (0.007)	–0.009 (0.010)	–0.007** (0.003)	0.011 (0.009)
Mortgage rate (%)	–0.009 (0.022)	–0.003 (0.023)	–0.002 (0.033)	–0.021* (0.012)	–0.071*** (0.027)
Amount outstanding (log)	–0.046* (0.025)	–0.016 (0.027)	–0.116*** (0.034)	–0.012 (0.013)	0.096*** (0.029)

continued

Table 4 continued

<i>Dependent variable:</i>	Preparation for rate-fixation end			Any prep	Perc. rates
		No prepay	<5y fix		
<i>Specification:</i>	(1)	(2)	(3)	(4)	(5)
Initial rate fixation (years)	0.000 (0.010)	-0.001 (0.010)	0.020 (0.013)	0.007 (0.005)	-0.015 (0.013)
Mortgage origination (years)	-0.006 (0.009)	-0.010 (0.009)	-0.023** (0.010)	-0.004 (0.004)	0.001 (0.013)
Remaining maturity (years)	-0.002 (0.008)	-0.001 (0.009)	-0.001 (0.018)	-0.009*** (0.004)	0.018 (0.011)
Avg. Y	0.53	0.45	0.52	0.93	3.22
Observations	857	739	358	857	1,595
R-squared	0.06	0.06	0.14	0.06	0.10

Notes: This table reports regression estimates of preparation for the end of the rate-fixation period and perceived rate changes. In Columns 1–3, the dependent variable is an indicator equal to one if respondents explain in open-ended text they have prepared or plan to prepare for the end of the fixation period by considering selling their property, partially or fully prepaying their mortgage, locking in rates early, or saving. The sample includes respondents whose open-text explanations we can classify and with expected debt at reset of at least €10,000. Column 2 further excludes respondents from the sample who write they prepare by fully prepaying. Column 3 restricts the sample to respondents whose fixation end is in less than five years. In Column 4, the dependent variable is one if the respondents prepare in any way, as written in open-ended text. In Column 5, the dependent variable is the response, on a five-point scale from “much lower” (0) to “much higher” (4), to the question “How do you estimate the current mortgage rate in Germany compared to three years ago (i.e., in 2021)?” *Higher rate effect on prices* and *on RE* are responses spanning “strong decrease” (0) to “strong increase” (4) to a question on the effect of an unexpected increase in interest rates in the economy on the inflation rate and house prices (see Question 22 in [Appendix C](#)). *Mortgage origination* captures the time passed since origination (in years) of the mortgage. *Probability of default* is from proprietary bank calculations. We control for indicators of letter reception. Robust standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 5: Effects of changes in hypothetical refinancing situation

<i>Dependent variable (0/1):</i>	Advisor	Search	Prepay	Forward	Costs ↓	Income ↑	Fix ≥10y
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
V2: 1.5% to 3.5% in 3y	-0.153*** (0.025)	-0.057*** (0.019)	-0.009 (0.024)	-0.042 (0.027)	-0.057** (0.028)	-0.071*** (0.027)	-0.011 (0.027)
V3: 3% to 3.5% in 1y	-0.047* (0.024)	-0.015 (0.019)	-0.041 (0.025)	0.100*** (0.027)	-0.008 (0.028)	-0.056** (0.027)	0.059** (0.027)
Controls	Y	Y	Y	Y	Y	Y	Y
Avg. Y V1	0.78	0.88	0.71	0.47	0.46	0.48	0.56
Observations	1,913	1,913	1,913	1,913	1,913	1,913	1,913
R-squared	0.05	0.06	0.10	0.08	0.06	0.12	0.07

Notes: The table reports estimates of regressions of actions in the context of a hypothetical refinancing situation. Other than in Column 7, the dependent variables are likelihoods of action measured on a four-point scale, covering “very unlikely,” “rather unlikely,” “rather likely,” and “very likely.” We construct an indicator for each action, equal to one if the action is rather or very likely, and zero if it is rather or very unlikely. *Advisor* refers to meeting an advisor from the current lender; *search* refers to comparing offers by different lenders; *prepay* is reducing the loan balance; *forward* means locking in rates using a forward loan; *costs* ↓ is lowering spending; *income* ↑ is increasing income; and *fix* ≥10y equals one if the borrower would choose a fixation period of 10 years or for as long as possible, and equals zero for one or five years. V2: 1.5% to 3.5% in 3y indicates vignette 2. V3: 3% to 3.5% in 1y indicates vignette 3. The effects are relative to vignette 1, which describes a rate increase from 1.5% to 3.5% in 1y. Survey *controls* include the perceived past-3y change in the mortgage rate (5-point scale); point estimates of the rate today and in 2y (1% tails winsorized); uncertainty about the rate in 2y (5-point scale); self-reported risk tolerance, debt aversion, trust in banks, and financial literacy (all on a 5-point scale); buckets of household income net of regular expenses; and indicators for university education, having non-owner-occupied property, traditional savings products (e.g., term deposit), life insurance, stocks, crypto, and completing the survey after the bank sent a reminder email. From the bank data, we control for log age, log total mortgage debt, the number of advisor meetings (past 12 months), number of online-banking logins (past 30 days), fixed effects for a proxy for neighborhood quality (9-point scale), as well as indicators for letter reception, living in East Germany, and having Bausparen or a public-subsidy loan. Robust standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 6: Letter effects observed in survey data

DV: Scale:	Letter read 0/1	Rate change Std.	Current rate 0/1	Pay change %	Prepay know Std.	Forward know Std.	Prepay hypo Std.	Forward hypo Std.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A. Indicator for each letter								
Letter 1	0.295*** (0.037)	-0.098 (0.092)	-0.008 (0.040)	0.016 (0.028)	0.142 (0.099)	0.142 (0.094)	0.175* (0.093)	-0.087 (0.092)
Letter 2	0.310*** (0.039)	-0.073 (0.095)	0.025 (0.041)	-0.014 (0.029)	0.116 (0.104)	0.142 (0.093)	0.129 (0.099)	-0.163* (0.098)
Letter 3	0.370*** (0.039)	-0.071 (0.091)	-0.050 (0.041)	0.022 (0.028)	0.211** (0.095)	0.142 (0.095)	0.097 (0.095)	0.007 (0.094)
Panel B. Indicator for any letter								
Any letter	0.326*** (0.027)	-0.081 (0.075)	-0.012 (0.034)	0.008 (0.024)	0.158* (0.085)	0.142* (0.080)	0.134* (0.078)	-0.078 (0.078)
Controls	Y	Y	Y	Y	Y	Y	Y	Y
Avg. Y CG	0.08	0.00	0.77	0.05	0.00	0.00	0.00	0.00
N	882	882	882	660	882	882	882	882
R2	0.12	0.07	0.06	0.07	0.08	0.14	0.05	0.07

Notes: This table reports estimates from regressions of survey variables on letter dummies. We standardize dependent variables that are not binary or percentage changes. *Letter read* is an indicator that the respondent states they have read a letter from the bank on increases in mortgage rates in the past two months. *Rate change* is a qualitative estimate of the level of the mortgage rate today relative to three years ago, measured on a five-point scale ranging from “much lower” to “much higher.” *Current rate* is one if the perceived current rate on a new mortgage with a 10-year fixation period in Germany is 3–4%. *Pay change* captures the expected change in monthly payments relative to the current payment, estimated by respondents who report they need to refinance. Respondents first state whether they expect payments to go up, stay roughly the same, go down, or that they do not need to refinance. Those who expect payments to go up or go down then choose from a list the expected change in euros (in buckets of 50). *Prepay know* and *forward know* are self-reported measures of awareness of prepayment options / forward loans on a four-point scale, spanning “completely unknown” to “completely known.” *Prepay hypo* is reducing the loan balance and *forward hypo* means locking in rates using a forward loan, both measured as actions on a four-point scale from “very unlikely” to “very likely” as part of the hypothetical refinancing situation. Panel A shows the effect of each letter relative to the control group. Panel B shows the effect of an indicator that pools all letter groups. We explain the letter RCT and the *controls* in [Section 5](#). *Avg. Y CG* shows the average of the dependent variable in the control group, except for the standardized variables for which the average is zero in the estimation sample. Robust standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 7: Letter effects observed in bank data

<i>DV (0/100):</i>	Meet advisor	Refi	Pre-offer refi	Meet and refi	Extra paym	Sav product
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Aggregate effects of letter intervention						
Any letter	-0.059 (0.316)	0.159 (0.117)	0.085 (0.064)	0.235*** (0.090)	0.154 (0.406)	0.054 (0.125)
Panel B. Heterogeneous effects by distance to expiration						
Any letter	-0.185 (0.355)	-0.034 (0.039)	-0.012 (0.021)	0.003 (0.022)	0.181 (0.460)	0.127 (0.158)
Until May 2025	25.055*** (2.078)	22.505*** (1.815)	2.054*** (0.646)	11.461*** (1.390)	-3.958** (1.713)	0.167 (0.580)
June 2025 - May 2029	2.677*** (0.641)	0.436*** (0.156)	0.541*** (0.140)	0.402*** (0.128)	5.004*** (0.899)	-0.126 (0.245)
Any letter × Until May 2025	4.404* (2.385)	3.546* (2.113)	2.016** (0.812)	4.513*** (1.655)	2.610 (2.004)	-0.194 (0.658)
Any letter × June 2025 - May 2029	-0.320 (0.697)	0.092 (0.162)	0.003 (0.157)	0.071 (0.139)	-0.552 (0.996)	-0.201 (0.267)
Controls	Y	Y	Y	Y	Y	Y
Avg. Y CG	11.14	1.32	0.35	0.71	12.75	1.41
Observations	47,422	47,422	47,422	47,422	34,594	47,422

