Mortgage Choice and Monetary Policy

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The Importance of Mortgages

- Mortgages are the largest household liability in the US, and in most other developed countries.
- Mortgage rates are the main direct channel through which monetary policy affects household consumption.
- Mortgage rates also have a strong impact on the construction industry.
- Problems with mortgage lending were at the heart of the global financial crisis in 2008-09, and are affecting banks again in 2023.

TABLE 2—INTERNATIONAL COMPARISON OF THE ALLOCATION OF HOUSEHOLD WEALTH

	USA	Canada	France	Germany	Italy	Netherlands	Spain	UK
Retirement assets and life insurance	13.3	24.1	6.1	10.5	1.5	16.8	1.4	25.1
Deposits and transaction accounts	11.6	9.9	22.0	30.0	11.9	21.3	10.5	5.9
Other financial assets	2.1	1.2	1.0	3.5	0.3	0.8	0.7	0.8
Mutual funds	1.3	1.3	0.7	2.4	0.6	1.6	0.4	0.3
Directly held stocks	1.3	1.0	1.0	0.9	0.2	0.6	0.5	0.6
Bonds	0.5	0.2	0.1	0.6	1.6	0.6	0.1	1.1
Main residence	40.6	31.9	38.9	29.9	53.2	43.3	61.2	34.6
Vehicles, valuables, and other assets	22.5	22.6	18.5	13.4	19.1	11.1	8.6	28.7
Private businesses	3.5	2.6	2.7	2.0	3.4	1.7	3.2	NA
Other real estate	3.2	5.2	9.1	6.7	8.2	2.2	13.3	2.8
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Mortgage debt for primary residence	52.7	38.1	31.5	33.8	35.5	60.6	48.3	51.1
Vehicle, student loans, and other debt	31.2	28.2	44.5	32.7	50.8	22.5	35.5	34.2
Credit card debt	12.1	12.4	NA	2.3	3.0	1.1	3.4	9.8
Other debt secured with real estate	3.3	5.4	15.7	9.5	4.7	2.4	12.2	4.8
Overdrafts and credit lines	0.7	15.9	8.3	21.7	6.2	13.4	0.5	NA
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Direct and indirect risky assets	38.2	50.3	22.6	29.0	18.5	40.2	15.7	42.2
Direct and indirect equity	21.2	26.0	9.2	8.6	6.2	16.2	6.2	21.2

Notes: We calculate the respective share of each wealth category relative to the total asset and debt holdings of the household and report averages across the population. The top part of the table refers to financial and nonfinancial assets and the bottom part to mortgage and non-mortgage debt. Retirement assets include all types of defined contribution plans (public, occupational, or private) which have an account balance. NA denotes asset or debt categories for which holdings are not separately classified, or for which data has not been collected.

Source: Campbell (2016)

The US Mortgage System

- In the US, the standard mortgage is a 30-year, amortizing, nominal, fixed-rate mortgage (FRM) with a refinancing option.
  - Refinancing is a new loan origination so it requires adequate income, credit score, and home equity.
- Adjustable-rate mortgages (ARMs) are also available but the market share is typically low.
- Borrowers can borrow their closing costs ("points"), without affecting their mortgage balance, by paying higher mortgage rates.
- US mortgages are typically not assumable.
  - Except for government-backed (FHA, VA, and USDA) mortgages.

International Comparison

- The US system is an outlier internationally.
- Many countries have ARMs with initial fixation periods of 1-5 years.
- Germany has FRMs with no refinancing option.
- Denmark has both ARMs and FRMs with a refinancing option, but their system differs in several important ways:
  - The refinancing option does not depend on income, credit score, or home equity, so long as no equity is extracted.
  - It is possible to refinance at either market or face value.
  - Mortgages are typically assumable.
  - There are no points.
  - The funding system relies on covered bonds.

Problems with the US Mortgage System

1. The **mortgage channel of monetary transmission** is weak.
2. US refinancing rules worsen **inequality** by disadvantaging lower-income and less sophisticated borrowers.
3. FRMs have long and variable **duration** which can destabilize the financial system.
4. When rates rise, there can be **lock-in** effects.

Outline

- I will discuss these four problems in turn:
  - The mortgage channel of monetary transmission
  - Inequality
  - Duration and financial stability
  - Lock-in effects.
- Then I will discuss evidence on borrower preferences
  - In the time series and the cross section.
- I will conclude with some policy suggestions.

The Mortgage Channel of Monetary Transmission

The Mortgage Channel of Monetary Transmission

- The mortgage channel is not about intertemporal substitution, but about **redistribution** across agents (Auclert 2019).
- The mortgage rate affects monthly payments by borrowers but also payments received by lenders. There is an aggregate effect if borrowers change their spending more than lenders do.
  1. Borrowers are domestic residents, while some lenders are foreigners with a higher propensity to spend on foreign rather than domestic goods.
  2. Borrowers have a high marginal propensity to consume (MPC) because they are borrowing-constrained, while lenders have a low MPC because they are unconstrained permanent income consumers.
- The second argument works only if mortgage payment changes are **temporary**. If they are permanent, lenders adjust their consumption one-for-one, perfectly offsetting the effect on borrowers.

