Asymmetric Pass-Through of Interest Rates to Rental Prices: Evidence from Rental Listings for Multi-Unit Housing *

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Abstract

I use property-level data merged with loan-level data to document three empirical facts about the relationship between interest rates and rental prices for properties financed through government-sponsored entity (GSE) commercial mortgage-backed securities (CMBS) loans. First, rental prices rise when interest rates increase. Second, rental prices do not decline when interest rates fall. Third, this asymmetric pass-through of interest rates primarily occurs among properties that are liquidity constrained due to debt-service coverage ratios (DSCR). These empirical facts cannot be rationalized with standard neoclassical models that assume pricing decisions are unaffected by fixed costs like mortgage payments. I propose an alternative model that rationalizes the pass-through of interest rates by incorporating liquidity constraints imposed by DSCR, which can create asymmetric responses to changes in interest rates.

Keywords: Monetary Policy, GSE CMBS Loan, Rental Price, Financial Friction
JEL codes: G14, R21, R31

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1 Introduction

The surge in inflation in the aftermath of the COVID-19 pandemic, followed by aggressive monetary policy tightening, brought renewed attention to the transmission mechanisms of interest rate changes. While much of the focus has been on how higher interest rates curb aggregate demand by discouraging credit and consumption (e.g., Smets and Wouters (2007)), less is known about how monetary policy affects rental prices, a key component of household budgets and inflation dynamics. Rental prices account for 32% of the Consumer Price Index (CPI), making them central to inflation measurement and policy discussions (Adams et al. (2023)). This paper provides novel evidence on the impact of monetary policy on rental markets, shedding light on an important but understudied channel through which monetary policy transmits to the economy.

In this paper, I study how monetary policy can impact renters through a novel mechanism: the pass-through of financing costs by landlords with liquidity constraints. Estimating the pass-through of interest rates to rental prices is challenging due to the interaction between interest rates, rental prices, and broader macroeconomic and regional factors. Even when examining within-property variations over time, annual rent changes are influenced by macroeconomic variables that correlate with interest rate fluctuations. For example, an increase in interest rates raises mortgage costs, which can deter potential first-time homebuyers, pushing them into the rental market and subsequently driving up rental prices. Consequently, establishing causal evidence using aggregate-level data or analyzing the effects of financing costs on annual rent changes remains difficult.

I address these challenges by examining the direct pass-through of financing costs at the monthly level using linkages between property-level rental listings and loans issued by commercial mortgage backed securities (CMBS). Since adjusted rate mortgages (ARMs) in my sample are primarily indexed to one-month LIBOR rates, I can observe monthly changes in interest rates. My identification strategy takes advantage of two sources of cross-sectional variation in interest rate changes across properties. First, there is variation in the amount of time between current and previous listings for the same property. Holding the current month fixed, there is cross-sectional variation in interest rate changes among ARMs due to differences in the timing of prior listings for the same property. New rental prices are posted whenever rental units become vacant in the property, which creates variation in interest rate changes that property owners face when setting rental prices. Second, I compare ARM and fixed rate mortgage (FRM) properties within the same ZIP code and month to estimate relative price changes of ARM properties in response to one-month changes in interest rates. The identifying assumption is that, conditional on fixed effects, changes in interest rates are uncorrelated with time-varying, unobserved property-level determinants of rental prices within a one-month period.

I find that a one percentage point increase in interest rates is associated with a 5.5% increase in rental prices during contractionary monetary policy regimes, as landlords pass higher financing costs onto renters by raising rents. In contrast, landlords do not pass through reductions in financing costs under expansionary monetary policy. This asymmetric pass-through is primarily driven by liquidity-constrained landlords, whose debt-service coverage ratio (DSCR)—the ratio of net operating income to mortgage payments—is below 1.25. This DSCR threshold is a critical criterion for loan assessment at origination, enforced by lenders. [1]

These empirical facts cannot be rationalized with standard neoclassical models that assume pricing decisions are unaffected by fixed costs like mortgage payments. I propose an alternative partial equilibrium model that rationalizes the pass-through of interest rates by incorporating liquidity constraints imposed on landlords through the DSCR, which can create asymmetric responses to changes in interest rates. Neoclassical models cannot offer theoretical justification for the pass-through of interest rates since mortgage payments are fixed and independent of the number of units supplied by landlords, implying that they cannot be marginal costs that shape optimal pricing decisions. The alternative model that I propose demonstrates that the DSCR constraint can be a key mechanism that explains why landlords pass on mortgage costs to renters in an asymmetric fashion. When interest rates rise, the DSCR ratio approaches the constraint threshold, inducing landlords to increase rental prices. Conversely, when interest rates fall, the DSCR ratio moves away from the threshold. Since landlords are no longer liquidity-constrained, they do not pass-on falling mortgage costs to renters. The model rationalizes how changes in interest rates, which are changes in the fixed costs of landlords, can lead to asymmetric pass-through when landlords face financial constraints.

Related Literature This paper contributes to the literature on mechanisms for the pass-through of interest rates in the mortgage market. Much of the existing research examines how residential mortgage borrowers respond to changes in mortgage payments, particularly through adjustable-rate resets and refinancing options. These studies primarily highlight borrowers' consumption and borrowing adjustments to interest rate changes (see Maggio, Kermani, and Palmer (2020); Maggio et al. (2017); Berger et al. (2021)) and study the distributional effects of monetary policy through refinancing (e.g., Beraja et al.

[1] The DSCR threshold typically ranges from 1.25 to 1.5, depending on loan structure factors such as interest-only periods and loan-to-value (LTV) ratios.

(2018); Wong (2019); Cloyne, Ferreira, and Surico (2019)). However, limited research has directly addressed the impact of monetary policy on rental markets.(Dias and Duarte (2019); Cloyne, Ferreira, and Surico (2019)). In the context of commercial mortgages, recent studies have begun to explore how monetary policy can influence rental prices for multifamily housing. Notably, Hughes (2022) and Kim (2023) study the influence of financial shocks, particularly those arising from the exogenous timing of the end of interest-only period and refinances after prepayment lock expiration. This paper extends the literature by examining (1) the short-term pass-through of interest rates to rental prices for ARM borrowers, and (2) asymmetric responses to expansionary and contractionary monetary policy regimes.

This paper also contributes to the literature on asymmetric pass-through of costs in various markets, including exchange rates (Gopinath, Itskhoki, and Rigobon (2010); Kreinin (1977)) and retail/energy (Borenstein, Cameron, and Gilbert (1997); Peltzman (2000); Noel (2009)). This study adds on to this body of work by documenting the asymmetric pass-through of interest rates in the rental market, which holds important policy implications for regulating DSCR standards and setting interest rates.

A related body of literature examines how financing costs and financial frictions, particularly liquidity constraints, shape firms' decisions (Myers and Majluf (1984); Fazzari, Hubbard, and Petersen (1988); Whited (1992); Baker and Wurgler (2002); Gomes (2001)). Firms respond to changes in the cost of capital by adjusting their investment levels. In the rental market, however, landlords cannot adjust borrowing levels in response to changes in interest rates. Since mortgage payments are fixed costs for landlords, it is challenging to offer theoretical justification for the pass-through of financing costs to pricing decisions. The novelty of my model is that it offers this theoretical justification through liquidity constraints on landlords, which aligns with prior work on landlords' cost-shock pass-through by Hughes (2022).

The results from my model further clarify this mechanism: in the non-DSCR binding region, the price elasticity of interest rate changes is effectively zero. However, as interest rates increase, pushing the DSCR ratio down towards the constraint, the price elasticity jumps to a positive level, indicating a positive pass-through of rising mortgage costs to rents. Moreover, this model captures the observed asymmetry of pass-through when the DSCR ratio fluctuates around the constraint boundary—suggesting that landlords respond sharply to rising interest rates but are unresponsive when costs fall, as they move away from the liquidity constraint.

The rest of the paper is organized as follows: Section 2 provides background information and describtes the data. Section 3 outlines empirical designs and key empirical facts about landlord's pricing behavior. Section 4 presents the main channel of the empirical findings in Section 3. Section 5 introduces the landlord partial equilibrium model that rationalizes the empirical findings and simulation results. Section 6 concludes.

2 Data & Background

2.1 DSCR in CMBS Underwriting

CMBS loans are secured by commercial real estate properties, which are pooled and sold to investors as bonds or securities. Unlike residential mortgages, where the borrower is the income-generating subject and assessments are based on the borrower's credit history and payment-to-income (PTI) ratios, CMBS loans focus on the property itself as the income-generating asset. Consequently, the underwriting process emphasizes metrics like the DSCR, which measures the property's ability to cover debt obligations through its generated income.

There are two institutional reasons why landlords may have strong incentives to maintain DSCR ratios near the thresholds. First, future refinancing opportunities create a compelling reason for landlords to keep DSCR ratios close to the threshold at loan origination, anticipating the requirements for potential refinancing. Unlike FRM contracts in the commercial mortgage market, which impose significant prepayment penalties (commonly referred to as "call protection" to deter early repayment), ARM borrowers face comparatively lenient prepayment penalties. This greater flexibility allows ARM borrowers to refinance earlier in the loan term. As a result, ARM borrowers remain subject to the same DSCR assessment criteria when refinancing, further incentivizing them to manage DSCR ratios effectively.

Despite the lack of direct evidence of DSCR covenants in loan contracts explicitly requiring landlords to maintain a certain DSCR threshold, DSCR ratios below the thresholds are subject to heightened scrutiny by master servicers, who oversee mortgage loan portfolios on behalf of investors. For instance, *Freddie Mac's Multifamily Performance* document indicates that properties with DSCRs below 1.10x are placed on a "watchlist" for closer monitoring,[2] which may impose reputational costs on landlords, further incentivizing them to maintain DSCR ratios near the thresholds.

[2] This can be inferred from FreddieMac (2024b), Freddie Mac's Multifamily Performance document. Additionally, the FreddieMac (2024a), Freddie Mac's Securitized Deals document, explicitly classifies loans with DSCRs below 1.10x as "High Priority," enabling investors to request additional performance information from Freddie Mac. These requests are treated with urgency, signaling elevated risk, and responses are expected within a specified timeframe.

2.2 The Role of GSEs in the CMBS Market

Since the financial crisis, government-sponsored enterprises (GSEs) have emerged as some of the largest originators of CMBS loans, specifically referred to as Agency CMBS loans, as illustrated in Figure 1b. This market, once dominated by conduit lenders, has shifted as GSEs expanded their role in multifamily housing finance. Agency CMBS loans have distinct characteristics: (1) only multifamily housings are eligible for approval[3], and (2) credit risks are guaranteed by the GSEs, which enforce strict criteria for loan approval using LTV ratios and DSCRs. Notably, the volume of adjustable-rate mortgage (ARM) loans has grown substantially since 2015, reaching nearly 40% of the GSEs' total loan originations by 2020 (Figure 1). Over 85% of these ARM loans were originated by GSEs, underscoring their significant presence in this segment.

2.3 Main Data Sources

To study short-term property-level rental price responses to changes in mortgage costs, I merge property-level asking price data with loan-level data on Agency CMBS loans. I focus exclusively on Agency CMBS loans because: (1) they are collateralized solely by multifamily properties, reducing unobservable heterogeneity across different property types within CMBS, and (2) most ARMs were originated by GSEs, helping to eliminate unobservable differences between loans with versus without a credit risk guarantee

Loan-Level & Property-Level Data The TREPP dataset includes both loan-level and associated property-level characteristics. Monthly loan characteristics, particularly interest rates, are crucial for identifying within-month changes in interest rates while controlling for time-varying features. Using TREPP's unique identifier, I extract the associated property-level characteristics, including the latitude, longitude, and address of each property.