Notes: This table reports estimates from regressions of post-RCT outcomes in the bank data on indicators for being in the letter treatment group. All outcome variables measure actions between November 15, 2024 (the date of letter receipt) and May 31, 2025 (end of sample). *Meet advisor* indicates whether borrowers meet with a bank advisor at least once. *Refi* is an indicator for whether borrowers refinance internally. *Pre-offer refi* indicates whether borrowers refinance internally at least six weeks before loan expiration. *Meet and refi* indicates whether a borrower meets with an advisor and refinances within seven days from the meeting. *Extra paym* indicates whether borrowers make use of their right to make extra payments during the fixation period. The sample in Column (5) is restricted to borrowers who are allowed to make such payments. *Sav product* indicates whether borrowers open a new savings account, investment account or home savings account (Bausparen). Panel B interacts the letter dummy with indicators of when borrowers face the end of fixed rate period. The omitted group is borrowers whose fixed-rate period expires after May 2029. *Avg. Y CG* shows the average of the dependent variable in the control group of non-recipients. *Controls* include: current interest rate, expected residual loan balance at expiration (log), rate fixation period, borrower age, gender, couple status, proxy for neighborhood quality (9-point scale), indicator for missing neighborhood quality information, probability of default (deciles), whether the borrower has checking or savings accounts (0/1), an investment account (0/1), or multiple mortgage loans (including both regular mortgage loans and home savings contracts with immediate borrowing) outstanding with the bank (0/1); the last four variables are measured pre-treatment in October 2024. All specifications in Panel A further include expiration-year fixed effects. Robust standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 8: Heterogeneity in propensity to read letter

<i>DV (0/1):</i>	Having read bank letter in past two months on topic of mortgage-rate increases						
	<i>Trait:</i>	Loan size	Loan reset	Loan repay	Literacy	Income	Rate change
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Letter	0.336*** (0.027)	0.341*** (0.028)	0.301*** (0.032)	0.239*** (0.037)	0.252*** (0.040)	0.191*** (0.066)	0.233*** (0.058)
Trait	-0.017 (0.017)	0.097* (0.056)	-0.015 (0.039)	-0.001 (0.037)	-0.042 (0.037)	0.005 (0.053)	-0.036 (0.048)
Letter x trait	0.070*** (0.026)	-0.021 (0.073)	0.105* (0.057)	0.182*** (0.052)	0.152*** (0.053)	0.168** (0.072)	0.133** (0.065)
Observations	881	881	877	884	884	884	884
R-squared	0.10	0.10	0.10	0.12	0.10	0.10	0.10

Notes: This table reports estimates from regressions of the propensity to read the bank letter. Specifically, the dependent variable equals one if the respondent states they have read a letter from the bank over the past two months on the topic of mortgage-rate increases, and zero otherwise (no letter received, letter received but not read, does not remember). *Letter* is one if the respondent has received any of the three letters, and zero if not. We explain the letter RCT in [Section 5.1](#). *Trait* is a loan (Columns 1–3) or borrower (Columns 4–7) characteristic we interact with *letter*: *Loan size* is the standardized current total mortgage debt. *Loan reset* is one if the end to the interest-rate fixation period is within two years. *Loan repay* equals one if the borrower has reduced the loan balance in the past using an annual partial repayment option (Sondertilgung). *Literacy* is one for self-reported financial literacy that is above the median. *Income* is one for above-median household income net of general expenses. *Rate change* is one if the respondent believes the current mortgage rate in Germany compared to three years ago (i.e., in 2021) is higher. *Current rate* is one if the perceived current rate on a new mortgage with a 10-year fixation period in Germany is 3–4%. Robust standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

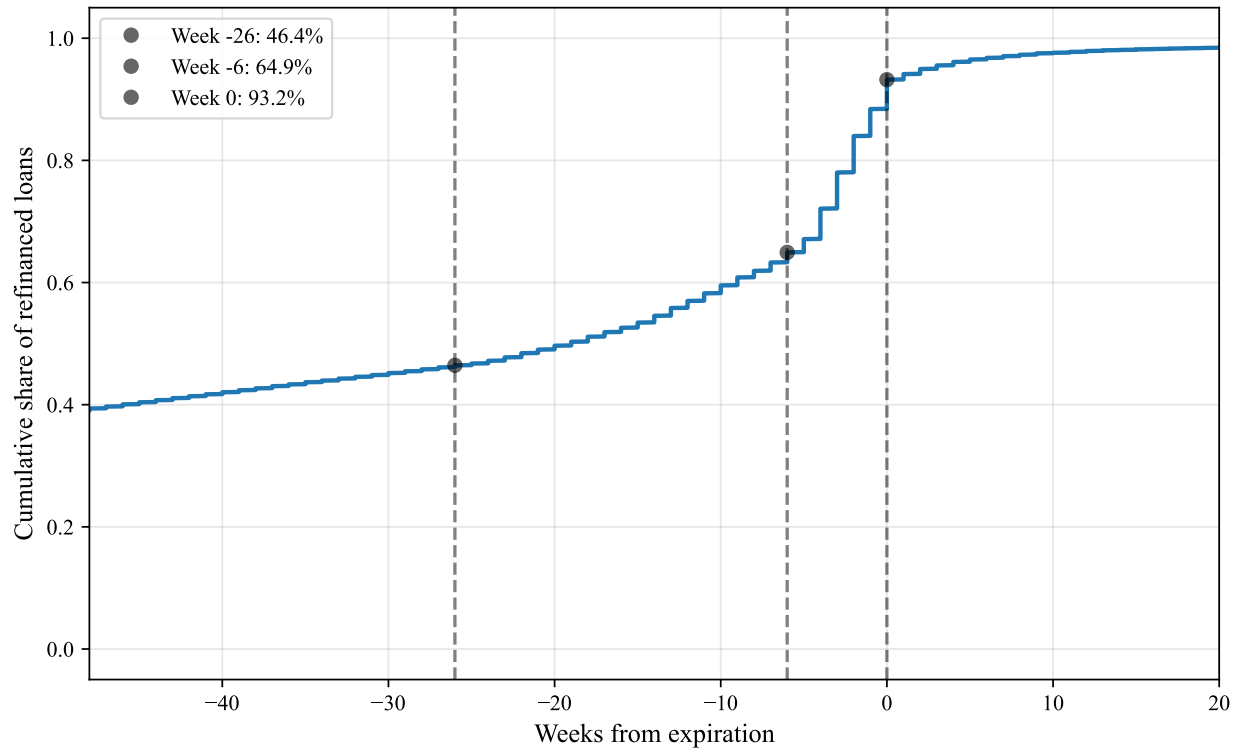
Online Appendix:
The Response of Debtors to Rate Changes

Andreas Fuster, Virginia Gianinazzi, Andreas Hackethal,
Philip Schnorpfeil, and Michael Weber

Not for Publication

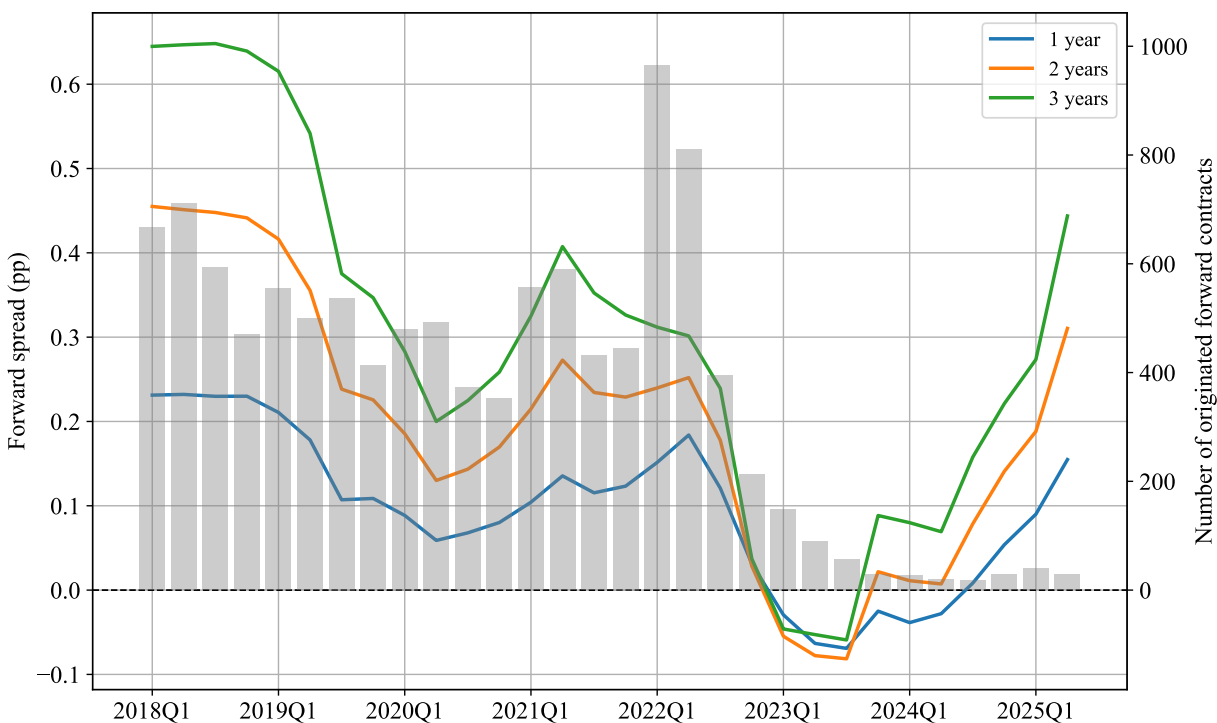
A Appendix figures and tables

Figure A.1: Timing of internal refinancing



Notes: The figure plots the cumulative share of internally refinanced loans by distance to expiration of the fixation period (in weeks). The sample applies the same restrictions as in [Table 2](#) and is limited to loans refinanced internally. *Week -26* indicates when refinancing via regular prolongation becomes possible; *week -6* indicates when the bank sends prolongation offers; *week 0* corresponds to the end of the fixation period.