ARMs, FRMs, and the Mortgage Channel

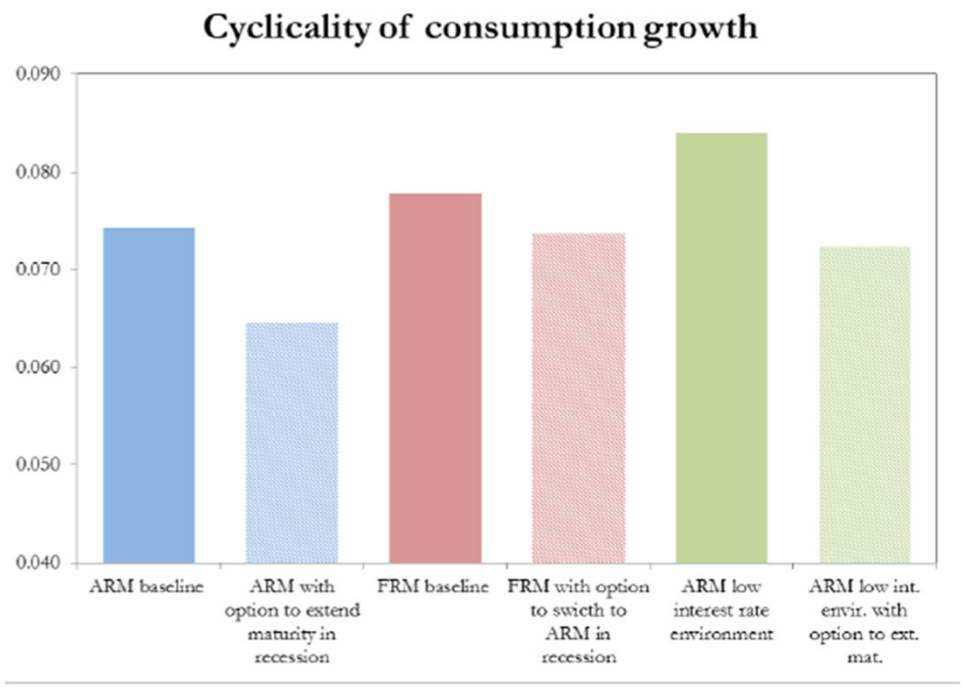
The mortgage channel works better for adjustable-rate mortgages (ARMs) than for fixed-rate mortgages (FRMs) (Di Maggio et al 2017).

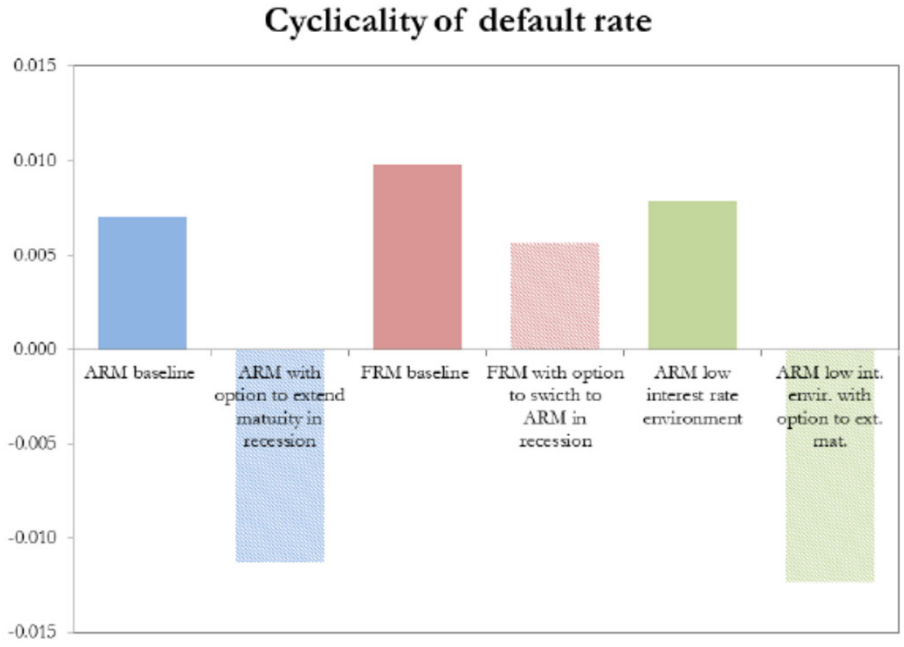
1. ARM payments are linked to the short rate but FRM payments are linked to the long-term mortgage rate which typically moves less.
2. ARM payments change for all borrowers, but FRM payments change only for new borrowers and (on the downside) refinancers.
3. The change in ARM payments is temporary while the change in FRM payments is long-lasting, so FRM lenders will adjust their consumption more, offsetting the effect on borrowers.

Can We Do Better than ARMs?