Property-level rental price Obtaining granular rental price data with sufficient geographic coverage is challenging. Private sources, such as StreetEasy (a subsidiary of Zillow), track unit-level transaction prices but are limited to New York City, while publicly available data often lacks sufficient detail—for example, the Zillow Observed Rent Index only provides data at the ZIP code level. To address this, I use property-level listing

[3] "Freddie Mac Multifamily's approach to securitizing mortgage loans backed by multifamily apartment properties nationwide enables us to help keep rental housing affordable, while attracting private capital to the market and minimizing U.S. taxpayers' exposure to credit risk."(FreddieMac (2015))

data on asking rents from the Multiple Listing Service (MLS), which offers nationwide coverage from 2010 onwards. The data is a weekly-level snapshots of asking rents for units within a property, which is collapsed by month and unit. Both TREPP and MLS contain longitude and latitude information, though they are not precise. To address this, I project properties from both TREPP and MLS onto a unified ArcGIS system using their recorded addresses to extract accurate geocodes, which I then use to merge the datasets by property and month.

Definition of Monetary Policy Regime To analyze the asymmetric responses of landlords under distinct monetary policy regimes, I define periods of rate hikes and rate declines based on Figure 2. Rate-hiking periods are classified as January 2018 to April 2019 and March 2022 to January 2023, while the rate-declining period is defined as May 2019 to February 2020. The properties under adjustable-rate mortgage (ARM) contracts in my sample are predominantly indexed to the 1-month LIBOR, which adjusts monthly in response to changes in the federal funds rate. Consequently, monthly changes in the federal funds rate align closely with changes in 1-month LIBOR rates, directly impacting ARM rates. Given that ARM credit volumes began to grow significantly only after 2015, I restrict the sample period to ensure a sufficiently large and balanced representation of both ARM and fixed-rate mortgage (FRM) contracts. Figure 2 illustrates that the median interest rates of ARMs closely track movements in the federal funds rate.

3 Asymmetry of Interest Rate Pass-through

3.1 Empirical Design

To identify how adjustable rate mortgage (ARM) landlords respond to interest rate changes in different monetary policy regimes, I employ two main specifications. The first strategy leverages cross-sectional variations in interest rate changes specifically among ARM borrowers, whose rates are pegged to the one-month LIBOR. As illustrated in Figure 4, these variations arise from differences in the time gap between the current listing month and the previous listing month. Since individual landlords or properties do not consistently list their units every month, these time gaps vary across properties. Fixing the current month, this variation in listing intervals leads to differences in the magnitude of interest rate changes experienced by each ARM landlord. This cross-sectional variation provides a basis for identifying how landlords adjust their pricing in response to changes in interest rates in the short-run. Additionally, I assume that listing occurs whenever a unit becomes vacant, making the timing of listings effectively random.

To examine the direct one-month effect of interest rate changes on landlords' price-setting behavior, as visualized in Figure 5, I include both ARM and FRM properties located within the same zip code and month. This approach addresses a potential limitation of the first specification, where properties with different gaps between current and previous listings might also be exposed to varying macroeconomic factors that could influence price changes. Since most ARM properties in the sample are pegged to the one-month LIBOR, there is little cross-sectional variation in interest rate changes within the same month, preventing identification of the pass-through effect solely among ARM properties. By including FRM properties, I am able to capture the direct effect of interest rate changes on rental prices, while controlling for time and region specific factors that affect both FRM and ARM properties equally.

3.2 N-Month Variations

In Figure 3, I provide graphical evidence of the differential responses of prices to changes in interest rates across two distinct monetary policy regimes. The figure presents a binned scatter plot showing the relationship between property-level price changes and mortgage rate deltas, after controlling for current month fixed effects. The plot reveals a clear kink in the relationship: during the hiking period, prices increase in response to rising interest rates, whereas during the federal funds rate declining period, there is no discernible relationship between price changes and interest rates.

$$\Delta P_{i,t,t-k(i)} = \beta \Delta r_{i,t,t-k(i)} + \alpha_{i(j)} + \alpha_{g(i),t} + \Gamma X_{i,t} + \epsilon_{i,t} \tag{1}$$

The variable $\Delta P_{i,t,t-k(i)}$ represents log change in rental price for property i between month t and month $t - k(i)$, capturing how the rental price of a specific property evolves over a given time gap. To ensure comparability across properties of varying sizes, the listing prices are normalized by square footage, presenting them as price per square foot. The variable $\Delta r_{i,t,t-k(i)}$ represents the change in the interest rate, expressed in percentage points (p.p.), of the loan associated with property i (denoted $i(j)$, where j indexes the loan) over the same interval. The term $X_{j(i),t}$ refers to the characteristics of loan j, which is collateralized by property i at time t, and includes factors such as LTV, DSCR, remaining terms, construction year, and renovation flag. To control for unobserved, time-invariant characteristics specific to each property-loan pair, including differences in price levels, I include a property-loan fixed effect, $\alpha_{i(j)}$. Additionally, $\alpha_{g(i),t}$ is a fixed effect for the property's geographic location, crossed with the current listing month, accounting for unobserved, time-varying factors related to the property's location and timing of the listing. By fixing the current month t and zip code g, this specification exploits cross-sectional variations in changes in interest rates and prices across properties located within same zipcodes.

Table 2 presents the results. Columns 1 and 3 report the pass-through effects during a contractionary monetary policy regime, examining the two contract types and ARM properties exclusively, respectively. Columns 2 and 4 show the magnitude of interest rate pass-through during periods of federal funds rate declines. A one-percentage-point increase in the interest rate is associated with a 6.6% increase in asking prices for ARM properties (Column 2), whereas no pass-through effect is observed during the declining period (Column 3). On average, the interest rate changes by 22 basis points on average during interest rate hiking period in my sample. Translated to a monthly effect, this corresponds to a 1.65% increase in asking prices. When FRM properties are included as the baseline group, a one-percentage-point increase in the interest rate corresponds to a 3.7% increase in asking prices (Column 1), with no observed pass-through of rate declines to asking prices (Column 4).

3.3 One-Month Variation

$$\Delta P_{i,(t_0,t_1)} = \beta \Delta r_{i,(t_0,t_1)} + \alpha_{i(j)} + \alpha_{g(i),(t_0,t_1)} + \Gamma X_{i,t_1} + \epsilon_{i,(t_0,t_1)} \tag{2}$$

This baseline regression specification models the relationship between changes in rental prices and interest rates for properties over a one-month period using both ARM and FRM properties. The dependent variable, $\Delta Y_{i,(t_0,t_1)}$, represents the change in rental price for property i between the initial month t_0 and the subsequent month t_1. The key explanatory variable, $\Delta r_{i,(t_0,t_1)}$, measures the change in the interest rate of the loan associated with property i, expressed in percentage points. Property-loan fixed effects $\alpha_{i(j)}$ control time-invariant characteristics (e.g., different pricing behavior) specific to each property-loan pairing. The variable X_{i,t_1} represents a set of control characteristics for property i at time t_1 as in specification 1, accounting for time-varying loan characteristics not captured by property fixed effects. Lastly, I include zipcode-month fixed effects, $\alpha_{g(i),t_0,t_1}$, to control for time-geography trends between the previous and current listing month. This helps account for any local market or seasonal influences on rental prices, effectively partialing out all geographic-specific economic factors that both ARM and FRM properties located within the same time and zip code are commonly exposed to.

The identifying assumption is that conditional on controls and geography-time fixed effects, one-month changes in interest rates do not correlate with unobserved characteristics that also affect prices. When this assumption holds, the specification in 2 identifies the parameter of interest β, the direct pass-through effect of changes in interest rates on changes in rental prices.

$$\Delta P_{i,(t_0,t_1)} = \gamma ARM_i + \alpha_{g(i),(t_0,t_1)} + \Gamma X_{i,t_1} + \epsilon_{i,(t_0,t_1)} \tag{3}$$

ARM_i is a binary variable indicating whether the property i is under ARM contract. The key parameter of interest, γ, measures the monthly relative price growth rate of properties under ARM contracts compared to those under FRM (fixed-rate mortgage) contracts within the same zip code. I maintain the same structure from Equation 2, except I exclude the property fixed effect $\alpha_{g(i),(t_0,t_1)}$ since ARM_i remains constant for property i. I include specification 3 to highlight that the key parameter β in specification 2 captures the relative pass-through of ARM properties compared to FRM properties within the same zip code, aligning with the estimates for γ.

Table 3 presents the pass-through effects estimated using specification 3. Columns 1, 3, and 5 report the effects during the recent monetary policy regime, the entire interest rate hiking period (including recent events), and the period of rate declines, respectively. Columns 2, 4, and 6 show the relative growth rate of rental prices, represented by γ, as estimated using specification 3 for the same periods. During the recent monetary policy hiking period in 2022, a one-percentage-point increase in interest rates is associated with a 6.7% increase in asking prices. The effect over the full hiking period, which includes the 2022 policy changes, is slightly lower. However, the pass-through effect weakens during the period of rate declines. The estimates from specification 2 capture the relative price growth driven by interest rate changes, with FRM properties serving as the baseline in the sample Columns 2, 4, and 6 illustrate the additional monthly growth rates of asking rental prices, which align with the estimates reported in Columns 1, 3, and 5. Although the magnitude of the one-month pass-through effect appears substantial, it should be interpreted in the context of loan sizes and the nature of Agency CMBS loans, which are often either interest-only or partially amortizing with interest-only periods. This structural difference contributes to the observed large pass-through effects.

3.4 Robustness Check

3.4.1 Balanced Panel

One potential concern is that the asymmetry in interest rate pass-through between the two monetary policy regimes may be influenced by variations in the composition of properties present during each period,stemming from the sparsity of rental listing data. I run the same specifications 2 and 3 by only using the properties that are present in both the hiking periods and the declining periods. Table 4 presents the results. A one-percentage-point increase in the interest rate corresponds to a 6.1% rise in asking prices, aligning with the magnitude reported in Table 3. Borrowers significantly pass on their interest rate risk to renters during periods of policy rate hikes but are reluctant to pass through decreases in interest rates, resulting in an asymmetric pass-through effect.

3.4.2 Proprensity Score Matching

A concern arises when measuring the direct interest rate pass-through channel by comparing properties with different loan contract types. Properties under ARM and FRM contracts located within the same zipcodes may be inherently different in ways that influence their pricing behavior, potentially confounding the true effect of contract type on pass-through rates. To address the concern, I constructed a matched sample using propensity scores derived from logit models that predict the likelihood of choosing an ARM loan. The models incorporate loan characteristics—such as LTV, DSCR, loan balance, and origination year—as well as property characteristics, including construction year, total number of units, renovation status, appraisal value, occupancy rate, and net operating income (NOI) at origination. Each ARM property is matched to the nearest FRM property based on the propensity score, restricted to a 5% difference in LTV, a 0.3 difference in DSCR, and within the same zipcode. Table 5 reports a positive pass-through effect during periods of interest rate hikes, while showing no significant pass-through of declining interest rates to the asking price.

4 Main-Channel: Liquidity-Constraints

In this section, I demonstrate that the asymmetry in short-term interest rate pass-through is primarily driven by liquidity-constrained properties. DSCR is a critical loan origination criterion in multifamily housing lending, serving as the commercial mortgage equivalent of the payment-to-income (PTI) ratio in the residential mortgage market. It is calculated as the revenue minus operating expenses, divided by the total annual debt service payment. At origination, GSEs (agency CMBS loan lenders) require a minimum DSCR of 1.25. Borrowers are strongly incentivized to maintain this DSCR level due to DSCR covenants, which require borrowers to uphold minimum DSCR levels to ensure ongoing debt service coverage.

4.1 Properties around the DSCR threshold

With monthly changes in interest rates, properties with DSCRs closely located around the threshold are the ones primarily jumping around this critical point. The DSCR can move below or above the threshold due to fluctuations in interest rates affecting mortgage payments in the short run. When interest rates rise, increasing mortgage payments, the DSCR may drop below the threshold, creating an incentive for landlords to raise rental prices to maintain adequate coverage. Conversely, when interest rates decline, mortgage payments decrease, potentially pushing the DSCR above the threshold, which reduces the immediate pressure on landlords to adjust prices.

$$\begin{aligned}\Delta P_{i,(t_0,t_1)} = {} & \beta_1 \Delta r_{i,(t_0,t_1)} + \beta_2 \Delta r_{i,(t_0,t_1)} \times DSCR_i \\ & + \beta_3 \Delta r_{i,(t_0,t_1)} \times Decline_t \\ & + \beta_4 \Delta r_{i,(t_0,t_1)} \times DSCR_i \times Decline_t \\ & + \alpha_{i(j)} + \alpha_{g(i),(t_0,t_1)} + \Gamma X_{i,t_1} + \epsilon_{i,(t_0,t_1)} \end{aligned} \tag{4}$$

Specification in Equation 4 investigates how interest rate pass-through to rental prices varies between DSCR-sensitive landlords—those with DSCR ratios near the 1.25 threshold—and less-constrained landlords. Following the structure of specification in Equation 2, I include two dummy variables: $Decline_t$, indicating periods of declining interest rates, and $DSCR_i$, identifying properties with DSCR ratios between 1.15 and 1.35. The main coefficients of interest, β_2 and β_4, estimate the additional pass-through effects for DSCR-sensitive properties during periods of policy rate hikes and declines, respectively.