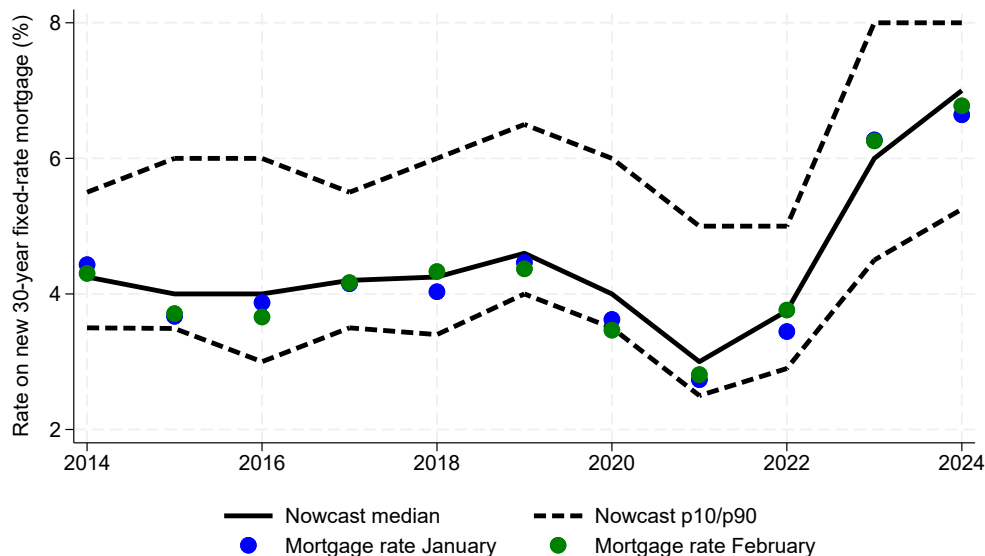
Figure A.2: Forward spread



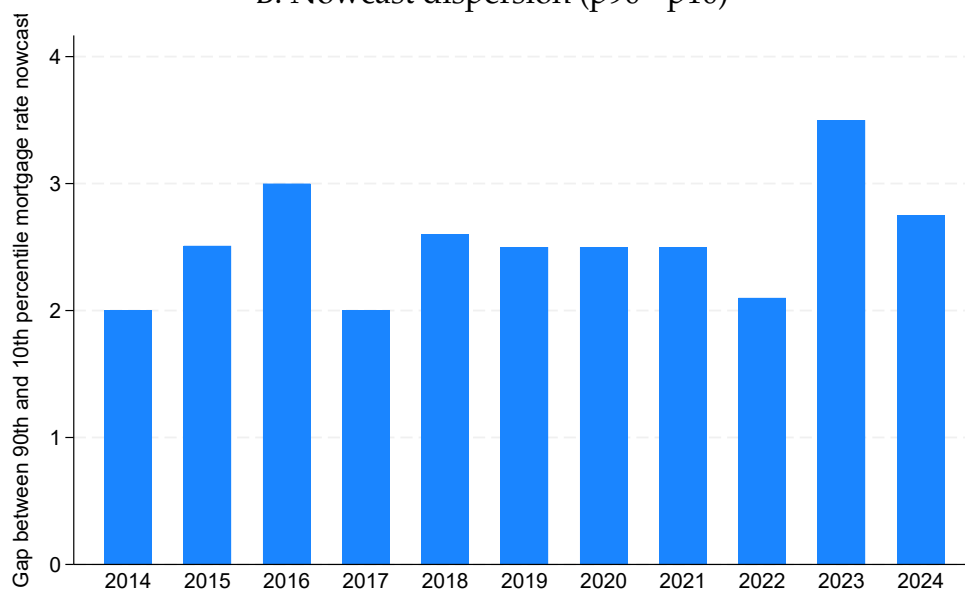
Notes: The figure plots the difference between 1-, 2-, and 3-year forward rates and the spot rates, computed from the zero-coupon 10-year covered-bond series (source: ECB). The grey bars show the number of forward loans with a 10-year fixation originated by the partner bank in each quarter.

Figure A.3: Mortgage rate awareness in the NY Fed SCE

A. Nowcasts versus actual rates

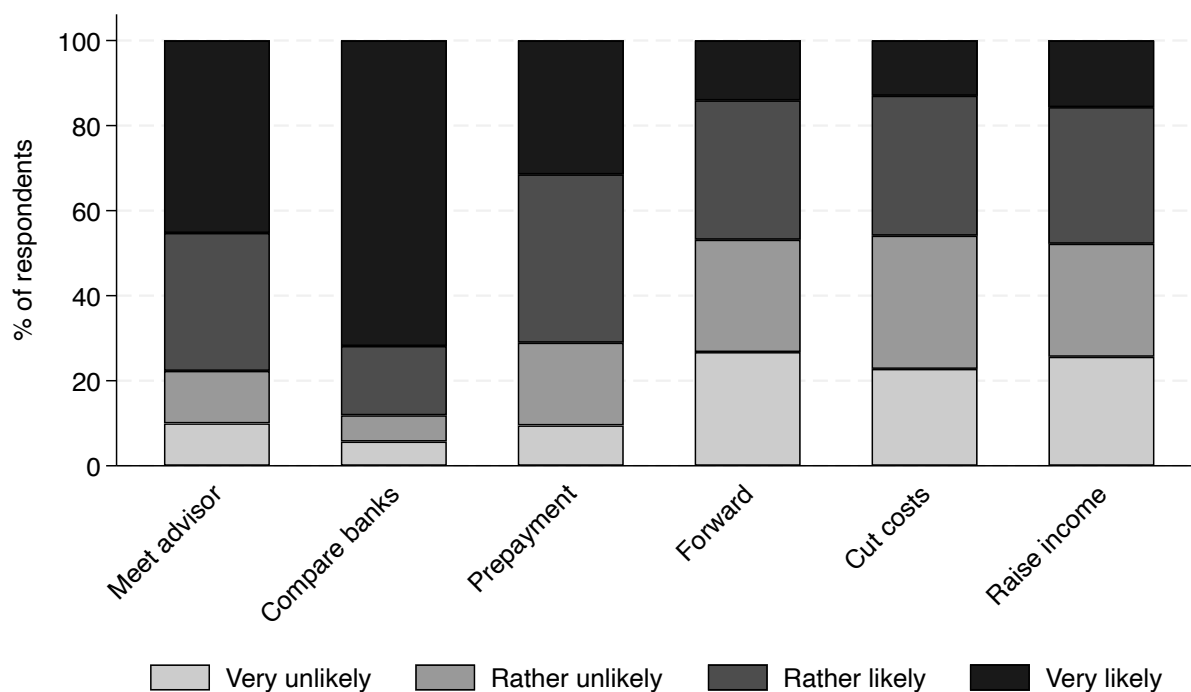


B. Nowcast dispersion (p90 - p10)



Notes: This figure shows the accuracy of mortgage rate nowcasts from the NY Fed Survey of Consumer Expectations (SCE) Housing Module, 2014–2024. The analysis is restricted to mortgagors (roughly 500–600 respondents per year) and uses the provided survey weights to compute the distribution of responses. Respondents are asked “What do you think is the average interest rate (for all borrowers) on a new 30-year fixed-rate mortgage as of today?” Panel A plots actual rates (the commonly used headline rate from the Freddie Mac PMMS, obtained via FRED) against the 10th, 50th, and 90th percentiles of respondent nowcasts. Since the survey is fielded in February, the figure shows both the mortgage rate in January and in February. Panel B shows the difference between the 90th and 10th percentiles of nowcasts for each survey year. For comparison, in our German survey from November/December 2024, this dispersion is 1.6 pp.

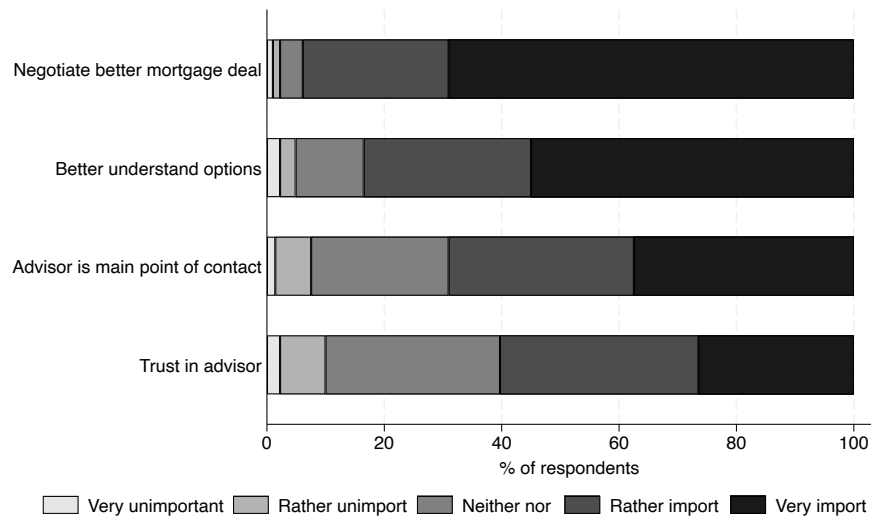
Figure A.4: Actions as part of hypothetical refinancing situation



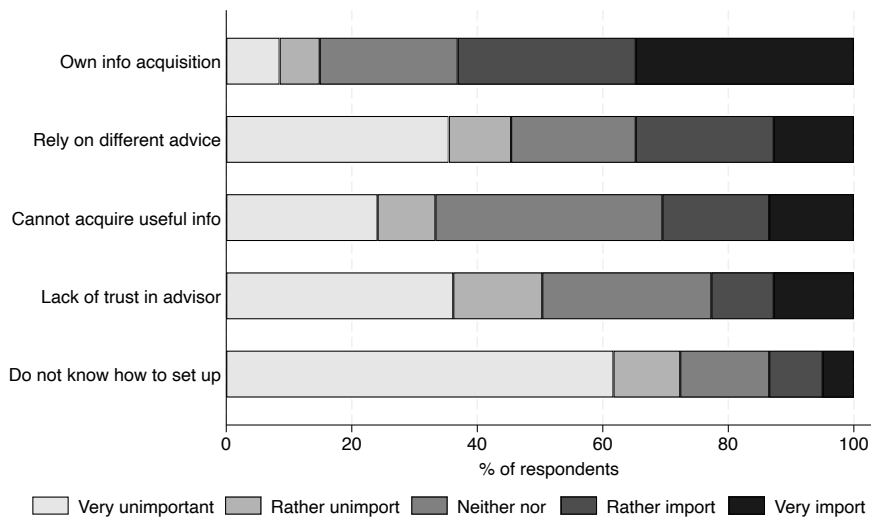
Notes: The figure shows the distribution of actions in the context of a hypothetical refinancing situation. We restrict the sample to 643 respondents who receive the baseline scenario of a hypothetical €100,000 mortgage with an interest rate of 1.5% that resets in one year to a rate of 3.5% (vignette 1). We study likelihoods of action measured on a four-point scale, covering “very unlikely,” “rather unlikely,” “rather likely,” and “very likely.” The actions are as follows. *Meet advisor* refers to meeting an advisor from the current lender; *compare banks* refers to comparing offers by different loan providers; *prepayment* is reducing the loan balance; *forward* means locking in rates using a forward loan; *cut costs* is lowering spending; and *raise income* is increasing income.