- In some circumstances the central bank may want an even stronger mortgage channel than ARMs offer.
  - For example, when the short rate is close to the zero lower bound.
- One approach is to build forbearance provisions into mortgage contracts ex ante.
  - As opposed to the ex post approach used in the Covid-19 pandemic (An et al 2022, Cherry et al 2021).
- Campbell, Clara, and Cocco (2021) studies this possibility using a structural model.
  - Importantly, the model looks at implications for default as well as consumption.

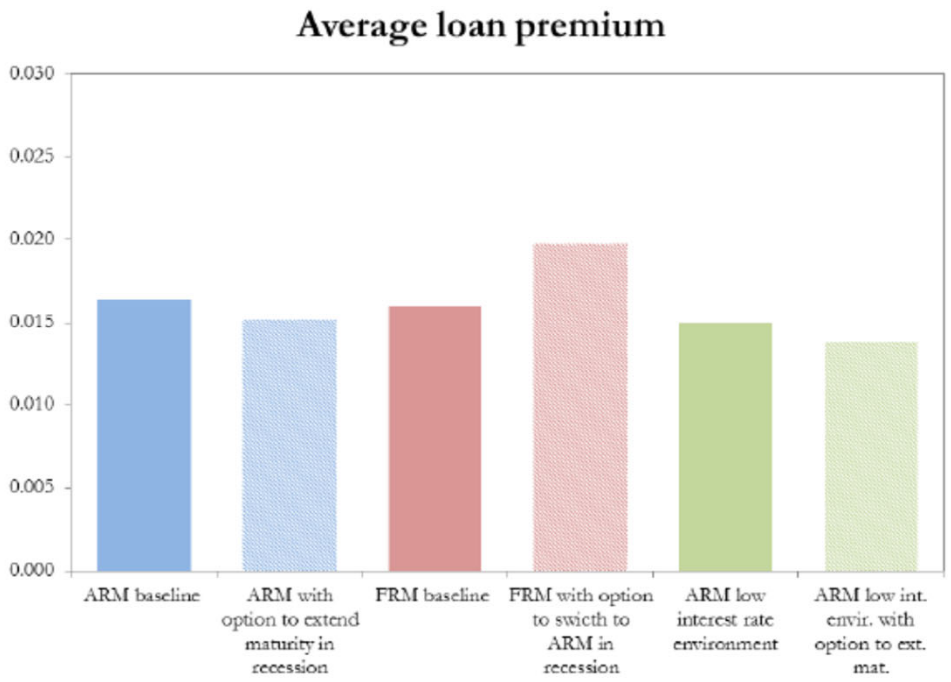
Cyclicality and Mortgage Structure

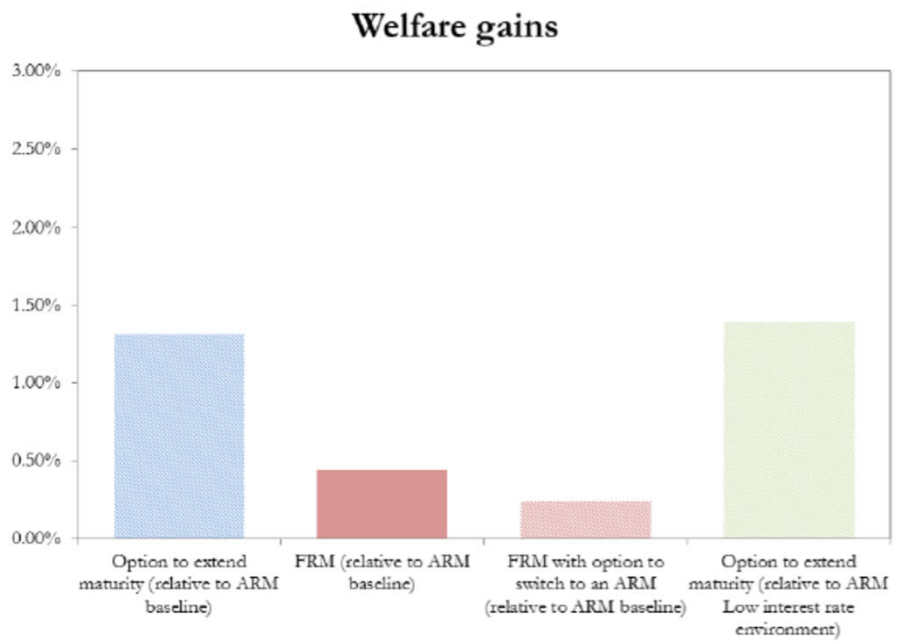




Source: Campbell, Clara, and Cocco (2021)

Cost, Welfare, and Mortgage Structure





Source: Campbell, Clara, and Cocco (2021)

Refinancing and Inequality

Who Refinances?