Table 7 presents the results, with Column 2 showing a positive interest rate pass-through effect during hiking periods and minimal pass-through during declining periods. Figure 7 illustrates the findings from Column 3, revealing that the pass-through effect is stronger for DSCR-constrained properties during hiking periods, while it is significantly muted for these properties in declining periods.

4.2 Counterfactual DSCR Pass vs. Non-Pass

Counterfactual Interest Rate The rationale for calculating counterfactual DSCRs, assuming ARM borrowers had instead taken FRM loans, is to underscore how differences in initial interest rates might affect loan eligibility at origination. Since ARMs typically have lower initial interest rates compared to FRMs—due to the absence of a term premium—some properties could qualify for an ARM but might not meet the DSCR threshold required for an FRM. The higher FRM rates, incorporating a term premium, could have prevented these properties from achieving a DSCR of 1.25, limiting their access to fixed-rate financing at origination. Consequently, properties that would not have met this threshold are effectively more liquidity-constrained, meaning they were more vulnerable to financial stress due to tighter cash flow conditions. Such liquidity-constrained properties were therefore more likely to face challenges in covering debt obligations, especially when mortgage rates were higher.

To estimate what the interest rates would have been for ARM borrowers had they instead applied for FRMs, I first model the relationship between loan characteristics and interest rates using only FRM loans. Specifically, I estimate the following regression:

$$r_{i(t)}^{FRM} = \alpha + \beta X_{i(t)} + \epsilon_{i(t)} \tag{5}$$

where $r_{i(t)}^{FRM}$ represents the interest rate on a fixed-rate mortgage at origination, and $X_{i(t)}$ includes loan characteristics such as LTV, DSCR, interest-only periods, loan size, loan maturity, amortization periods, and origination year by county fixed effects to account for region by time-varying heterogeneity. Once the coefficients $\hat{\alpha}$ and $\hat{\beta}$ are obtained, I then use these estimates to predict the counterfactual interest rates for ARM properties as if they had chosen FRMs:

$$\hat{r}_{i(t)}^{FRM} = \hat{\alpha} + \hat{\beta} X_{i(t)}^{ARM} \tag{6}$$

This counterfactual interest rate, $\hat{r}_i^{FRM}$, provides an estimate of what the interest rate would have been for each ARM property under FRM terms. Given that FRMs typically include a term premium, these predicted rates are generally higher than the ARM rates, which could mean that some ARM properties might not meet the DSCR threshold of 1.25 required for FRM approval. I use these counterfactual interest rates to calculate the counterfactual debt service payments, and subsequently, the counterfactual DSCR for each ARM property, as follows:

$$\text{DSCR}_i^{\text{CF}} = \frac{\text{Net Operating Income}_i}{\text{Debt Service Payment}_i^{\text{CF}}} = \frac{\text{Net Operating Income}_i}{\text{Principal Payment}_i + \text{Loan Balance}_i \times \hat{r}_i^{FRM}} \quad (7)$$

where $\text{DSCR}_i^{\text{CF}}$ is the counterfactual DSCR, Net Operating Income$_i$ represents the property's net operating income, and Debt Service Payment$_i^{\text{CF}}$ is calculated as the sum of the principal payment and the product of the loan balance and the counterfactual interest rate $\hat{r}_i^{FRM}$.

In Figure 6, the red histogram represents the distribution of the actual DSCR for ARM properties, while the blue histogram shows the counterfactual DSCR distribution, assuming these property owners had instead applied for FRM loans. Using a 1.25x DSCR threshold, I categorize properties with a counterfactual DSCR below this threshold as "non-pass" properties, indicating that they were more cash-flow constrained at the time of origination. I then apply the baseline specification in Equation 2, sub-sampling the ARM properties into two groups based on their counterfactual DSCR, while retaining the baseline observations of FRMs located within the same zipcode and month.

Table Table 8 reports the results, following the specification in Equation 2. Columns (1) and (2) present the results for the full sample, including both pass and non-pass groups, during the hiking and declining periods, respectively. Columns (3) and (4) highlight a clear asymmetry in pass-through effects among liquidity-constrained properties. In contrast, Columns (5) and (6) report results for properties that are not liquidity-constrained, where no significant pass-through effects are observed

4.3 Other Potential Channel

4.3.1 Rent-Control Channel

One concern could be that the observed asymmetry is not driven by liquidity constraints alone but rather by the fact that properties in areas with rent control tend to also be financially constrained. Rent control typically imposes a cap on the maximum rent increase a landlord can implement, often ranging between 5% and 7%. As a result, landlords in rent-controlled areas may be reluctant to reduce rental prices even when interest rates decline. If landlords anticipate future restrictions on price increases should interest rates rise again, they face a disincentive to pass through any declines today. Forward-looking landlords would therefore prefer to maintain current rent levels in order to preserve the flexibility to respond more effectively to future interest rate hikes.

Despite this concern, about 76% of the properties in my sample are located in states that either have no rent control or even explicitly ban rent control.[4] To address this potential confounding factor, I re-estimate Equation 2 focusing only on properties located in states without rent control. Table 10 demonstrates that the asymmetry in the pass-through remains evident even among landlords in these states, implying that the asymmetry is driven by a mechanism other than rent control.

4.3.2 Financial Constraint - LTV Proxy

One concern is that LTV ratios might determine the level exposure to interest rate risks, since the interest payments are determined by the the size of loan balance of each loan. Therefore, the asymmetry can stem from heterogenous effects among properties with high LTV ratio versus low LTV ratios. To assess whether LTV ratio influences the asymmetry in pass-through effects, I replace the DSCR dummy variable from the previous specification in Equation 4 with an LTV dummy variable. This new dummy indicates whether properties have an LTV above or below the median level of 70%.

$$\begin{aligned}
\Delta P_{i,(t_0,t_1)} = {} & \beta_1 \Delta r_{i,(t_0,t_1)} + \beta_2 \Delta r_{i,(t_0,t_1)} \times HighLTV_i \\
& + \beta_3 \Delta r_{i,(t_0,t_1)} \times Decline_t \\
& + \beta_4 \Delta r_{i,(t_0,t_1)} \times HighLTV_i \times Decline_t \\
& + \alpha_{i(j)} + \alpha_{g(i),(t_0,t_1)} + \Gamma X_{i,t_1} + \epsilon_{i,(t_0,t_1)}
\end{aligned} \tag{8}$$

The key parameters of interest are β_2 and β_4, which estimate the additional pass-through effects for properties with above-median LTV ratios during periods of policy rate hikes and declines, respectively. The results, reported in Table 9, show that properties with high LTV ratios do not exhibit significantly different pass-through effects compared to those with low LTV ratios, suggesting that LTV itself does not account for the asymmetry observed in the pass-through effects.

5 Model

My empirical findings suggest that liquidity-constrained landlords are mainly driving the asymmetry of interest rate pass-through to tenants. I develop a partial equilibrium model is to clarify how fluctuations in mortgage costs conditionally influence landlords'

[4]California and Oregon are the only states with state-level rent control. Other states, including New York, Maryland, Maine, Minnesota, New Jersey, Massachusetts, and Washington D.C., have localities that impose rent control.

pricing decisions. A central complexity arises from the fact that, unlike variable costs, mortgage costs are fixed within each period t, irrespective of the number of units supplied. This contrasts with the classic monopolistic firm's problem, where capital is the sole input and the interest rate r_t (representing the cost of capital) typically enters the price equation via the first-order condition with respect to capital. In the landlord's case, absent any frictions, mortgage costs do not directly influence the optimal price equation, as they are non-marginal. This makes it challenging to establish a direct relationship between mortgage cost changes and pricing behavior. To address this, I introduce a DSCR constraint, which binds when rental income falls below a threshold relative to mortgage obligations.

Setup I consider an infinite-horizon optimization problem for a landlord who manages a multifamily housing building with a unit mass normalized to one. Each period, a representative tenant, taking the landlord's price as given, decides between renting and searching for alternatives. The landlord faces a downward-sloping demand curve, derived from the tenant's indifference condition, and selects the optimal price to maximize the value function.

5.1 Tenant Problem

Each period, a representative tenant maximizes utility by choosing between renting and searching:

$$V_t^{Tenant} = \max\{V_t^{Rent}, V_t^{Search}\} \tag{9}$$

When choosing to rent, the tenant pays the landlord's price p_t in exchange for indirect utility b from being housed, plus an idiosyncratic preference shock ϵ_t^R:

$$V_t^{Rent} = b - p_t + \epsilon_t^R \tag{10}$$

Alternatively, if the tenant chooses to search, they receive d, which represents the utility of continuing to search for housing, along with a preference shock ϵ_t^S:

$$V_t^{Search} = d + \epsilon_t^S \tag{11}$$

Both preference shocks, ϵ_t^R and ϵ_t^S, are assumed to follow an Extreme-Value Type I distribution.

Indifference Condition The tenant chooses to rent if $V_t^{Rent} \geq V_t^{Search}$, which is equivalent to

$$\epsilon_t^S - \epsilon_t^R \leq b - p_t - d \tag{12}$$

Since ϵ_t^R and ϵ_t^S each follow an Extreme Value Type I distribution, the probability of renting in each period is the logistic cumulative distribution function $F_{\epsilon^S - \epsilon^R}(b - p_t - d)$ with location $\bar{\mu}$ and scale σ. By defining $\mu \equiv \bar{\mu} - b + d$, this can be rewritten as the following demand function:

$$n(p_t) = \frac{1}{1 + e^{(p_t + \mu)/\sigma}} \tag{13}$$

5.2 Landlord Problem

5.2.1 Benchmark

I begin with a static model involving a landlord who rents out units that she owns. Assume the landlord has a fixed, loan balance B^{LTV} normalized as the LTV ratio, and has some market power. The landlord then faces a downward-sloping demand curve $n(p)$, where n represents the mass of tenants accepting the offer or the probability of accepting the offer as a function of the rental price p. The landlord seeks to maximize revenue, given the interest rate r set today. I abstract away from other operating or management cost for simplicity. When setting the optimal rental price, the landlord must weigh the trade-off between setting a higher price, which increases revenue per tenant, and lowering the fraction of potential tenants willing to rent the property.

The landlord's problem can be expressed as maximizing the value function:

$$V(r) = \max_p \{n(p)p - rB^{LTV}\}, \tag{14}$$

where $n(p)p$ represents the total revenue, and rB^{LTV} is the mortgage payment cost. The first-order condition with respect to the rental price p shows that the optimal price is a function of the demand curve's elasticity. Since the mortgage cost r is not a marginal cost, changes in interest rates, which cause fluctuations in mortgage costs over time, will not directly affect optimal rental prices unless there are binding constraints or an additional adjustment channel.

5.2.2 Dynamic Problem with DSCR Constraints

Profit Maximization The landlord aims to maximize the present value of profits over time, considering both current profits and the effect on future value. The value function is given by:

$$V(m_t, r_t) = \max_{p_t}\{m_t \cdot n(p_t)(p_t - c_t) - r_t B^{LTV} + E[\beta V(m_{t+1}, r_{t+1})]\} \tag{15}$$

the value function $V(m, r)$ represents the maximum value that the landlord can achieve, given the current tenant base m_t and the interest rate r_t. The decision variable p_t represents the rental price that the landlord chooses in order to maximize their profit. The tenant base m_t is an endogenous state variable that evolves over time, influenced by the landlord's pricing decisions. The interest rate r_t is an exogenous state variable and the variable c_t denotes the operating cost per unit, representing the costs incurred to maintain and rent out the property, which is fixed as a constant proportion of the rental price. [5] The loan balance B^{LTV} represents the total mortgage balance, normalized to the median loan-to-value (LTV) ratio of 70% among agency CMBS borrowers. In the model, I assume no amortization, aligning with the common practice of partial or full interest-only periods during the maturity of CMBS loans. Total mortgage payments are determined by floating interest rate r_t, which I assume to follow AR(1) process. Lastly, the discount factor β is used to appropriately value future profits, allowing the landlord to consider both current and future income when making pricing decisions.