Figure A.5: Reasoning about advisor meeting as part of hypothetical refinancing situation

Panel A. Reasons of the 78% of borrowers who would likely meet advisor



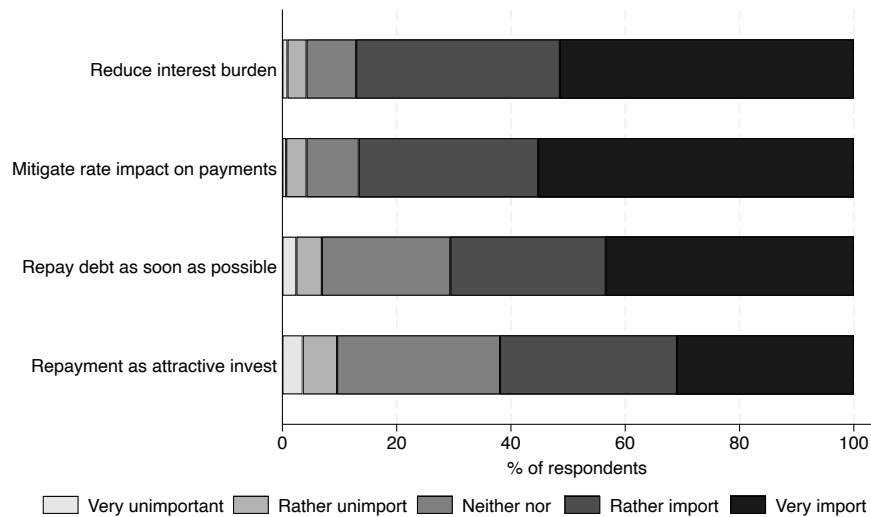
Panel B. Reasons of the 22% of borrowers who would be unlikely to meet advisor



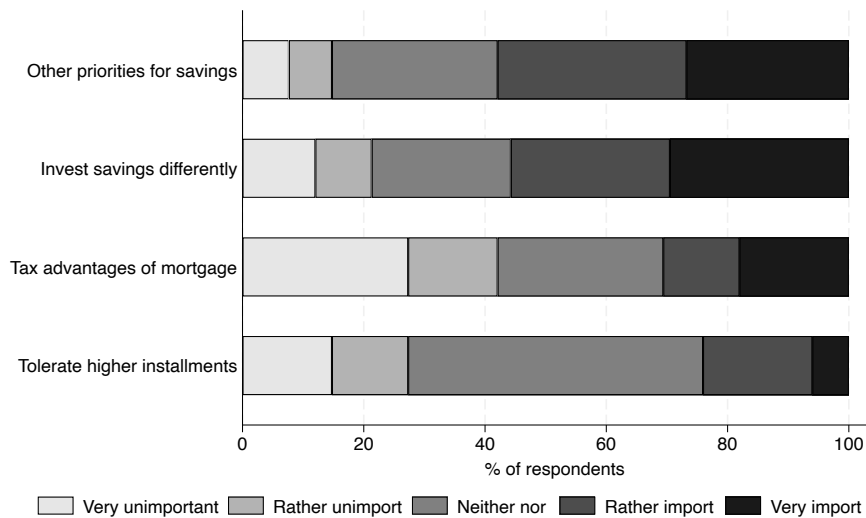
Notes: The figure shows how respondents reason about meeting an advisor from the current lender in the context of a hypothetical refinancing situation. We restrict the sample to 643 respondents who receive the baseline scenario of a hypothetical €100,000 mortgage with an interest rate of 1.5% that resets in one year to a rate of 3.5% (vignette 1). Among them, only the 78% of borrowers who state they would be “rather” or “very” likely to meet an advisor subsequently explain why (Panel A). Accordingly, only the remaining 22% of borrowers who would be “rather” or “very” unlikely to meet an advisor explain why not (Panel B). For each predefined reason, respondents choose from five answers ranging from “very unimportant” to “very important.”

Figure A.6: Reasoning about prepayment as part of hypothetical refinancing situation

Panel A. Reasons of the 71% of borrowers who would likely prepay



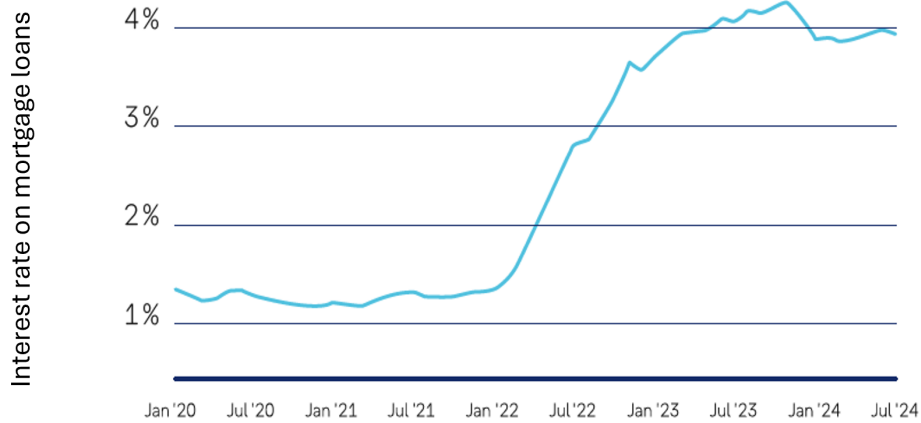
Panel B. Reasons of the 29% of borrowers who would be unlikely to prepay



Notes: The figure shows how respondents reason about prepaying a mortgage in the context of a hypothetical refinancing situation. Our definition of prepayments, which respondents read, is broad, encompassing any voluntary, extra reduction in the loan balance. We restrict the sample to 643 respondents who receive the baseline scenario of a hypothetical €100,000 mortgage with an interest rate of 1.5% that resets in one year to a rate of 3.5% (vignette 1). Among them, only the 71% of borrowers who state they would be “rather” or “very” likely prepay subsequently explain why (Panel A). Accordingly, only the remaining 29% of borrowers who would be “rather” or “very” unlikely to prepay explain why not (Panel B). For each predefined reason, respondents choose from five answers ranging from “very unimportant” to “very important.”

Figure A.7: Graphics shown in the letter

Panel A. Recent increase in mortgage rates in Germany



Source: Deutsche Bundesbank SUD 131

Panel B. Initial impact of higher mortgage rates on monthly payments

	Initial effect on interest payments	
	Annual	Monthly
Interest rate increase from 2% to 4% on a €100,000 loan amount	+ 2,000 euros	+ 167 euros

Notes: The figures show the graphics embedded in the letter. We describe the letter experiment in [Section 5.1](#) and show the letter content in [Appendix D](#). Panel A shows the development of the average effective fixed interest rate including costs on newly originated mortgages for households in Germany. The data come from Deutsche Bundesbank (SUD 131). Panel B illustrates how an increase in the interest rate by 2 pp of a €100,000 mortgage affects interest payments initially on an annualized and on a monthly basis.

Table A.1: Comparison of means across samples

<i>Data source:</i>	PHF	Partner bank		
<i>Sample:</i>		All mortgagors	Survey invited	Survey completed
Demographic characteristics				
Age (years)	50.22	50.51	48.71	48.08
University completed (0/1)	0.36			0.62
Household net income (€)	4,257.28			5,680.12
Male (vs. F or C) (0/1)		0.26	0.35	0.42
Couple (vs. F or M) (0/1)		0.60	0.47	0.41
Neighborhood quality (1–9)		5.88	5.88	6.09
Mortgage characteristics				
Original amount (€k)	203.17	182.61	195.57	211.74
Current amount (€k)	139.85	148.17	163.14	175.89
Monthly payment (€)	985.20	859.57	886.27	946.52
Fixation period (years)	11.46	11.92	12.25	12.37
Interest rate (%)	2.16	2.29	2.16	2.03
Value property >2015 (€k)	311.09	389.35	383.15	372.01
>1 collateral property (%)	9.35	4.23	4.51	6.02
Relation with partner bank				
Individual advisor (0/1)		0.27	0.34	0.43
Advisor meetings (no.)		1.72	1.89	2.05
Credit card (0/1)		0.11	0.20	0.26
Checking account (0/1)		0.41	0.58	0.61
Observations	989	190,375	40,357	1,705

Notes: This table presents summary statistics for borrowers' demographic characteristics (survey and bank data), mortgage characteristics (bank data), and their relation with the partnering bank (bank data). We report the mean of each variable for four samples: a representative German sample from the Bundesbank's Panel on Household Finances (PHF), mortgagors we observe in the bank data (see [Section 3.1](#)), those who receive a survey invitation (see [Section 4.2](#)), and those who complete the survey. We restrict the PHF sample to households with a mortgage, within which we focus on the person most knowledgeable about financial matters. As the latest PHF data are from 2021, we require an active mortgage in 2021 in the bank samples, and report mortgage characteristics from that year (we only have current data on demographics and the bank relation). Mortgage amounts and payments are sums at the borrower level; fixation period and interest rate are averages across loans of the borrower. *Household net income* is a point estimate in the PHF and the mid point of the income bucket selected by a respondent of our survey (e.g., €4,000 to 4,999). *Male* equals one if the bank customer is male rather than female (F) or a couple (C). *Original amount* refers to loan origination or, if available, refinancing. *Value property >2015* is the self-reported purchase price of a property if bought after 2015 in the PHF, and the initial value of the collateral underlying a loan initiated after 2015 in the bank samples. *>1 collateral property* indicates whether the mortgagor uses more than one property as collateral.