- In the US, refinancing requires positive home equity and an adequate income and credit score.
  - Hence, rate cuts have the weakest impact on regions with depressed home prices and high levels of unemployment (Beraja et al 2019).
  - The mortgage channel of monetary transmission is weakest where we want it to be the strongest!
- Refinancing also varies with borrower sophistication.
  - Effect can be measured in Denmark, where refinancing right is not contingent on home equity, income, or credit score (Andersen et al 2020).
  - Helps to explain racial differences in mortgage rates paid by US borrowers (Gerardi, Willen, and Zhang 2021).

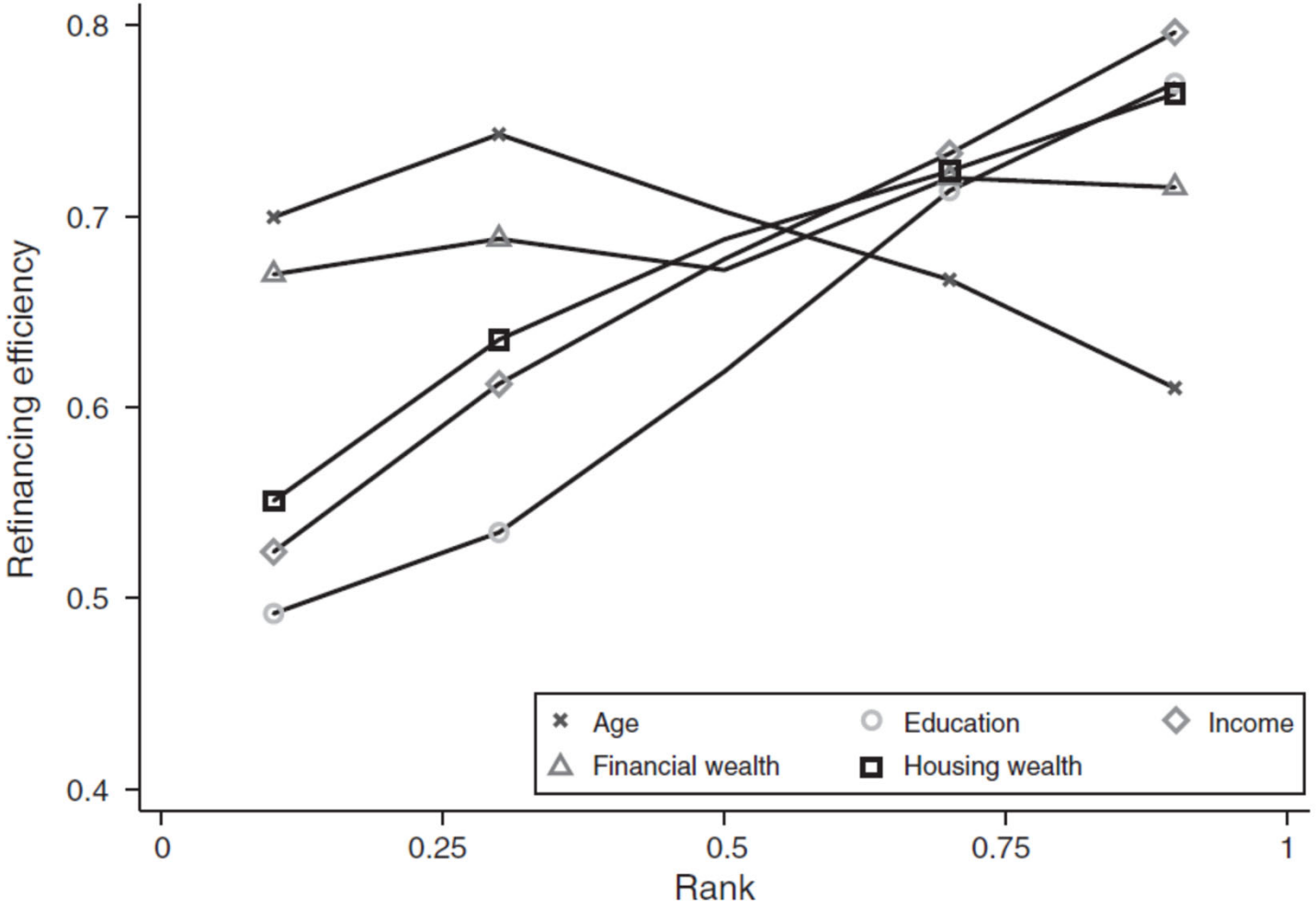


FIGURE 5. REFINANCING EFFICIENCY

Refinancing efficiency is the interest saved by refinancing as a fraction of the interest saved by the optimal strategy of Agarwal, Driscoll, and Laibson (2013).

Refinancing efficiency is measured for Danish households in different quintiles of age, education, income, financial wealth, and housing wealth.

Source: Andersen et al (2020).