Liquidity Constraint The landlord faces a liquidity constraint, which binds when the DSCR falls below a threshold τ. The constraint enables fluctuations in mortgage costs to impact prices directly by capturing landlords' responses when their debt coverage is constrained. Specifically, it creates a kink in the price elasticity with respect to price changes for properties with DSCRs near the threshold. This kink occurs because, upon reaching the constraint, landlords experience a direct channel for passing increased mortgage costs through to prices. Conversely, when the DSCR constraint is not binding, landlords remain in a region of inaction, thereby diminishing the pass-through effect.

$$m_t n(p_t)(p_t - c_t) \geq \tau r_t B^{LTV} \tag{16}$$

Tenant-Base Following previous studies on the long-term effects of pricing on the customer base Gottfries (1986); Klemperer (1987); Farrell and Shapiro (1988), I assume that rental income depends on the tenant base, implying that the current price affects both today's demand, $n(p_t)$, and the future tenant base, m_{t+1}, thereby influencing future rental income. The parameter γ quantifies tenant attrition or retention in response to changes in

[5] Hughes (2022) demonstrates that operating expenses consistently account for approximately 48% of total revenue, and this proportion remains stable over time

rental price, capturing how tenants react to the landlord's pricing decisions. The reference price level, $\tilde{P}$, is normalized to a constant. The landlord faces a trade-off between raising today's price to maximize current profit or meet the DSCR constraint and maintaining a higher future rental income by preserving the tenant base.

$$m_{t+1} = (1 - \gamma(p_t - \tilde{p}))m_t \tag{17}$$

$$\frac{\partial m_{t+1}}{\partial p_t} = -\gamma m_t$$

Interest-Rate Pass-through To quantify how changes in interest rates are transmitted to rental prices, I derive the optimal rental price equation by taking the first-order condition of the landlord's value function with respect to the rental price. By then taking the partial derivative of the optimal price with respect to interest rates, Equation 18 shows that the degree of pass-through depends on whether the debt-service coverage ratio (DSCR) constraint is binding. Furthermore, the degree of pass-through is influenced by three key factors: 1) the exposure to interest rate risks, determined by the loan-to-value (LTV) ratio B^{LTV}, 2) the DSCR threshold τ, and 3) the elasticity of the demand curve, which reflects the landlord's market power.

$$\frac{\partial p}{\partial r} = \begin{cases} 0 & \text{DSCR not binding} \\ \frac{\tau B^{LTV}}{m_t(n(p_t)+(p_t-c_t)\frac{\partial n}{\partial p_t})} & \text{if DSCR constraint binds} \end{cases} \tag{18}$$

5.3 Simulation Results

Calibration The model is calibrated using a set of key parameters that reflect market characteristics and empirical observations relevant to the multifamily housing sector. The Loan-to-Value Ratio ($B_{\text{LTV}} = 0.70$) is set to match the median value for Agency CMBS loans, providing a realistic representation of typical leverage levels in this segment. The Debt Service Coverage Ratio ($\tau = 1.25$) is calibrated based on thresholds used by Freddie Mac, reflecting the lender's requirements for loan origination. The discount factor ($\beta = 0.95$) captures time preferences in the model, emphasizing the importance of future cash flows. Interest rate dynamics are modeled using a persistence parameter ($\rho = 0.825$) and a mean rate ($\mu_r = 1.2\%$), both sourced from Campbell and Cocco (2015), alongside volatility ($\sigma_r = 1.8\%$), to capture fluctuations in financing costs. The demand side is parameterized with $\mu = 0.1$, representing the location of the demand function, and

$\sigma = 0.8$, which scales tenant sensitivity to rent changes, reflecting relatively inelastic demand characteristics. Additionally, the stickiness in tenant behavior is captured by $\gamma = 0.4$, suggesting a moderate degree of inertia in tenants' responses to pricing changes, which has been normalized for simplicity. Together, these parameters provide a foundation for simulating landlord decision-making under varying economic conditions and rent-setting constraints.

Simulation Results The model is solved using dynamic programming to derive the policy function, optimal price, and simulate interest rates to calculate the pass-through of interest rates to prices. Figure 8 depicts the relationship between the pass-through of interest rates to prices and the DSCR binding condition as interest rates vary. The left-hand side y-axis indicates the level of pass-through, while the right-hand side y-axis indicates whether the DSCR ratio is binding. The elasticity curve shows a sharp increase around an interest rate of approximately 0.02, which corresponds with the DSCR binding indicator transitioning from 0 to 1, indicating that the DSCR constraint is binding. When this occurs, landlords respond more aggressively to interest rate changes, resulting in a jump in elasticity. Beyond this point, as interest rates rise, elasticity increases steadily. This suggests that liquidity-constrained properties experience amplified sensitivity in pricing, reflecting increased financial pressure.

Figure 9 presents simulation results for changes in interest rates around the threshold to verify if the model replicates the kinked pass-through behavior observed in the data at $\Delta r = 0$, as seen in Figure 3. The scatter plot distinguishes between rate cuts (blue points) and rate hikes (red points). Negative changes (rate cuts) show responses clustered around zero, indicating limited pass-through, whereas positive changes (rate hikes) demonstrate significant increases in $\Delta \log(\text{Price})$ for larger interest rate changes. This confirms the model's ability to capture kinked behavior—no pass-through during cuts, but significant effects during hikes—highlighting the role of liquidity constraints.

Figure 10 illustrates how pass-through behavior varies with interest rate levels, reflecting the impact of financial constraints faced by properties with different rental income levels or loan-to-value (LTV) ratios. Although these properties share the same DSCR threshold of 1.25, they experience constraints at different interest rate levels. Consequently, we observe heterogeneous responses to interest rate changes across properties. Specifically, landlords with "Never Binding" properties are unaffected by interest rate fluctuations, while those with "Always Binding" properties remain constrained, causing rate hikes to significantly affect their pricing decisions. Most notably, landlords with properties "Close to Threshold" form the key marginal group. Their interest rate pass-through behavior is asymmetric, as they hover around the DSCR constraint. This group, represented by blue scatter plots, is the primary driver of the observed asymmetry in pass-through dynamics.

Policy Experiments Figure 11 illustrates how varying DSCR thresholds impact rental price elasticity and DSCR binding across different interest rates. DSCR thresholds can differ based on the type of lender. Banks or insurance companies that retain loans on their balance sheets tend to impose higher DSCR thresholds, as they bear the full risk of the loans they originate. These lenders are also subject to capital requirements for holding such loans, which can influence their choice of DSCR thresholds. The results highlight three key implications: (1) Higher DSCR thresholds cause landlords to become liquidity-constrained at lower interest rate levels; (2) The magnitude of interest rate pass-through increases more rapidly with higher thresholds, particularly as interest rates rise; and (3) For the DSCR 1.5 scenario, the degree of pass-through grows exponentially. However, beyond a certain interest rate level (approximately 10%), landlords are unable to meet the constraint, resulting in no further pass-through. This analysis suggests that while imposing higher DSCR thresholds can improve loan quality, excessively high thresholds may pressure landlords to pass through more interest rate risk to tenants. In extreme cases, such thresholds could render landlords unable to meet the DSCR constraint at all, as observed in the $DSCR = 1.5$ scenario.

Figure 12 illustrates the degree of interest rate pass-through for properties with varying levels of loan-to-value (LTV) ratios. Two key observations emerge from this analysis. First, properties with higher LTV ratios are more exposed to interest rate risk, as these properties hit the DSCR constraint at lower interest rate levels compared to properties with lower LTV ratios. This demonstrates the increased vulnerability of highly leveraged properties to changes in interest rates. Second, the degree of pass-through is significantly higher for properties with higher LTV ratios, especially within the higher interest rate regions. This indicates that landlords of highly leveraged properties are more likely to pass on the burden of rising interest costs to tenants through rent increases. These findings highlight the critical role of leverage in shaping the dynamics of interest rate pass-through in the rental market.

6 Conclusion

This paper provides new evidence on how monetary policy influences the rental market through the pass-through of financing costs by landlords, with a focus on short-term asymmetric responses driven by liquidity constraints. Using property-level data from commercial mortgage-backed securities (CMBS) and exploiting monthly variations in interest rates for adjustable-rate mortgages (ARMs), I find that landlords facing liquidity constraints pass higher mortgage costs onto renters during contractionary monetary policy regimes, while demonstrating limited pass-through during expansionary regimes. This asymmetry is primarily driven by landlords with DSCRs near or below the threshold of 1.25, a critical benchmark enforced by lenders.

The findings challenge neoclassical models that assume fixed costs, such as mortgage payments, do not influence pricing decisions. Instead, I propose an alternative partial equilibrium model where DSCR constraints create a mechanism for asymmetric pass-through of interest rates. The model highlights that as interest rates rise, liquidity constraints tighten, inducing landlords to raise rents to preserve their DSCR ratios. Conversely, when interest rates fall, landlords move away from the constraint and exhibit no significant pass-through of cost reductions to renters.

These findings highlight important policy implications, particularly regarding how the type of mortgage contract amplifies the transmission of monetary policy to renters. Maggio et al. (2017) and Guren, Krishnamurthy, and Mcquade (2021) show that ARM contracts in the residential mortgage market often act as automatic stabilizers, helping households hedge their income risk by allowing interest rates to decline during recessions and rise during economic expansions. However, the dynamics of ARM contracts in the multifamily housing sector are different. Multifamily landlords with CMBS ARM contracts transfer interest rate risks onto renters through higher rents, rather than bearing these risks themselves as residential borrowers typically do.

This transfer of risk has significant implications for renters, who are disproportionately burdened by rising rents that compress their disposable income. Notably, renters' disposable income is subject to asymmetric risks: it is highly vulnerable to erosion during periods of rising interest rates, yet any potential benefit from declining interest rates is largely capped. Such asymmetry raises concerns about the equity and effectiveness of policies that encourage the use of ARM financing in multifamily housing, as these mechanisms may unintentionally undermine the goals of affordability, disproportionately affecting renters.