Table A.2: Heterogeneity in refinancing choices

<i>DV (0/1):</i>	Internal refi	Forward	Prolong	Conditional on internal refinancing		
	(1)	(2)	(3)	Prolong	Post-offer	Post-expiry
	(1)	(2)	(3)	(4)	(5)	(6)
Mortgage rate (%)	0.024*** (0.005)	0.025*** (0.005)	-0.001 (0.006)	-0.030** (0.012)	-0.011 (0.011)	-0.004 (0.003)
Residual loan balance (log)	0.049*** (0.006)	0.079*** (0.006)	-0.029*** (0.005)	-0.127*** (0.008)	-0.091*** (0.007)	0.005 (0.003)
Initial rate fixation (years)	0.000 (0.002)	0.016*** (0.003)	-0.016*** (0.003)	-0.038*** (0.007)	-0.036*** (0.007)	-0.008*** (0.002)
Borrower age	0.000 (0.000)	-0.001*** (0.000)	0.001*** (0.000)	0.002*** (0.000)	0.001** (0.000)	-0.001*** (0.000)
Male (0/1)	-0.016** (0.006)	-0.015*** (0.004)	-0.001 (0.007)	0.018** (0.009)	0.006 (0.011)	0.007* (0.004)
Couple (0/1)	-0.046*** (0.006)	0.001 (0.006)	-0.047*** (0.007)	-0.045*** (0.010)	-0.048*** (0.009)	-0.010*** (0.003)
Neighborhood quality (1–9)	-0.007*** (0.001)	-0.005*** (0.001)	-0.002*** (0.001)	0.003* (0.002)	0.001 (0.002)	-0.001 (0.001)
Probability of default (deciles)	0.008*** (0.001)	0.001 (0.000)	0.008*** (0.001)	0.006*** (0.001)	0.009*** (0.001)	0.004*** (0.001)
Checking/savings account (0/1)	0.055*** (0.006)	0.040*** (0.006)	0.015*** (0.005)	-0.024*** (0.008)	-0.015** (0.007)	0.005** (0.002)
Brokerage account (0/1)	-0.029*** (0.007)	-0.014** (0.005)	-0.015** (0.006)	-0.001 (0.009)	-0.023** (0.009)	-0.016*** (0.005)
Other mortgage debt (0/1)	0.096*** (0.009)	0.064*** (0.007)	0.031*** (0.003)	-0.032*** (0.006)	-0.025*** (0.006)	0.005 (0.004)
Expiration quarter FE	Y	Y	Y	Y	Y	Y
Avg. Y	0.44	0.22	0.22	0.50	0.35	0.07
Observations	121,499	121,499	121,499	53,178	53,178	53,178
R-squared	0.03	0.07	0.03	0.13	0.10	0.02

Notes: This table reports estimates of regressions of actual refinancing choices on loan and borrower characteristics. We restrict the sample to loans with a fixation period of up to 10 years, an expected residual balance of at least € 10,000 at expiration of the fixed rate period, and expiration between January 2018 and March 2025. Columns 4–6 restrict the sample to loans that refinance internally. *Post-offer* is equal to one for loans that refinance internally six weeks or less before expiration of the fixation period (i.e., after receiving the prolongation offers) or after expiration. *Post-expiry* is equal to one for loans refinanced internally after expiration. *Other mortgage debt* equals one if the borrower has other mortgage loans outstanding (both regular mortgage and home savings contracts). We include an indicator equal to one for loans with missing neighborhood quality information (6.6% of observations; not reported). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.3: Loan adjustments at refinancing

<i>Dependent variable:</i>	Term adjustment (months)			Balance reduction (0/100)			New fixation (years)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Market rate change (pp)	8.536*** (0.254)	7.503*** (0.296)	7.258*** (0.625)	-0.005 (0.116)	0.381*** (0.120)	0.894** (0.372)	-0.507*** (0.032)	-0.201*** (0.036)	0.615*** (0.054)
Residual loan balance (log)		-9.362*** (0.671)	-9.541*** (0.657)		6.891*** (0.285)	6.881*** (0.278)		1.094*** (0.042)	1.008*** (0.034)
Initial rate fixation (years)		-0.659*** (0.151)	-0.766*** (0.214)		0.444*** (0.115)	0.565*** (0.169)		0.461*** (0.015)	0.674*** (0.023)
Borrower age		0.697*** (0.042)	0.687*** (0.040)		-0.049** (0.020)	-0.042** (0.019)		-0.050*** (0.002)	-0.045*** (0.002)
Male (0/1)		3.898*** (0.748)	4.052*** (0.747)		-2.625*** (0.751)	-2.660*** (0.703)		-0.273*** (0.090)	-0.301*** (0.073)
Couple (0/1)		-1.515* (0.847)	-1.564* (0.832)		0.919 (0.686)	0.847 (0.644)		0.030 (0.076)	-0.023 (0.061)
Neighborhood quality (1-9)		0.664*** (0.108)	0.595*** (0.109)		-0.289*** (0.093)	-0.280*** (0.091)		-0.068*** (0.010)	-0.080*** (0.009)
Probability of default (deciles)		1.340*** (0.120)	1.388*** (0.118)		-1.158*** (0.076)	-1.167*** (0.074)		0.059*** (0.009)	0.068*** (0.008)
Checking/savings account (0/1)		4.620*** (0.672)	4.623*** (0.645)		-1.470*** (0.392)	-1.514*** (0.388)		0.007 (0.045)	0.000 (0.043)
Brokerage account (0/1)		0.530 (1.174)	0.406 (1.164)		1.308 (0.810)	1.272 (0.790)		-0.142* (0.084)	-0.206*** (0.071)
Other mortgage debt (0/1)		-2.000*** (0.644)	-2.435*** (0.655)		-2.333*** (0.384)	-2.284*** (0.379)		0.749*** (0.039)	0.697*** (0.034)
Refi-month FE	No	No	Yes	No	No	Yes	No	No	Yes
Adj. R2	0.08	0.13	0.14	-0.00	0.04	0.04	0.05	0.24	0.28
Avg. Y	-26.35	-26.35	-26.35	14.41	14.41	14.41	7.52	7.52	7.52
Observations	39,305	39,304	39,304	39,305	39,304	39,304	39,305	39,304	39,304

Notes: This table reports estimates of regressions of the form $Y_i = \beta_0 + \beta_1(Rate_t^m - Rate_i^m) + \Gamma'X_i + \mu_t + \varepsilon_i$, where the dependent variable Y_i represents a particular loan choice at the time of internal refinancing. The sample is restricted to loans with fixation periods of up to 10 years, an expected residual balance of at least €10,000 at expiration, expiration between January 2018 and March 2025, and which are refinanced internally. Our main explanatory variable of interest is $(Rate_t^m - Rate_i^m)$, the change in the market rate on a 10-year mortgage in the month of refinancing versus the month in which the borrower had taken out their original loan. The dependent variable in Columns 1–3, *term adjustment*, is the difference between the term of the new loan and the term of the passive counterfactual loan. In Columns 4–6, *balance reduction* equals 100 if the borrower makes an additional payment at refinancing that exceeds 5% of the original loan amount. In Columns 7–9, *new fixation* is the rate fixation period after refinancing. Controls (X_i): *Residual loan balance* is the natural logarithm of the expected residual loan balance at expiration assuming no extra payments. *Initial rate fixation* is the number of years the expiring interest rate was fixed for. *Borrower age* is borrower age at expiration. *Male* is equal to one if the borrower is a single male (versus female or couple). *Couple* is equal to one if the borrower is a couple (versus male or female). Controls for both *neighborhood quality* (9-point scale) and *probability of default* (deciles) are from proprietary bank calculations. *Checking/savings account* is equal to one for borrowers with a current or savings account at the bank. *Brokerage account* is equal to one for borrowers with an investment account at the bank. *Other mortgage debt* equals one if the borrower has other mortgage loans outstanding (both regular mortgage and *Bausparen with Vorfinanzierung*). The last three variables are measured four years before expiration or at the earliest available observation. *Refi-month FE* captures the year-month of loan refinancing (μ_t). Constant included but not reported. Robust standard errors are two-way clustered at the refinancing-month and borrower level and reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.4: Letter effects on propensity to participate in survey

<i>Dependent variable:</i>	Survey started (0/1)		Survey completed (0/1)	
	(1)	(2)	(3)	(4)
Panel A. Indicator for each letter				
Letter 1: baseline, all sections included	0.007 (0.005)	0.008 (0.005)	0.003 (0.004)	0.004 (0.004)
Letter 2: section on rate uncertainty omitted	0.003 (0.005)	0.003 (0.005)	0.000 (0.004)	0.000 (0.004)
Letter 3: section on payment impact omitted	0.004 (0.005)	0.004 (0.005)	0.004 (0.004)	0.004 (0.004)
Panel B. Indicator for any letter				
Any of the three letters received	0.004 (0.004)	0.005 (0.004)	0.002 (0.003)	0.003 (0.003)
Controls from bank data	N	Y	N	Y
Avg. Y control group	0.053	0.053	0.045	0.045
Observations	19,477	19,426	19,477	19,426
R-squared	0.00	0.00	0.00	0.00

Notes: This table reports estimates from regressions of indicators for starting or completing the survey on indicators for receiving the letter. The estimation sample includes mortgagors from the partner bank who are part of the letter experiment (including the control group) and receive an email invitation to participate in the survey. *Survey started* equals one if a mortgagor clicks on the survey link embedded in the email invitation. *Survey completed* is one if the mortgagor makes it to the end of the survey. Panel A shows the effect of each letter relative to the control group. Panel B is on the effect of an indicator that pools all letter groups. We explain the letter RCT in [Section 5.1](#). *Controls from bank data* include account type (female, male, couple), age, living in East Germany, log total current loan amount, and indicators for neighborhood quality and having Bausparen or a public-subsidy loan. Robust standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.5: Association between actual choices and hypothetical refinancing