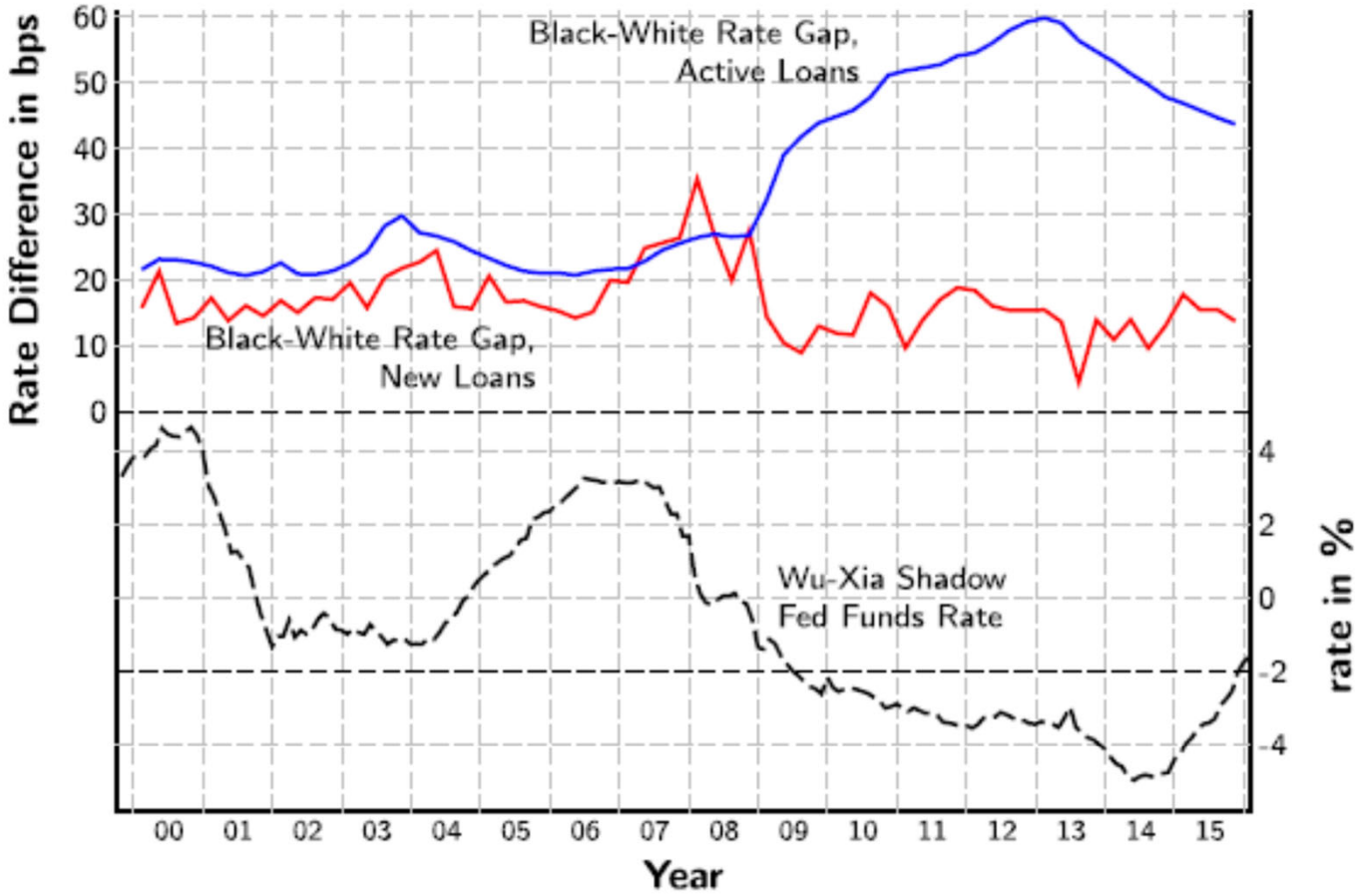


Fig. 1. Rates on outstanding mortgages insured by Fannie Mae and Freddie Mac: Black versus white borrowers for mortgages originated from 2000 to 2015.

This figure displays the unconditional rate gaps for Black and white borrowers with 30-year FRMs insured by Fannie Mae and Freddie Mac. New Loans represent mortgages originated in the quarter and active loans represent all outstanding mortgages. The rate gaps for both new loans and active loans represent raw differences not conditioned on loan and borrower characteristics. Data to compute the rate gaps come from the HMDA-McDash database. The Wu–Xia Shadow Fed Funds rate comes from https://www.frbatlanta.org/cqer/research/wu-xia-shadow-federal-funds-rate.

The black-white rate gap is small for new loans (and can be explained by other differences in borrower characteristics). It is much larger for outstanding loans, and rises when interest rates decline, reflecting the slower refinancing rate of Black borrowers relative to non-Hispanic white borrowers.

Source: Gerardi, Willen, and Zhang (2023).

Cross-Subsidy from Poor to Rich

- In a competitive market, the extra revenue that mortgage lenders get from non-refinancers is partly passed on in the form of lower up-front mortgage rates.
- This implies that sophisticated refinancers get a cross-subsidy by pooling with non-refinancers (Campbell 2006).
  - An example of Gabaix-Laibson (2006) “shrouded equilibrium”.
- The cross-subsidy makes it harder for innovators to introduce new, easier to manage mortgages.
  - An automatically refinancing mortgage, even if it reduces transactions costs, is expensive for sophisticated refinancers because they lose the cross-subsidy.
  - And unsophisticated borrowers don’t know they need it!