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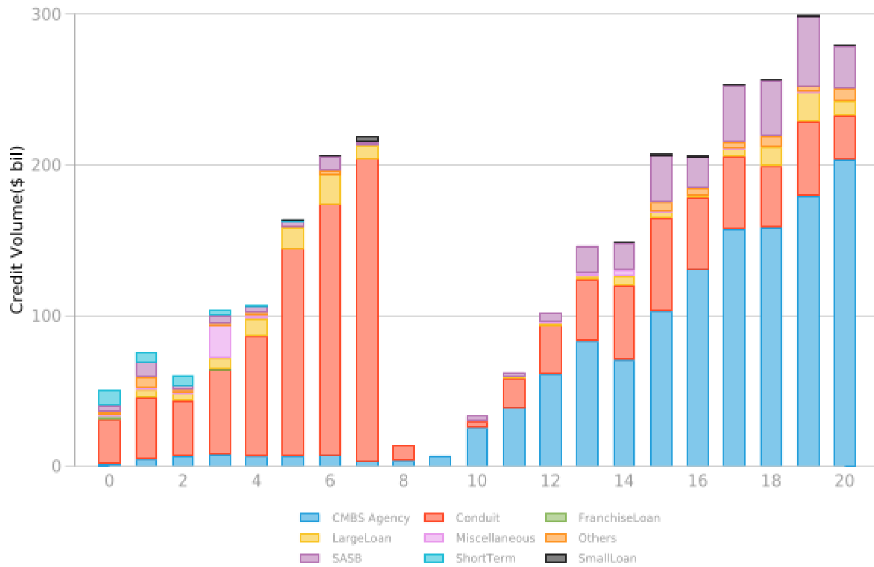
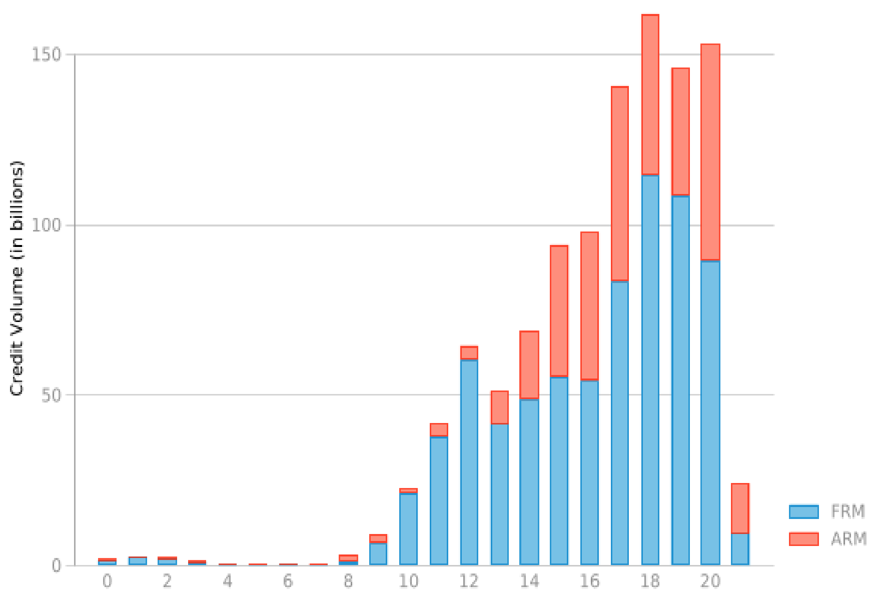