<i>Dependent variable (0/1):</i>	Advisor	Search	Prepay	Forward	Costs ↓	Income ↑	Fix ≥10y
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Advisor meeting (0/1)	0.038 (0.028)	-0.009 (0.023)	0.067** (0.027)	0.017 (0.030)	0.001 (0.032)	0.011 (0.031)	-0.018 (0.031)
Any prepayment (0/1)	0.015 (0.025)	-0.002 (0.020)	0.164*** (0.023)	-0.039 (0.027)	0.009 (0.027)	-0.004 (0.027)	-0.005 (0.027)
Any forward (0/1)	0.052* (0.029)	-0.032 (0.022)	-0.037 (0.028)	0.125*** (0.031)	-0.007 (0.031)	-0.007 (0.030)	0.122*** (0.030)
Bausparen (0/1)	0.035 (0.025)	-0.029 (0.020)	-0.007 (0.026)	0.058** (0.028)	0.002 (0.029)	0.018 (0.028)	0.043 (0.028)
Fixation length (0-2)	0.006 (0.018)	-0.001 (0.014)	-0.012 (0.017)	-0.006 (0.019)	0.012 (0.019)	-0.011 (0.018)	0.063*** (0.019)
Controls	Y	Y	Y	Y	Y	Y	Y
Avg. Y V1	0.78	0.88	0.71	0.47	0.46	0.48	0.56
Observations	1,556	1,556	1,556	1,556	1,556	1,556	1,556
R-squared	0.06	0.07	0.12	0.11	0.07	0.14	0.09

Notes: The table reports estimates of regressions of actions in the context of a hypothetical refinancing situation. Other than in Column 7, the dependent variables are likelihoods of action originally measured on a four-point scale, covering “very unlikely,” “rather unlikely,” “rather likely,” and “very likely.” We construct an indicator equal to one if the action is rather or very likely, and zero if it is rather or very unlikely. *Advisor* refers to meeting an advisor from the current lender; *search* refers to comparing offers by different loan providers; *prepay* is reducing the loan balance through voluntary, extra payments; *forward* means locking in rates using a forward loan; *costs* ↓ is lowering spending; *income* ↑ is increasing income; and *fix* ≥10y equals one if the borrower would choose a fixation period of at least 10 years, and equals zero for one or five years. Explanatory variables of interest are from the bank data. *Any prepayment* indicates whether the mortgagor has made any voluntary, extra repayments in the past. *Any forward* equals one if the borrower has had a forward mortgage at some point. *Bausparen* is one if the borrower currently has a Bausparen product. *Advisor meeting* captures whether the borrower met an advisor over the past 12 months. *Fixation length* is zero if the original rate fixation period is less than 10 years, one if it is 10 to less than 15 years, and two for at least 15 years. Survey *controls* include the perceived past-3y change in the mortgage rate (5-point scale); point estimates of the rate today and in 2y (1% tails winsorized); uncertainty about the rate in 2y (5-point scale); self-reported risk tolerance, debt aversion, trust in banks, and financial literacy (all on a 5-point scale); buckets of household income net of regular expenses; and indicators for vignette assignment, university education, having non-owner-occupied property, traditional savings products (e.g., term deposit), life insurance, stocks, crypto, and completing the survey after the bank sent a reminder email. From the bank data, we control for log age, log total mortgage debt, the number of advisor meetings (past 12 months), number of online-banking logins (past 30 days), fixed effects for a proxy for neighborhood quality (9-point scale), and indicators for letter reception, living in East Germany, and having Bausparen or a public-subsidy loan. *Avg. Y V1* is the average of the dependent variable for vignette-1 respondents. Robust standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.6: Letter sample

	Control	Treat: group 1	Treat: group 2	Treat: group 3	p-value (1)=(2)	p-value (1)=(3)	p-value (1)=(4)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Months to expiration	80.03 (55.50)	80.32 (55.82)	79.67 (55.01)	80.22 (55.33)	0.69	0.62	0.79
Residual amount at expiration (€ k)	111.59 (136.38)	108.33 (133.16)	111.26 (137.57)	110.12 (137.41)	0.06*	0.85	0.41
Interest rate (%)	1.94 (0.86)	1.95 (0.86)	1.95 (0.86)	1.94 (0.86)	0.23	0.15	0.77
Monthly payments (€)	936.35 (875.94)	918.74 (868.23)	925.60 (876.03)	915.16 (867.77)	0.12	0.34	0.06*
Fixation period (years)	12.76 (4.24)	12.80 (4.29)	12.75 (4.20)	12.75 (4.23)	0.42	0.92	0.90
Allowed prepayments (0/1)	0.73 (0.45)	0.73 (0.44)	0.73 (0.45)	0.73 (0.44)	0.37	0.89	0.36
Borrower age	49.31 (11.20)	49.42 (11.27)	49.40 (11.09)	49.23 (11.11)	0.45	0.52	0.57
Male (0/1)	0.28 (0.45)	0.27 (0.45)	0.27 (0.44)	0.27 (0.44)	0.64	0.33	0.11
Couple (0/1)	0.60 (0.49)	0.60 (0.49)	0.60 (0.49)	0.61 (0.49)	0.88	0.35	0.05**
Has bank account	0.50 (0.50)	0.50 (0.50)	0.51 (0.50)	0.49 (0.50)	0.54	0.67	0.16
Met advisor (0/1)	0.19 (0.39)	0.18 (0.38)	0.19 (0.39)	0.18 (0.39)	0.07*	0.74	0.34
Observations	11,854	11,853	11,857	11,858			

Notes: This table reports means and standard deviations (in parentheses) for loan characteristics and borrower demographics in the control group (Column 1) and the three letter treatment groups (Columns 2–4). Columns 5–7 report the p-value of the t-test of equal means across treated and control groups. *Months to expiration* the remaining time (in months) until the end of the current fixation period as of the end of October 2024. *Residual balance* is the expected outstanding loan amount at expiration. *Interest rate*, *monthly payments*, *fixation period*, and *allowed prepayments* refer to the terms of the current loan. To determine exposure to the end of the fixed rate period we only consider loans with an expected remaining balance of at least €10,000 at expiration, and for which the post-expiration interest rate has not been locked in through a forward contract. For borrowers with multiple loans, classification is based on the earliest expiration date. *Has bank account* is equal to one for borrowers with a deposit account at the bank. *Meets advisor* is equal to one for borrowers who met with a bank advisor at least once in the year prior to the experiment. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

B Passive counterfactual estimation

This section explains in more detail the methodology to estimate the offered interest rate on the counterfactual passive prolongation loan and to calculate the corresponding counterfactual monthly payment.

We begin by training a random forest model to predict the interest rate on prolongation offers. The model uses as inputs (i) the month of loan origination, (ii) loan amount, (iii) loan term, (iv) length of the fixation period, and (v) the time gap between the origination of the prolongation and the expiration of the existing loan (recall that prolongations can be agreed upon as early as six months before the end of the fixation period). The training sample consists of about 39,000 observed prolongation loans.

We then use the trained model to predict counterfactual prolongation rates for internally refinanced loans, under the assumption that the borrower passively rolls over the residual debt at fixed-rate expiration. In this counterfactual, the loan characteristics are defined as follows: (i) month of origination is set to the month of expiration of the existing loan; (ii) residual loan amount is the balance at expiration assuming no extra payments; (iii) the term is either the residual term at expiration or such that the initial amortization rate of the prolongation loan matches the final amortization rate (*Tilgungssatz*) of the original loan at the end of the fixed-interest period;² (iv) the fixation period is the minimum of the fixation on the expiring loan and the residual term; and (v) the time gap between the origination of the prolongation and expiration is set to zero by definition, since the prolongation is assumed to be taken out at expiration. Finally, the counterfactual monthly payment is computed for each loan based on these characteristics and the predicted interest rate. [Table A.7](#) provides an illustrative example.

Table A.7: Example of counterfactual and actual loan choice

Loan type	Amount (€)	Term (months)	Fixation (months)	Rate (%)	Payment (€)
Old loan	155,000.00	230	120	2.45	850.00
Passive counterfactual	83,892.39	101	101	4.52	994.72
New loan	67,816.00	96	96	4.45	848.27

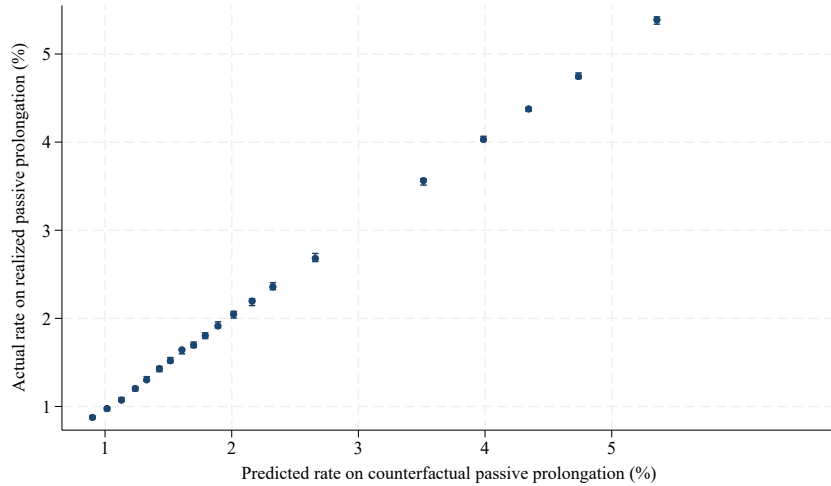
To verify the accuracy of the counterfactual, we focus on the subset of loans that appear to have passively rolled-over their debt, as for these the counterfactual should match

²This approach mirrors the bank’s actual refinancing offers. The goal of the latter is to prevent a reduction in amortization speed upon prolongation.