Mortgage Points

The closing costs a borrower pays to the lender, as a percentage of the mortgage principal, are shown in the body of the table. They can be negative (additional borrowing to cover other closing expenses). The columns correspond to different lengths of time a mortgage rate is locked in. Lower closing costs correspond to higher mortgage rates.

Source: Zhang (2023), Figure 1.

Rate	15 Day	30 Day	45 Day
3.500	4.043	4.213	4.303
3.625	2.910	3.080	3.180
3.750	2.104	2.274	2.364
3.875	1.649	1.829	1.919
4.000	0.917	1.097	1.187
4.125	0.238	0.408	0.508
4.250	(0.569)	(0.399)	(0.309)
4.375	(1.122)	(0.952)	(0.862)
4.500	(1.733)	(1.553)	(1.463)
4.625	(2.281)	(2.111)	(2.011)
4.750	(2.835)	(2.665)	(2.575)
4.875	(3.298)	(3.128)	(3.028)
5.000	(3.546)	(3.376)	(3.276)

Points Are Weird

- It's worth emphasizing how weird the points system is.
- In textbook finance, the interest rate is a single number given by the bond market. Borrowing more money increases the size of your debt but doesn't change the interest rate.
- In the points system, borrowing more money leaves the size of your debt unchanged but increases the interest rate.
- But either way, the required monthly payment goes up so why does it make any difference how you calculate it?
- Because if you refinance, you don't have to pay that higher interest rate for very long!

Points Worsen Inequality

- Zhang (2023) explores the effects of the mortgage points system.
- He shows that many borrowers who take points to cover closing costs are sluggish refinancers, and this lowers the cost of taking points for prompt refinancers.
- In equilibrium with points, calibrated to the 2013-19 period,
  - There is a transfer with an average present value of about $10,000 per mortgage from non-refinancers to prompt refinancers.
  - About 1/3 of refinances would not occur in the absence of the cross-subsidy from points. These refinances have substantial resource costs (about $1,400 for each mortgage originated at the time a house is purchased).

It's Not Just a FRM Problem

- In the US, FRMs are the mortgages that require refinancing and generate inequality
- But similar problems can arise in ARM systems too.
- In the UK (and many other countries including Canada), ARMs have teaser rates that adjust to a much higher "standard rate" after 1-5 years. Sophisticated people refinance, leaving unsophisticated people to pay high rates.
  - Problem was pointed out in the UK Miles Report in 2004.
  - Fisher, Gavazza, Liu, Ramadorai, and Tripathy (2022) document continuing transfers from poorer to richer mortgage borrowers in the UK.

Fixed Rate Mortgages and Financial Stability

FRMs and Financial Stability

- FRMs are long-term fixed-income securities, so they create maturity mismatch when they are held by deposit-financed banks.
  - This was the undoing of the savings and loan (S&L) industry when interest rates rose in the 1980s.
- The modern US securitization system is intended to solve this problem by passing mortgage interest rate risk on to MBS investors.
  - However it works imperfectly because banks hold mortgages during origination and may also buy MBS to earn a term spread.
  - Global financial crisis of 2008-09 and banking crisis of 2023.
- ARMs do not create this problem and are common in countries with deposit-financed mortgage origination.
  - Covered bonds are another solution as in Denmark.

Refinancing and Financial Stability

- Refinancing has important effects on the MBS market, broader fixed-income markets, and the banking system.
- Random variation in refinancing speed creates prepayment risk, unrelated to interest rates.
  - This cannot be hedged in Treasury markets and is priced by MBS investors (Gabaix, Krishnamurthy, and Vigneron 2007).
  - It's ironic that the least sophisticated participants in the financial system create a source of risk that is a headache for the most sophisticated players.
- Interest rate movements alter the duration of MBS, creating shocks to the supply of duration that destabilize bond markets and banks.

Interest Rates and Duration Shocks

- Interest rate increases reduce refinancing and thereby lengthen the duration of FRMs and MBS.
  - This contributes to the problems of banks like First Republic that have a large mortgage portfolio.
  - In a rising-rate environment, losses are amplified by the increasing duration of the portfolio.
- Interest rate decreases stimulate refinancing.
  - If this happened instantaneously, the refinancing option in FRMs would restrike and the duration of mortgages and MBS would be restored.
  - But it happens slowly, so there is a temporary reduction in the duration of FRMs and the overall supply of duration to the bond market.
  - Hanson (2014) documents this fact and its impact on bond yields.

The Rising-Rate Environment

Average 30-year mortgage rates.