(a) CMBS Origination Credit Volume by Deal Type



(b) Agency CMBS Credit Volume by Contract Type

Figure 1: CMBS Loan Origination Credit Volume By Year

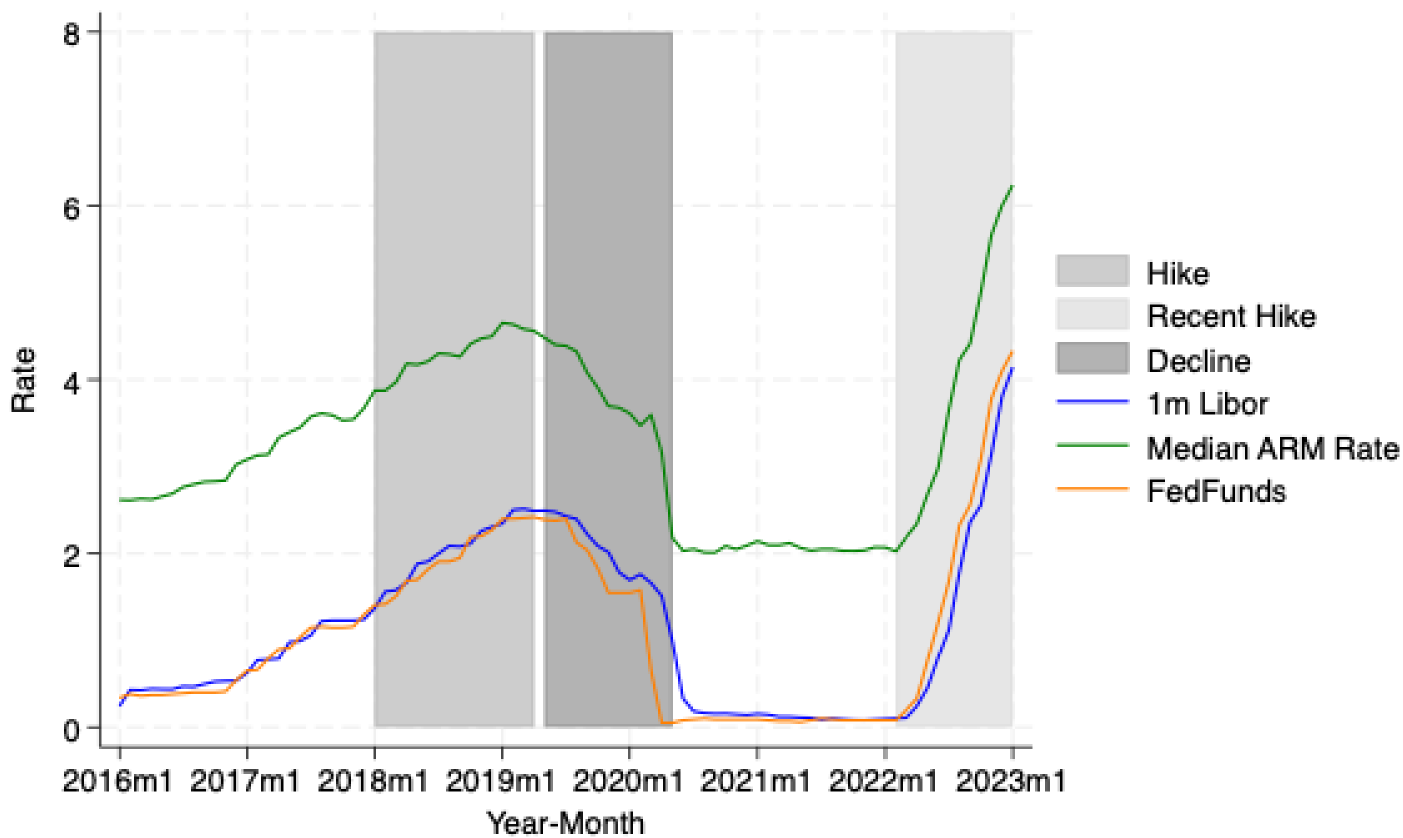


Figure 2: Definition of Different Monetary Policy Regimes

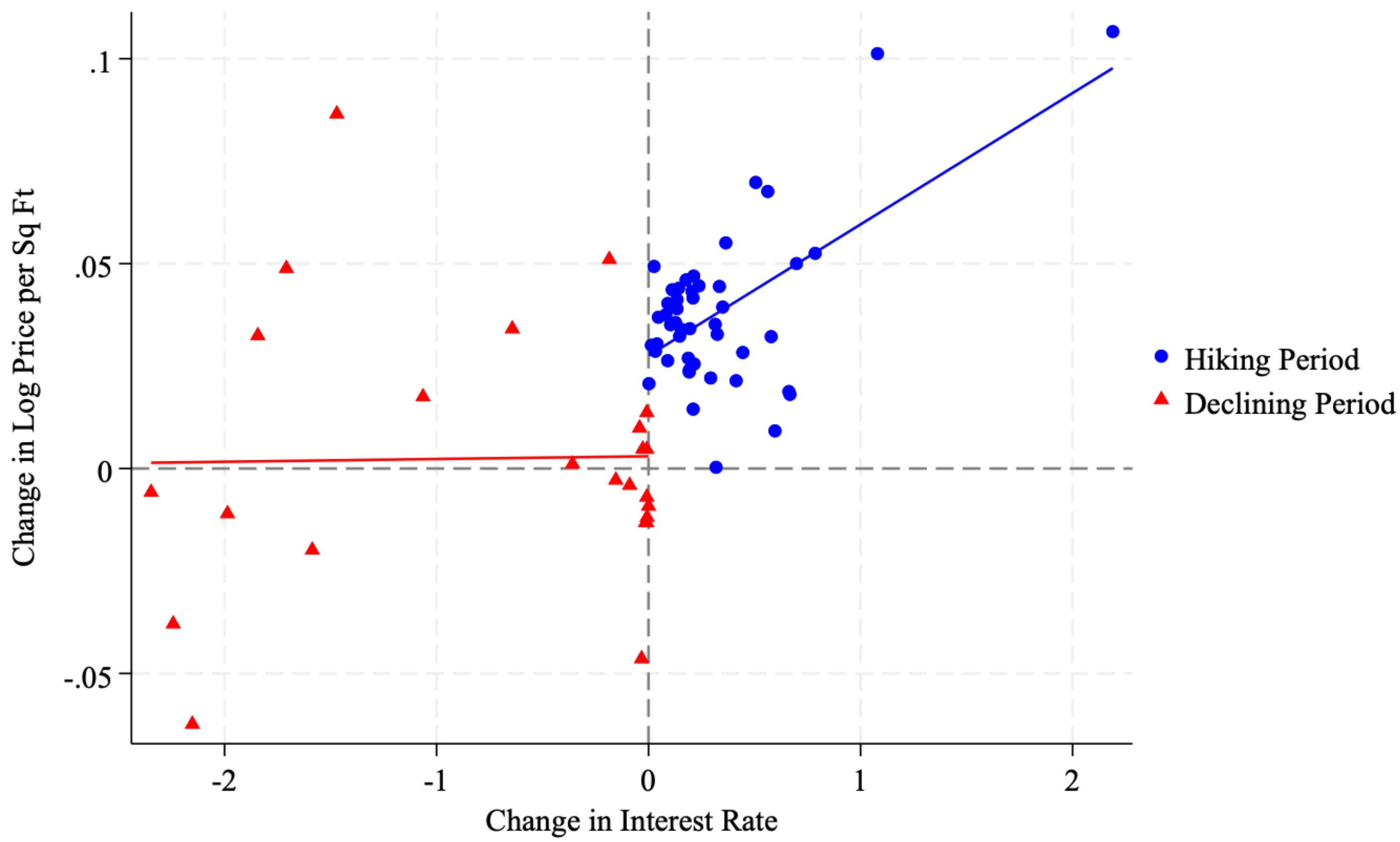


Figure 3: Kinked Price Elasticity of Interest Rates

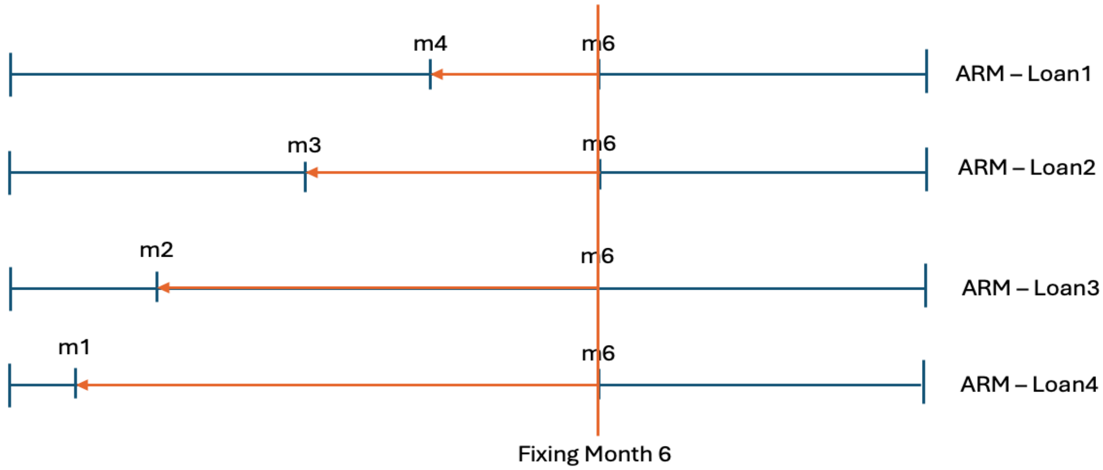


Figure 4: N-month Identification

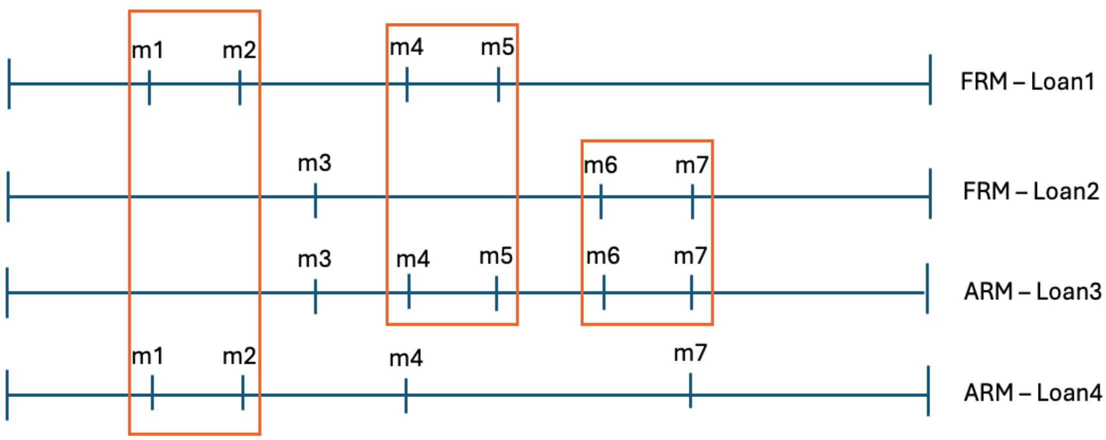


Figure 5: One-month Identification

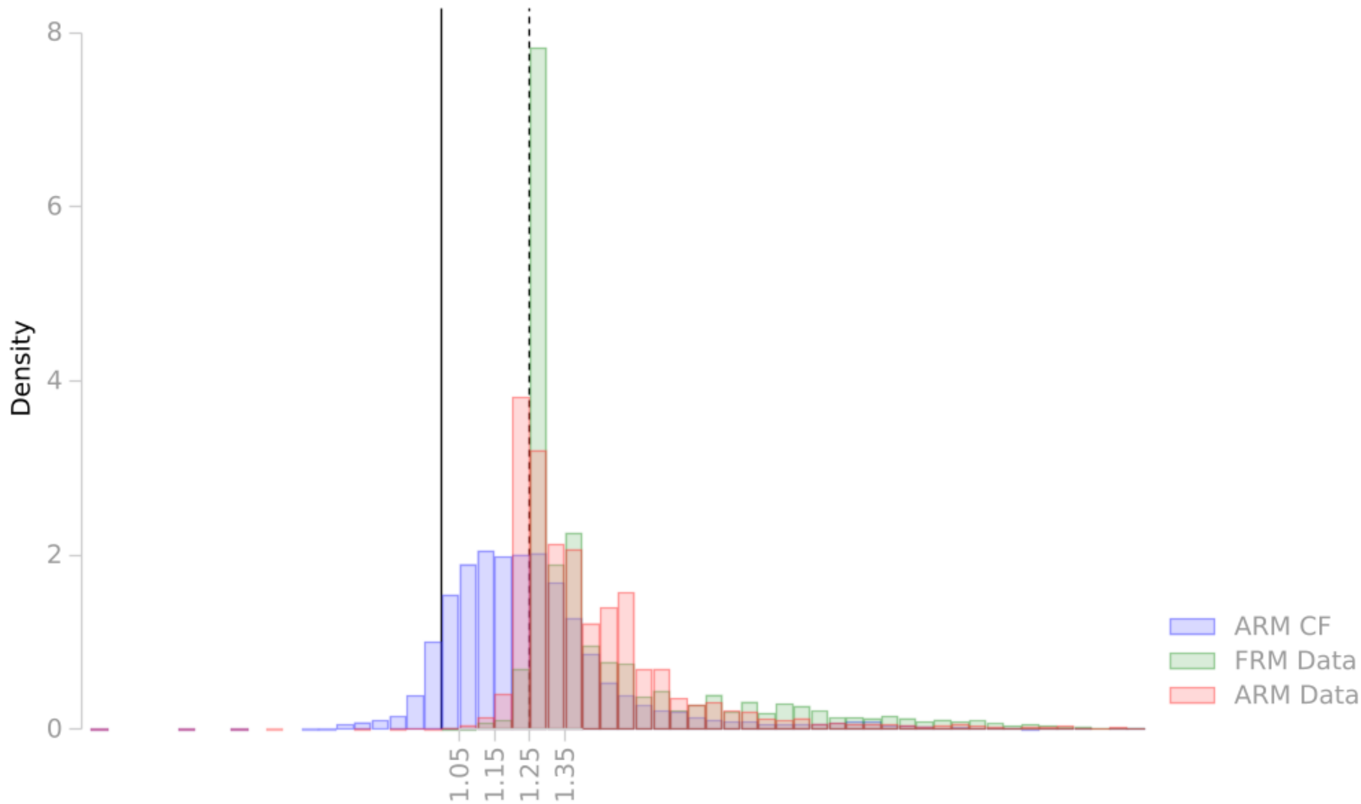


Figure 6: Distribution of DSCRs by Loan Type

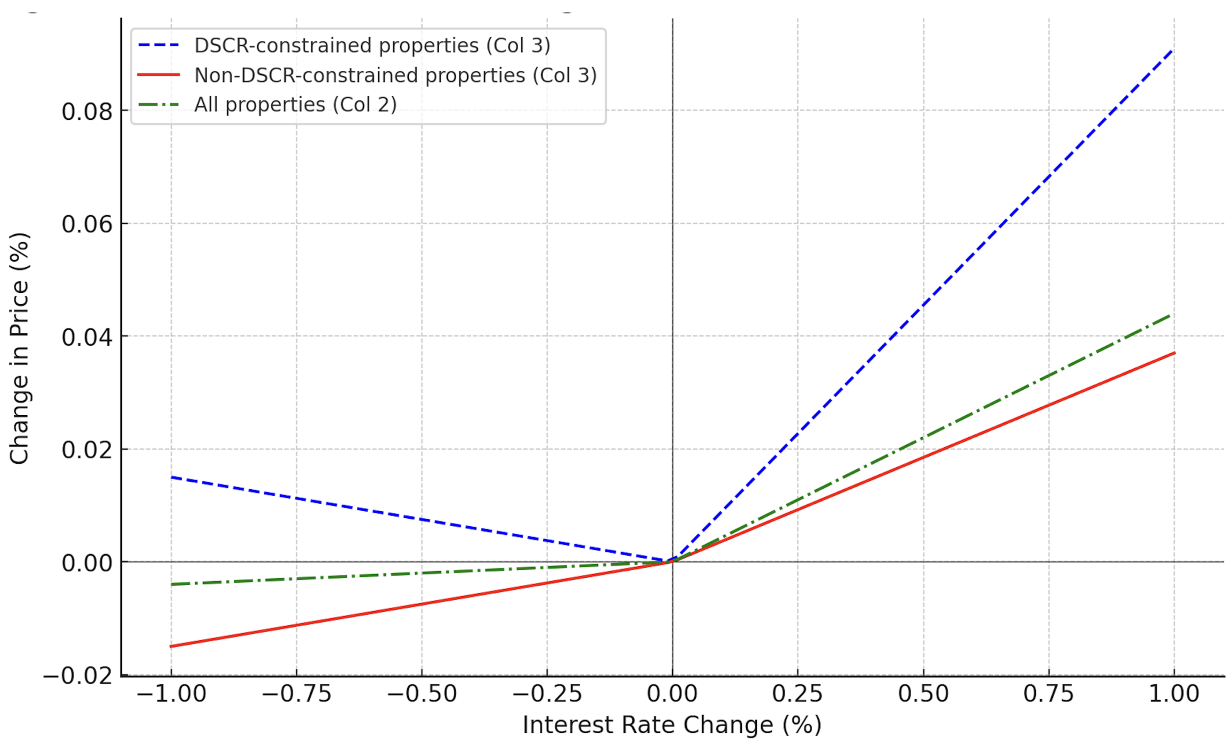


Figure 7: Kinked Price Elasticity of Interest Rates

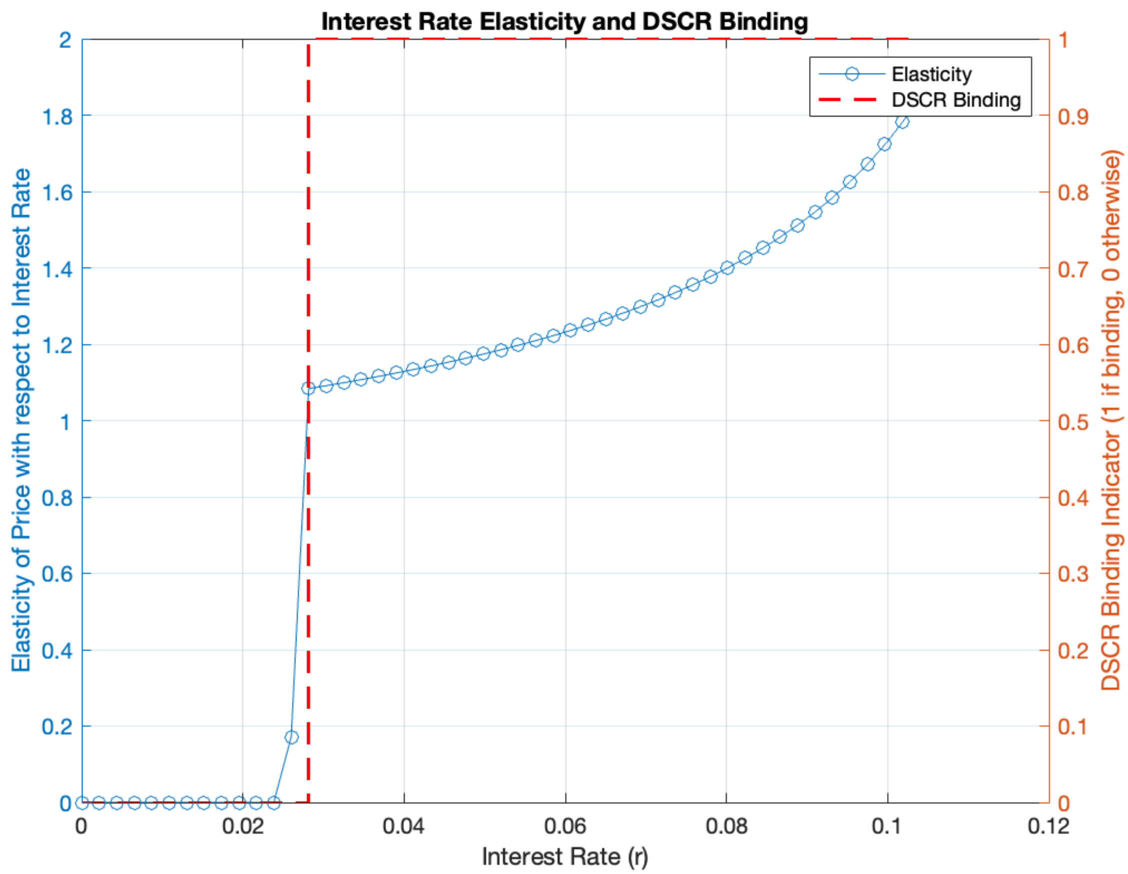


Figure 8: Discrete Jump in Elasticity

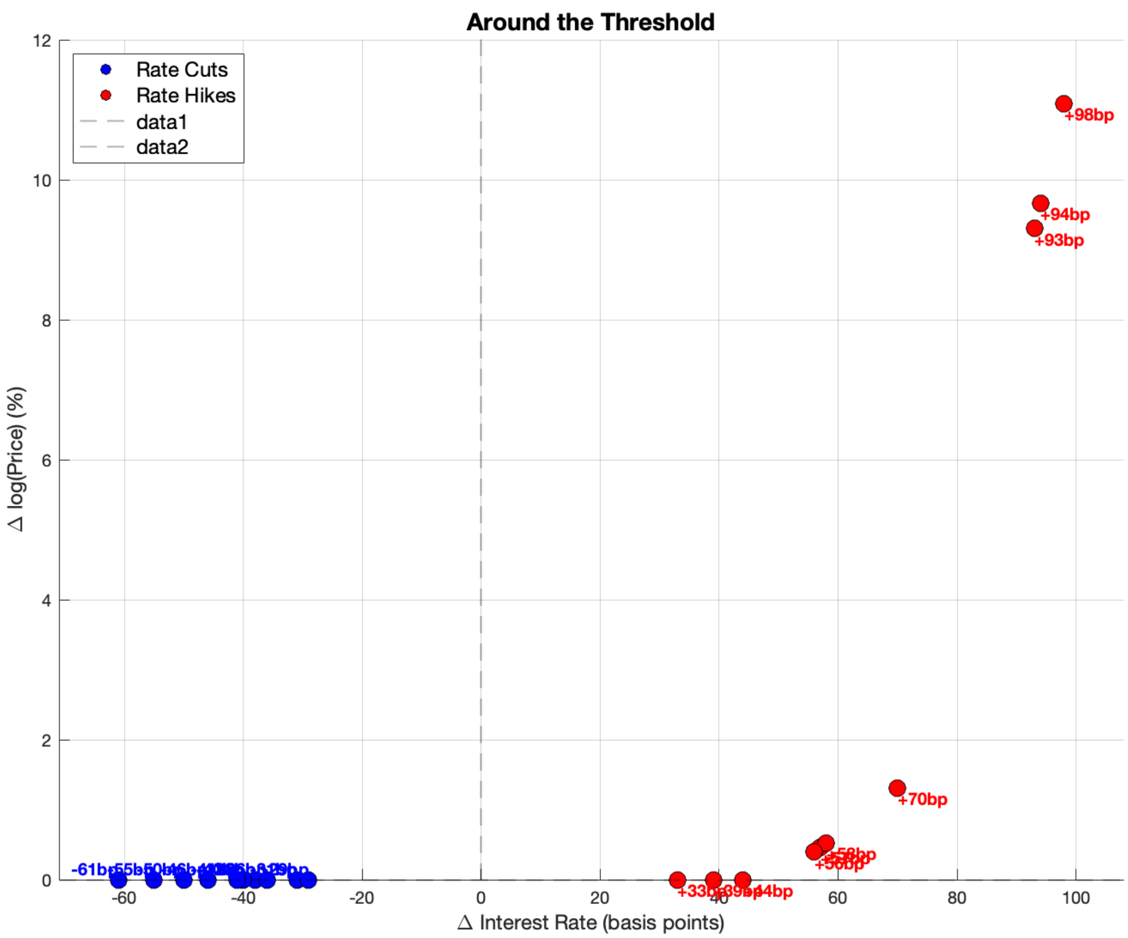


Figure 9: Caption