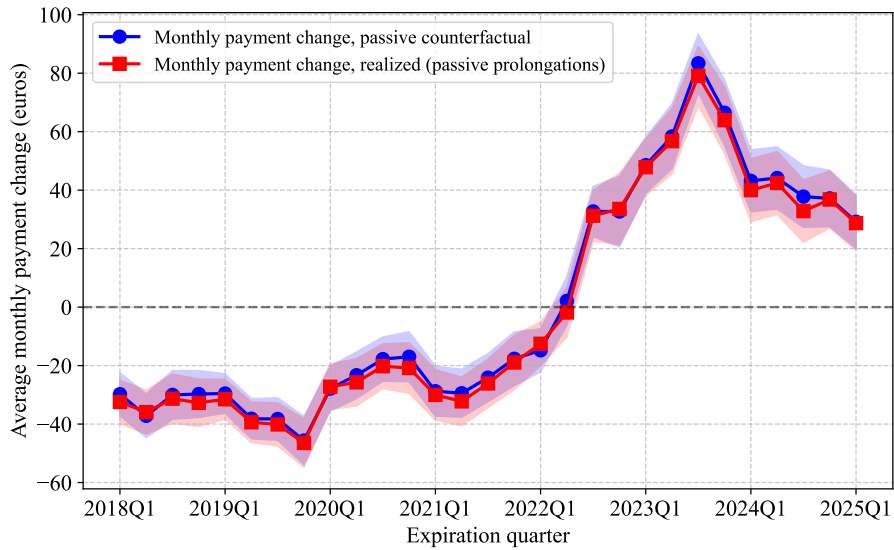
the observed prolongation. Since the bank data do not contain information on whether borrowers selected an offer sent by the bank, we infer this based on the features of the refinanced loan. Specifically, we classify a loan as a passive rollover if the new amount is within €1,000 of the expected outstanding balance, and both the term and interest-rate fixation differ by no more than three months from their respective counterfactuals. This identifies about 5,000 such prolongations. Panel A of [Figure A.8](#) shows a binned scatter plot of the realized rates plotted against bins of the predicted rate. The predicted rates align closely with the observed rates. Panel B then replicates Panel B of [Figure 5](#) on this subset, confirming that the counterfactual accurately reproduces roll-over offers.

Figure A.8: Prediction accuracy for passively rolled-over loans

Panel A. Binned scatter of predicted and actual rates



Panel B. Average actual vs. counterfactual monthly payment changes



Notes: The figure shows the accuracy of the estimated passive prolongation rates. Accuracy is evaluated using the sample of internally refinanced loans that, based on timing and loan characteristics, are likely to have been passively rolled over. Panel A presents a binned scatter plot of realized and predicted prolongation rates; the vertical bars denote 95% confidence intervals. Panel B plots the average realized change in monthly payments upon refinancing (red) together with the average estimated change under the passive counterfactual (blue); the shaded area represents the 95% confidence interval.

C Survey text

This appendix provides the survey instructions translated from German to English. We use **green text in brackets** to highlight aspects of the survey design. We show non-numerical response options using a), b), c), and so forth.

C.1 Welcome screen

Welcome to this survey by Goethe University Frankfurt!

The survey will take **around 10 minutes**. Your responses will be aggregated and only used for scientific research. If you feel unfamiliar with some of the survey topics, that is fine. We ask you to provide your best estimate. Since we are interested in your unfiltered opinion, please refrain from relying on external sources (e.g., using a Google search).

As a thank-you for completing the survey, you will receive an **Amazon voucher worth €10**. To receive the voucher, you can enter your e-mail address at the end of the survey. Your e-mail address will only be used to send you the voucher.

Please do not use the “Back” button in your browser, as this may require restarting the survey. Do you have any questions? Please contact us at **umfrage@finance.uni-frankfurt.de**.

C.2 Pre-vignette section

Q1: How do you assess the current interest rate for mortgage loans in Germany compared to three years ago (i.e., in 2021)?

- a) The current interest rate is much lower
- b) Somewhat lower
- c) Similar
- d) Somewhat higher
- e) Much higher

[Ask Q2 only if Q1 = d) or e).]

Q2: Do you think the increase in mortgage interest rates has an impact on your **household’s financial situation**?

Impact on your **current** financial situation

[Likert scale from 1 (“Very negative”) to 3 (“No impact”) to 5 (“Very positive”)]

Impact on your **expected future** financial situation

[Likert scale from 1 (“Very negative”) to 3 (“No impact”) to 5 (“Very positive”)]

[Allow non-negative values only; at most one decimal place. If a negative entry is attempted, display: “Entries cannot be negative.” Use a comma as the decimal separator.]

Q3: What do you think is the current **interest rate** of a newly originated mortgage with a 10-year fixed-rate period? And what interest rates do you expect for the future?

Please enter a positive number with at most one decimal place (use a comma as the decimal separator).

Current annual interest rate: _____ %

Annual interest rate in two years: _____ %

Annual interest rate in five years: _____ %

Q4: What do you think is the probability that **the actual mortgage interest rate in two years will be higher than (your answer in Q3 for “in two years” + 2 percentage points)?**

[Likert scale from 1 (“Very unlikely”) to 5 (“Very likely”)]

Q5: If your mortgage is not fully repaid at the end of the fixed-rate period, you will need follow-up financing. Have you already prepared for the **future follow-up financing of your loan**, or do you plan to do so?

- a) No, I have not prepared and will not do so
- b) Yes, I plan to prepare
- c) Yes, I have already prepared

[If Q5 = a), ask Q5a.]

Q5a: Please describe why you are not preparing for the future follow-up financing of your loan.

Your response is very important for our research project. Please take the time to answer carefully.

[Open-ended response field.]

[If Q5 = b), ask Q5b]

Q5b: Please describe how you plan to prepare for the future follow-up financing of your loan and what the reasons are.

Your response is very important for our research project. Please take the time to answer carefully.

[Open-ended response field]

When would you like to begin preparing?

- a) Less than six months before follow-up financing
- b) Six to 12 months before
- c) 1–2 years before
- d) 2–4 years before
- e) More than four years before
- f) No response

[If Q5 = c), ask Q5c]

Q5c: Please describe how you prepared for the future follow-up financing of your loan and what the reasons were.

Your response is very important for our research project. Please take the time to answer carefully.

[Open-ended response field]

When did you begin preparing?

- a) Less than six months before follow-up financing

- b) Six to 12 months before
- c) 1–2 years before
- d) 2–4 years before
- e) More than four years before
- f) No response

Q6: What do you expect will happen to your **monthly payment (interest + principal)** with the future follow-up financing of your loan?

Please do not take into account planned actions (e.g., Sondertilgungen, that is, voluntary extra repayments) that could affect the future payment amount.

- a) The payment will decrease
- b) The payment will remain roughly unchanged
- c) The payment will increase
- d) I will not need follow-up financing—the loan will be fully repaid

[If Q6 = a), ask Q6a]

Q6a: By how much do you expect your **monthly payment (interest + principal)** to decrease with the future follow-up financing of your loan?

- a) At least € 250 less
- b) € 200–€ 250 less
- c) € 150–€ 200 less
- d) € 100–€ 150 less
- e) € 50–€ 100 less
- f) Up to € 50 less

[If Q6 = c), ask Q6b]

Q6b: By how much do you expect your **monthly payment (interest + principal)** to increase with the future follow-up financing of your loan?

- a) Up to € 50 more
- b) € 50–€ 100 more
- c) € 100–€ 150 more
- d) € 150–€ 200 more
- e) € 200–€ 250 more
- f) At least € 250 more

Q7: In the past two months, have you received and read a **letter from your bank about increases in mortgage interest rates**?

- a) No, I have not received a letter
- b) I have received a letter but have not read it
- c) Yes, I have received a letter and read it
- d) I do not remember

C.3 Vignette section

Q8: In the next questions, we would like to learn how you would behave in the following role-play. There are no right or wrong answers; we are interested in your opinion. **Your responses are very important for our research project.** Please take your time when answering.

[Randomly assign respondents to one of the following three variants]

[Variant 1]

Role-play: Suppose the remaining balance of your mortgage is €100,000 and the **fixed-rate period ends in one year**. Your current interest rate is 1.5%. Due to changing market conditions, you expect your interest rate to **increase by two percentage points to 3.5%**, with uncertainty about the exact path.

[Variant 2]

Role-play: Suppose the remaining balance of your mortgage is €100,000 and the **fixed-rate period ends in three years**. Your current interest rate is 1.5%. Due to changing market conditions, you expect your interest rate to **increase by two percentage points to 3.5%**, with uncertainty about the exact path.

[Variant 3]

Role-play: Suppose the remaining balance of your mortgage is €100,000 and the **fixed-rate period ends in one year**. Your current interest rate is 3%. Due to changing market conditions, you expect your interest rate to **increase by 0.5 percentage points to 3.5%**, with uncertainty about the exact path.

[Place immediately below the framed text above. For all variants]

We will now ask you about several options you might consider in this situation. We will ask you in more detail about a) and c); the other options only briefly:

- a) Appointment with your bank advisor
- b) Comparing loan offers from different lenders
- c) Reducing the outstanding loan balance (prepayment or partial repayment at the end of the fixed-rate period)
- d) Fixing future loan terms today (forward loan)
- e) Building up savings
- f) Length of the fixed-rate period

[Show the respective framed text summarizing the role-play on top of question]

Q9: How likely is it that you would **schedule an appointment with an advisor at your bank** to prepare for the expected interest-rate increase?

[In Variant 2, append: “within the next 12 months”]

[Response options: “Very unlikely,” “Rather unlikely,” “Rather likely,” “Very likely”]

[If Variant 1 or 3 and Q9 = 1 or 2, ask Q9a]

Q9a: You answered that it is unlikely that you would schedule an **appointment with your bank**. How important are the following reasons for your answer?

[Randomize order of response options; for each of them, rate from 1 “Not important at all” to 5 “Very important”]

- a) I have concerns about whether I can trust the advisor’s recommendations
- b) I do not expect to obtain useful information in a meeting
- c) I am already well informed or prefer to think things through on my own
- d) I use other advisory services
- e) I do not know with whom to schedule or how to schedule an appointment

[If Variant 2 and Q9 = 1 or 2, ask Q9b]

Q9b: You answered that it is unlikely that you would schedule an **appointment with your bank** within the next 12 months. How important are the following reasons for your answer?

[Randomize order of response options; for each of them, rate from 1 “Not important at all” to 5 “Very important”]

- a) I have concerns about whether I can trust the advisor’s recommendations
- b) I do not expect to obtain useful information in a meeting
- c) I am already well informed or prefer to think things through on my own
- d) I use other advisory services
- e) I do not know with whom to schedule or how to schedule an appointment
- f) I will only deal with the follow-up financing later

[If Variant 1 or 3 and Q9 = 3 or 4, ask Q9c; if Variant 2 and Q9 = 3 or 4, ask Q9d]

Q9c/Q9d: You answered that it is likely that you would schedule an **appointment with your bank** [in Variant 2, add: “within the next 12 months”]. How important are the following reasons for your answer?