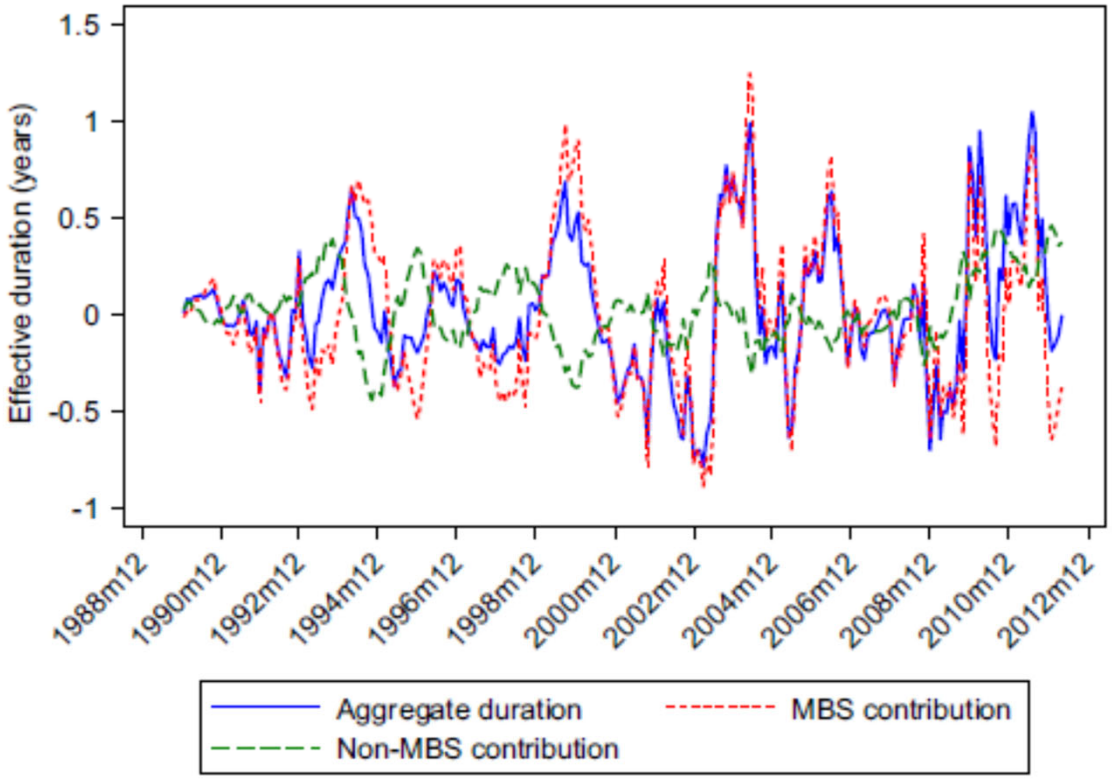
Source: FRED via Fonseca and Liu (2023).

The History of Duration Shocks

12-month change in effective duration of the Barclays Aggregate Index.

Duration rises when interest rates rise and refinancing falls. Duration temporarily declines when interest rates fall and refinancing increases.

Source: Hanson (2014).



Fixed Rate Mortgages and Lock-In

FRMs and Lock-In

- In a rising rate environment, borrowers with old FRMs are reluctant to move because by doing so they will have to replace a cheap mortgage with an expensive one.
- This reduces liquidity in the housing market and can prevent people from moving to take better jobs.
- The lock-in effect has not been salient in recent decades because rates have been trending downward.
- But it is newly relevant in 2022-2023.

Lock-In Without Rising Rates

- Because refinancing incurs fixed costs, it is not cost-effective to refinance a mortgage of typical size until the currently available FRM rate is about 1.8% below the old rate.
- Moving forces a new mortgage origination, paying a fixed cost to obtain a new mortgage rate.
- The difference between the old rate and the new rate therefore affects the overall cost of moving even if the new rate is below the old rate.