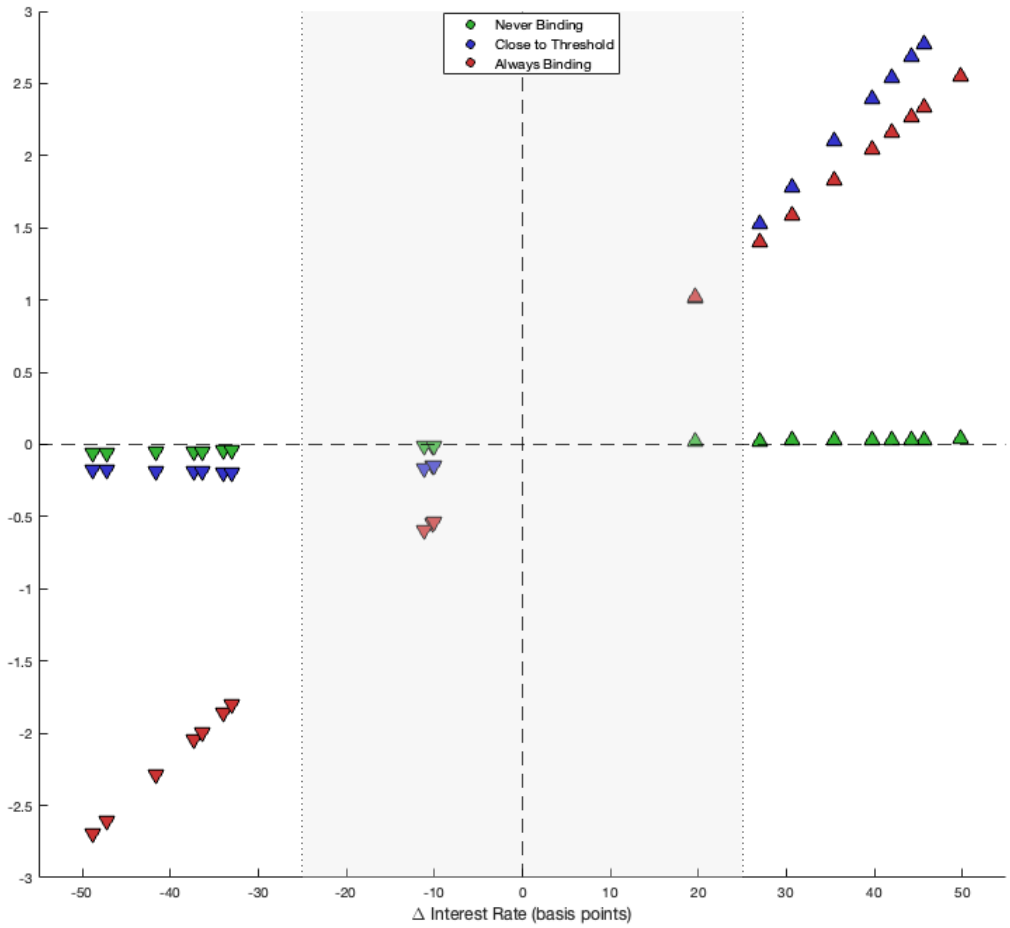


Figure 10: Property Around DSCR Threshold

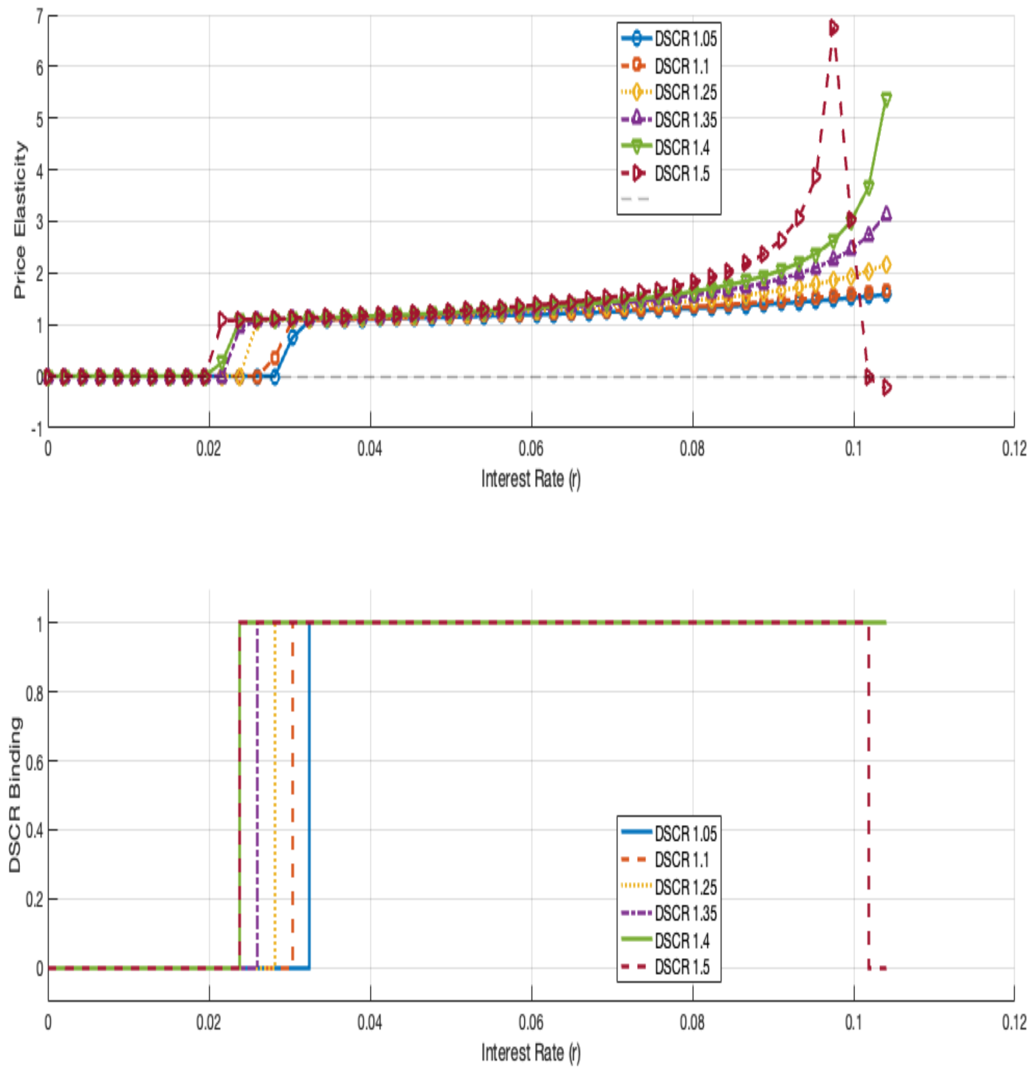


Figure 11: Different Levels of DSCR Thresholds

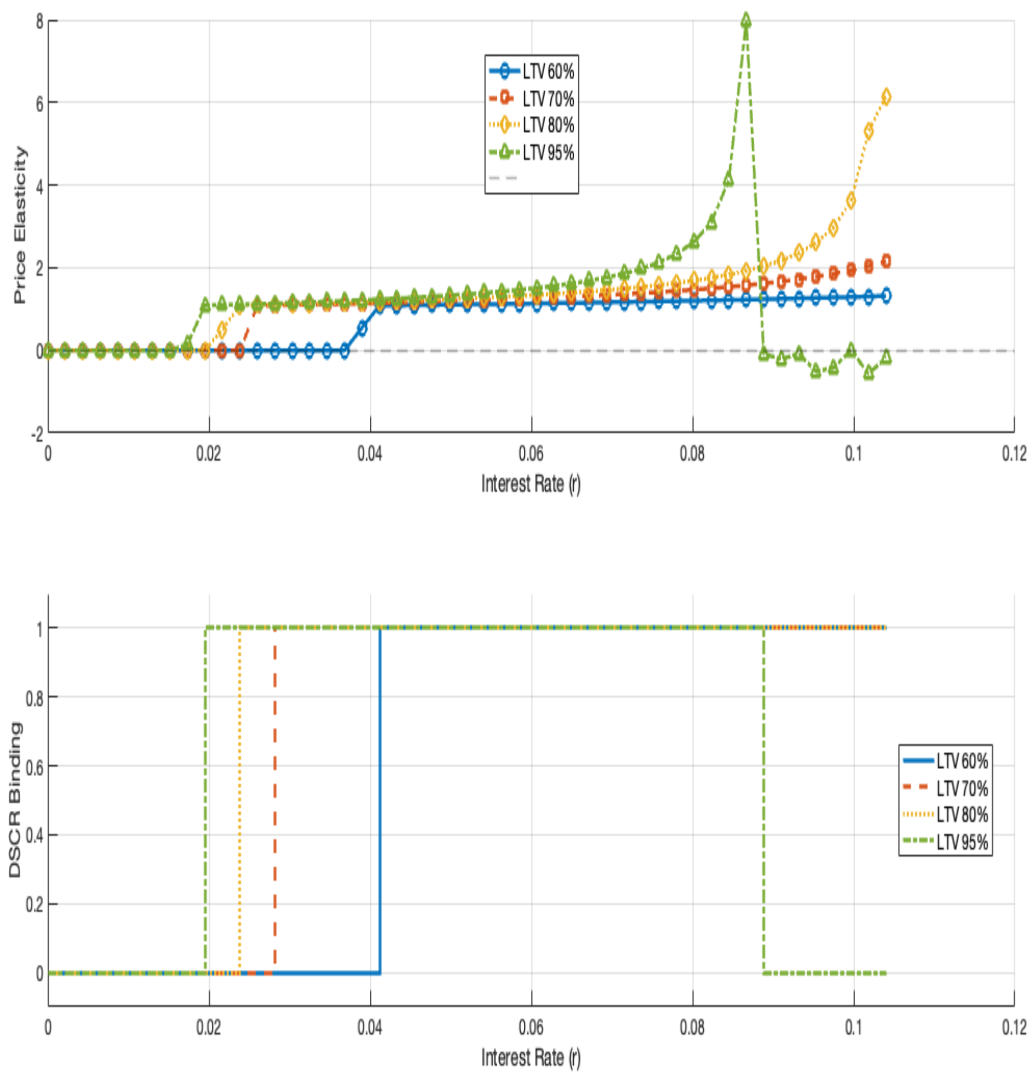


Figure 12: Different Levels of LTV

Table (1) Descriptive Summary Statistics

	ARM			FRM		
	Mean	**Median**	**SD**	**Mean**	**Median**	**SD**
Interest Rate	3.47	3.47	0.70	4.37	4.25	0.67
LTV	69.43	71.00	8.85	68.57	70.00	8.72
DSCR	1.46	1.35	0.40	1.51	1.35	0.43
log(Balance)	16.36	16.63	1.19	16.03	16.09	1.01
Maturity	138.28	120.00	81.16	98.90	98.00	24.01
Amortization	369.03	396.00	91.61	351.94	360.00	84.40
P/F InterestOnly	0.86	1.00	0.35	0.58	1.00	0.49
Construction Year	1980.96	1985.00	23.33	1983.82	1986.00	20.00
Renovation Flag	0.49	0.00	0.50	0.45	0.00	0.50
# of Units	224.53	208.00	198.66	255.29	230.00	197.10
Observations	5,884	—	—	7,196	—	—