[Randomize order of response options; for each of them, rate from 1 “Not important at all” to 5 “Very important”]

- a) I trust the advice of the bank advisor
- b) I would like to better understand my situation and options
- c) I try to negotiate more attractive loan terms
- d) I use my bank advisor as my main point of contact for loan questions

Q10: Would you use **other information sources** to prepare for the expected interest-rate increase?
Multiple answers possible.

[Randomize order of response options; keep “No, I would not use other sources” at the bottom]

- a) Independent advisors/brokers
- b) Other banks
- c) Finance apps or online tools
- d) Social media (e.g., Instagram, Facebook, X/Twitter, online forums)
- e) Printed guides or traditional media (print, TV, radio)
- f) Family, friends, or coworkers

g) No, I would not use other sources [Exclusive response]

[Show the respective framed text summarizing the role-play on top of question]

Q11: How likely is it that, to prepare for the expected increase in interest rates, you would **reduce the remaining loan balance**? Such a reduction can occur through annual prepayments during the fixed-rate period (i.e., voluntary extra repayments) or partial repayments at the end of the fixed-rate period.

[Response options: 1 (“Very unlikely”), 2, 3, 4 (“Very likely”)]

[If Q11 = 1 or 2, ask Q11a]

Q11a: You answered that it is unlikely that you would **reduce the remaining loan balance**. How important are the following reasons for your answer?

[Randomize order of response options; rate each item from 1 “Not important at all” to 5 “Very important”]

- a) I have other priorities for my savings (e.g., larger purchases, emergency fund)
- b) I prefer to invest my savings elsewhere
- c) I benefit from tax advantages due to the outstanding loan
- d) I am willing to tolerate higher monthly payments due to the rate increase

[If Q11 = 3 or 4, ask Q11b]

Q11b: You answered that it is likely that you would **reduce the remaining loan balance**. How important are the following reasons for your answer?

[Randomize order of response options; rate each item from 1 “Not important at all” to 5 “Very important”]

- a) I want to reduce interest costs
- b) I want to get rid of outstanding debt quickly
- c) I view paying down the loan as an attractive “investment” of my savings
- d) I want to avoid a (large) increase in the monthly payment

[If Variant 1 or 3 and Q11 = 3 or 4, ask Q12a; if Variant 2 and Q11 = 3 or 4, ask Q12b]

Q12a/Q12b: How would you reduce the remaining loan balance?

Multiple answers possible.

- a) Prepayment(s) before the end of the fixed-rate period [In Variant 2 instead allow: “Prepayment(s) within the next 12 months” and “Prepayment(s) at later dates”]
- b) Partial repayments at the end of the fixed-rate period
- c) Don’t know [Exclusive response]

[Show the respective framed text summarizing the role-play on top of question]

Q13: We would now like to ask about **other possible actions**. There will be no follow-up questions on these actions. [In V2, add: “Please focus on actions planned within the next 12 months.”]

How likely is it that you would already fix future loan terms such as the interest rate—so that this uncertainty is eliminated? This is possible via a **forward loan**.

[Response options: 1 (“Very unlikely”) to 4 (“Very likely”)]

How likely is it that you would **spend less to save** for the future interest-rate increase?

[Response options: 1 ("Very unlikely") to 4 ("Very likely")]

How likely is it that you would try to **increase your income** to save for the future interest-rate increase?

[Response options: 1 ("Very unlikely") to 4 ("Very likely")]

How likely is it that you would **compare loan offers from different providers**?

[Response options: 1 ("Very unlikely") to 4 ("Very likely")]

For how long would you want to fix the **3.5% interest rate** after the fixed-rate period ends? Assume the remaining loan term exceeds 15 years.

- a) One year
- b) Five years
- c) Ten years
- d) As long as possible

Q14: How familiar are you with prepayments during the fixed-rate period or partial repayments at the end of the fixed-rate period as ways to reduce the remaining balance of a mortgage loan?

[Likert scale from 1 ("Completely unfamiliar") to 4 ("Very familiar")]

Q15: How familiar are you with forward loans as a way to lock in future loan terms already today?

[Likert scale from 1 ("Completely unfamiliar") to 4 ("Very familiar")]

C.4 Post-vignette section

Q16: You have now reached the final part of the survey. We would like to ask a few questions about your attitudes and your situation.

To what extent do you agree with the statements below?

[Likert scale from 1 ("Strongly disagree") to 5 ("Strongly agree")]

- a) I am willing to take risks when making financial decisions
- b) I try to get rid of outstanding debt as quickly as possible
- c) A bank's reputation plays an important role in my choice of lender
- d) My bank will only present me with a product offer if it is in my best interest
- e) Because loan interest rates have increased, I have started to save more money in recent months than before
- f) For my saving and spending decisions, I create and follow a plan or rules
- g) I have good financial knowledge

Q17: After paying your essential monthly expenses such as groceries, utilities, and debt payments, how much money typically remains for other spending or for saving?

- a) €0 (no money left)
- b) Less than €100
- c) €100 to €249
- d) €250 to €499
- e) €500 to €749
- f) €750 to €999

- g) € 1,000 to € 1,249
- h) € 1,250 to € 1,499
- i) € 1,500 or more

Q18: Do you own real estate?

Multiple answers possible.

- a) Property I live in
- b) Rental property
- c) Vacation home
- d) Other real estate
- e) I do not own any real estate [Exclusive response]

Q19: Do you own the following financial products?

Multiple answers possible.

- a) Savings accounts (e.g., instant-access or time deposits)
- b) Life insurance policies
- c) Bonds
- d) Stocks
- e) Gold or other precious metals
- f) Cryptocurrencies
- g) Consumer loans
- h) Mortgage loans
- i) I do not own any of these financial products [Exclusive response]

Q20: What is your **household's total monthly net income**?

Note: This refers to the sum of wages, salaries, income from self-employment, pensions, or retirement income, each after deduction of taxes and social security contributions. Please also include income from public benefits, rental income, housing benefits, child benefits, and any other income.

If your household's net income was irregular over the past 12 months, please provide an average over the last 12 months.

- a) Under € 1,000
- b) € 1,000 to € 1,999
- c) € 2,000 to € 2,999
- d) € 3,000 to € 3,999
- e) € 4,000 to € 4,999
- f) € 5,000 to € 5,999
- g) € 6,000 to € 7,999
- h) € 8,000 or more
- i) Prefer not to say

Q21: What is your highest educational attainment?

- a) No degree
- b) Lower secondary school certificate (Hauptschulabschluss)
- c) Intermediate secondary school certificate (Realschulabschluss)

- d) Upper secondary school leaving certificate ((Fach-)Abitur)
- e) Vocational training/apprenticeship
- f) Master craftsman/technician qualification
- g) University of applied sciences degree
- h) University degree
- i) Doctorate

Q22: What do you think is the effect of an **unexpected increase in interest rates** in the economy (by the central bank) on the following macroeconomic variables?

[Response options: "Strong decrease", "Slight decrease", "No effect", "Slight increase", "Strong increase"]

- a) Inflation rate
- b) Economic growth
- c) Stock prices
- d) House prices

Q23: How interesting did you find this survey?

[Likert scale from 1 ("Not interesting at all") to 5 ("Very interesting")]

Q24: Do you have any suggestions or feedback about our survey? Please share them here (**optional**).

[Open-ended response field]

Q25: Thank you very much for participating in our survey!

As a thank-you for your participation, you will receive an Amazon voucher worth €10. To receive the voucher, please confirm that you agree to be contacted by us for the purpose of sending the voucher, and in the next step provide your e-mail address.

- a) Yes, I would like to receive the voucher
- b) No, I do not want to receive the voucher

[If Q25 = a), show Q25a on the same screen]

Q25a: Please enter your e-mail address for sending the voucher:

[Allow continuation only if the two e-mail entries match]

Enter e-mail address:

Confirm e-mail address:

Q26: Once again, thank you very much for your participation! Your responses have been saved.

You can now close this window in your browser.

D Letter text

This section reports the text of the letter, translated from German to English. The gray text indicates which letter variants include which letter sections and the position of two figures that are also part of the letter. Our partner bank asks us not to display the original letter, so we show letter figures separately in [Figure A.7](#). The original letter also includes the bank letterhead and contact details of the respective mortgage advisor.

How do you deal with higher mortgage rates?

Dear XXXX,

— Section 1: included in variants 1,2, and 3 —

Since the beginning of 2022, market interest rates have risen significantly. Together with Goethe University Frankfurt, we investigate how borrowers deal with the increase in interest rates. As part of this study, we would like to provide you with relevant information some time before the fixed interest rate on your mortgage comes to an end.

— Figure 1: recent increase in mortgage rates —

According to the Bundesbank, the average fixed interest rate on newly originated mortgages in Germany is currently 4% per year. The interest rate at which we can continue your contract may be higher or lower than this value. This is because the final value depends primarily on market developments[.]

— Section 2: included in variants 1 and 3 —

[...] that cannot be predicted. For example, a current study by the Bundesbank (Survey on Consumer Expectations, date: August 2024) shows that 40% of Germans expect an increase in loan rates. 20% of respondents believe that lending rates will fall.

[page 1]

— Section 3: included in variants 1 and 2 —

An increase in interest rates can imply significantly higher monthly payments after the end of your fixed interest period. This example illustrates the possible impact:

— Figure 2: initial impact of higher rates on interest payments —

— Section 4: included in variants 1, 2, and 3 —

In principle, there are different options to deal with increased mortgage rates. These include:

- You reduce the loan amount by making extra payments during the fixation period and/or a (partial) prepayment. Extra payments are possible once a year, provided that the contract allows them; prepayments can be made after 10 years from origination for fixation periods of more than 10 years and at expiration of the fixation period.
- You take out a forward loan or a home savings plan. This gives you planning certainty, as future fixed interest rates and payments are predetermined.
- You build up savings to be able to make higher payments in the future.

Which option is most appropriate for your situation and best suited to you depends on various factors. We are always available for a consultation.

[Signature from a manager of the bank responsible for retail customers]

As part of the joint study with Goethe University, you may receive an email in the coming weeks inviting you to participate in an online survey run by Goethe University. We appreciate your participation and thank you in advance.

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