Table (2) N-Month Change in Pass-Through Effects (2)

	Dependent Variable: $\Delta P_{i,t,t-k(i)}$			
	(1)	(2)	(3)	(4)
$\Delta r_{i,t,t-k(i)}$	0.037***	0.066**	0.001	-0.0135
	(0.014)	(0.029)	(0.021)	(0.008)
Sample	All	ARM Only	All	ARM Only
Regime	Hike	Hike	Decline	Decline
Geo-Time FE	ZipXMonth	ZipXMonth	ZipXMonth	ZipXMonth
Prop-Loan FE	Yes	Yes	Yes	Yes
N	34,766	11,229	5,530	1,741
R-squared	0.915	0.952	0.937	0.956

Notes: The table reports OLS estimates of Equation 1. Columns 1 and 2 report the relationship between changes in prices and changes in interest rates during the federal funds rate hiking period, while columns 3 and 4 report the relationship during the declining period. In columns 1 and 3, we include both ARM and FRM properties. In columns 2 and 4, we restrict the sample to ARM properties only. Controls include property-leve fixed effects, month-zipcode fixed effects, LTV, DSCR, mortgage balance, remaining term, property construction year, and a renovation flag. Standard errors are clustered at the property level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table (3) One-Month Pass-through Effects

	Dependent Variable: $\Delta P_{i,t}$					
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta r_{i,t}$	0.067***		0.055***		-0.024	
	(0.022)		(0.021)		(0.017)	
ARM=1		0.079***		0.057***		-0.010
		(0.010)		(0.004)		(0.010)
Regime	Recent Hike	Recent Hike	Hike	Hike	Decline	Decline
Geo-Time FE	ZipXPeriod	ZipXPeriod	ZipXPeriod	ZipXPeriod	ZipXPeriod	ZipXPeriod
Prop-Loan FE	Yes	No	Yes	No	Yes	No
N	11,266	11,957	22,453	24,643	5,431	7,371
Unique # of Props	2,057	2,748	4,416	6,602	1,745	3,680
R-squared	0.912	0.829	0.923	0.840	0.979	0.964

Notes: The table reports the OLS estimates of specifications in Equation 2 and 3. Columns 1, 3 and 5 reports the pass-through estimate β in specification 2 during recent contractionary monetary policy, all federal funds rate hiking periods(including the recent episode) and declining period respectively. Controls include property-leve fixed effects, month-zipcode fixed effects, LTV, DSCR, mortgage balance, remaining term, property construction year, and a renovation flag. Standard errors are clustered at the property level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table (4) One-Month Pass-through Balanced Panel

	Dependent Variable: $\Delta P_{i,t}$			
	(1)	(2)	(3)	(4)
$\Delta r_{i,t}$	0.061*		-0.007*	
	(0.033)		(0.004)	
ARM=1		0.046***		-0.008
		(0.007)		(0.009)
Regime	Hike	Hike	Decline	Decline
Geo-Time FE	ZipXPeriod	ZipXPeriod	ZipXPeriod	ZipXPeriod
Prop-Loan FE	Yes	No	Yes	No
N	10,743	11,370	5,431	7,371
R-squared	0.948	0.907	0.986	0.965

Notes: The table reports the OLS estimates of Equation 2 and 3 using properties present in both federal funds rate hiking and declining periods. Columns 1, 3 and 5 reports the pass-through estimate β in specification 2 during recent contractionary monetary policy, all federal funds rate hiking periods(including the recent episode) and declining period respectively. Controls include property-leve fixed effects, month-zipcode fixed effects, LTV, DSCR, mortgage balance, remaining term, property construction year, and a renovation flag. Standard errors are clustered at the property level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table (5) Balance Test After Match

	(1) ARM Prop	(2) FRM Prop	(3) Difference
Property Year	1984.04	1983.33	0.71
			(0.48)
# of Units	245.57	238.19	7.38
			(5.10)
Occupancy Rate	94.63	95.16	-0.53***
			(0.11)
Appraisal Value	27,609,431.67	27,386,587.71	222,843.95
			(693,598.44)
NOI	1,539,569.05	1,553,748.95	-14,179.90
			(37,013.07)
Renovation Flag	0.448	0.505	-0.057***
			(0.016)
LTV	72.001	70.90	1.091***
			(0.138)
DSCR	1.462	1.363	0.099***
			(0.007)
Props	777	1,382	

Notes: This table presents a balance test after propensity score matching, with ARM properties matched to the closest FRM properties based on logit-derived propensity scores. Matching criteria include a 5% threshold for LTV, a 0.3 threshold for DSCR, and properties located within the same ZIP code. Key loan and property characteristics used for matching are loan balance, origination year, property construction year, total units, renovation flag, appraisal value, occupancy rate, and net operating income (NOI) at origination. Standard errors are clustered at the property level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table (6) Propensity Score Matched Sample

	Dependent Variable: $\Delta P_{i,t}$		
	(1)	(2)	(3)
$\Delta r_{i,t}$	0.094*	0.085*	0.004
	(0.050)	(0.045)	(0.003)
Regime	Recent Hike	Hike	Decline
Geo-Time FE	ZipXPeriod	ZipXPeriod	ZipXPeriod
Prop-Loan FE	Yes	Yes	Yes
N	3,190	6,535	1,372
R-squared	0.917	0.925	0.999

Notes: The table presents the OLS estimates from the specification 2 using a propensity score matched sample, with properties matched across federal funds rate hiking and declining periods. Included controls are property-level fixed effects, month-zipcode fixed effects, LTV, DSCR, mortgage balance, remaining term, property construction year, and a renovation flag. Standard errors are clustered at the property level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table (7) DSCR Interaction Effects

	Dependent Variable: $\Delta P_{i,t}$		
	(1)	(2)	(3)
$\Delta r_{i,t}$	0.018***	0.044***	0.037***
	(0.007)	(0.012)	(0.013)
$\Delta r_{i,t}$ × Decline		-0.040**	-0.022
		(0.017)	(0.019)
$\Delta r_{i,t}$ × DSCR			0.054*
			(0.029)
$\Delta r_{i,t}$ × Decline × DSCR			-0.084**
			(0.033)
Geo-Time FE	ZipXPeriod	ZipXPeriod	ZipXPeriod
Prop-Loan FE	Yes	Yes	Yes
N	27,405	27,405	27,405
R-squared	0.964	0.964	0.964

Notes: This table reports the OLS estimates of Equation 4. Decline dummy variable indicates declining periods and DSCR indicates properties with DSCR ratio between 1.15 and 1.35 at origination. The specification uses the same controls as in Equation 2, including property-level fixed effects, month-zipcode fixed effects, loan-to-value (LTV) ratio, mortgage balance, remaining term, property construction year, and a renovation flag. Standard errors are clustered at the property level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table (8) DSCR Counterfactual Pass vs. Non-Pass

	Dependent Variable: $\Delta P_{i,t}$					
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta r_{i,t}$	0.060***	-0.007*	0.088***	-0.016**	0.030	0.001
	(0.020)	(0.004)	(0.028)	(0.008)	(0.033)	(0.003)
DSCR-Constrained	Both	Both	Yes	Yes	No	No
Regime	Hike	Decline	Hike	Decline	Hike	Decline
Geo-Time FE	ZipXPeriod	ZipXPeriod	ZipXPeriod	ZipXPeriod	ZipXPeriod	ZipXPeriod
Prop-Loan FE	Yes	Yes	Yes	Yes	Yes	Yes
N	22,010	5,432	18,701	4,527	18,575	4,627
R-squared	0.927	0.984	0.933	0.987	0.934	0.988

Notes: This table presents the OLS estimates for the DSCR counterfactual pass versus non-pass scenarios, with properties categorized based on their ability to meet the DSCR threshold under a FRM instead of an ARM. The dependent variable is $\Delta P_{i,t}$, representing the change in property-level rental prices. The results follow the OLS specification in Equation 2. Columns (1) and (2) present the one-month pass-through estimates during hiking and declining periods using the full sample, respectively. Columns (3) and (4) provide estimates for properties classified as DSCR-constrained ("non-pass"), while Columns (5) and (6) show the results for properties that met the DSCR threshold ("pass"). Standard errors are reported in parentheses and are clustered at the property level. Significance levels are denoted as * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table (9) LTV Interaction Effects

	Dependent Variable: $\Delta P_{i,t}$	
	(1)	(2)
$\Delta r_{i,t}$	0.077***	0.062***
	(0.018)	(0.020)
$Decline_t \times \Delta r_{i,t}$	-0.064**	-0.046*
	(0.021)	(0.028)
$HighLTV_i \times \Delta r_{i,t}$		0.033
		(0.031)
$HighLTV_i \times Decline_t \times \Delta r_{i,t}$		-0.039
		(0.038)
Geo-Time FE	ZipXPeriod	ZipXPeriod
Prop-Loan FE	Yes	Yes
N	27,856	27,856
R-squared	0.946	0.946

Notes: This table reports the OLS estimates of the specification in Equation 8. Decline dummy variable indicates declining periods and HighLTV indicates properties with above the median level of LTV at origination. The specification uses the same controls as in Equation 2, including property-level fixed effects, month-zipcode fixed effects, loan-to-value (LTV) ratio, mortgage balance, remaining term, property construction year, and a renovation flag. Standard errors are clustered at the property level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table (10) One-Month Pass-through Effects in No-Rent Control States

	Dependent Variable: $\Delta P_{i,t}$					
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta r_{i,t}$	0.062***		0.052**		0.001	
	(0.022)		(0.022)		(0.006)	
ARM=1		0.076***		0.059***		-0.021*
		(0.010)		(0.005)		(0.012)
Regime	Recent Hike	Recent Hike	Hike	Hike	Decline	Decline
Geo-Time FE	ZipXPeriod	ZipXPeriod	ZipXPeriod	ZipXPeriod	ZipXPeriod	ZipXPeriod
Prop-Loan FE	Yes	No	Yes	No	Yes	No
N	9,190	9,714	17,873	19,567	3,527	4,916
Unique Loans						2,551
R-squared	0.916	0.826	0.922	0.831	0.986	0.976

Notes: The table reports the OLS estimates of specifications in Equation 2 and 3 with samples located in no-rent control states. Columns 1, 3 and 5 reports the pass-through estimate β in specification 2 during recent contractionary monetary policy, all federal funds rate hiking periods(including the recent episode) and declining period respectively. Controls include property-leve fixed effects, month-zipcode fixed effects, LTV, DSCR, mortgage balance, remaining term, property construction year, and a renovation flag. Standard errors are clustered at the property level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table (11) Calibration

Parameter	Value	Description	Source/Target
θ_{LTV}	0.70	Loan-to-Value Ratio	Median Agency CMBS LTV
τ	1.25	DSCR Threshold	Freddie Mac Loan Assessment Table
β	0.95	Discount Factor	
ρ	0.825	Interest Rate Persistence	Campbell and Cocco(2015)
μ_r	1.2%	Mean Interest Rate	Campbell and Cocco(2015)
σ_r	1.8%	Interest Rate Volatility	Campbell and Cocco(2015)
μ	0.1	Demand function location parameter	
σ	0.8	Demand function scale parameter	Empirical Estimate on Pass-through
γ	0.4	Tenant-base Stickiness	normalized