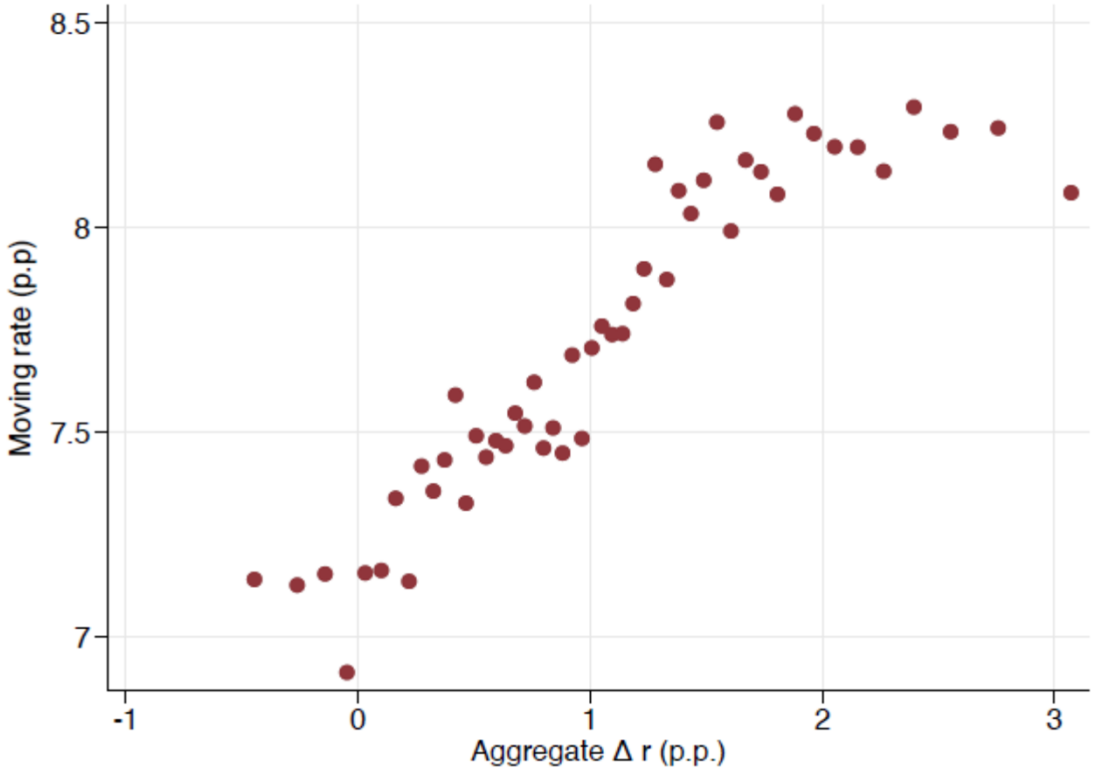
Evidence of Lock-In

Moving rate plotted against “mortgage delta”, the difference between the household’s old mortgage rate and the currently available mortgage rate.

People to the right of 1.8 are sluggish refinancers who should have refinanced without moving. People to the left of 0 are in a rising-rate environment.

Lock-in (a positive slope) occurs not only to the left of 0, but also between 0 and 1.8.

Source: Fonseca and Liu (2023).



How Big a Deal is Lock-In?

- Fonseca and Liu (2023) estimate that a 1% rise in mortgage rates lowers the annual moving rate by 70 bps (9% of the mean moving rate).
- Using forward rates as forecasts of future mortgage rates, they predict a 1.9 percentage point or 25% decline in the moving rate, relative to 2018, by 2033.
- Labor market effects are harder to estimate but can be substantial at this level of immobility.

How to Fix the Lock-In Problem?

- Lock-in can be avoided in several ways.
  - Most obviously, with ARMs.
  - Or with assumable mortgages (like FHA, VA, and USDA mortgages).
  - Or with portable mortgages (common in Canada and the UK, but not the US).
  - Or with mortgages that allow borrowers to refinance by buying back their mortgages at either market value or face value (the system in Denmark).
- Any of these alternatives avoid the distortions created by privileging non-movers over movers.
  - Similar to the distortions caused by rent control systems that adjust rents only when tenants leave, or by property tax systems that adjust valuations only when properties are sold.

Consumer Preferences for FRMs and ARMs

What Do People Naturally Choose?

- So far I have discussed mortgage systems without regard to borrower preferences.
- But it is natural to ask what types of mortgages people prefer when they are offered both FRMs and ARMs.
- In the time series, Badarinza, Campbell, and Ramadorai (2018) show in country-level panel data that the ARM share increases with the spread between the current FRM rate and the current and 1-year-ahead expected ARM rate.
  - Not surprising: interest costs matter.
- What about the cross section?

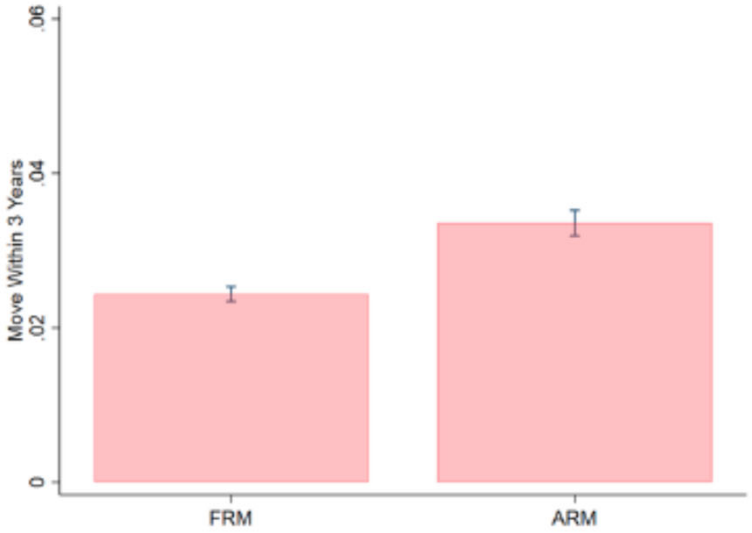
Cross Section of US Mortgage Choice

- In the US cross section, the ARM share is higher for subprime mortgages and jumbo mortgages, and lower for conforming mortgages (prime borrowers, not too large).
- This is often attributed to implicit government subsidies to FRMs provided by the credit guarantees and securitization offered by the GSEs for conforming mortgages.
  - On this interpretation, the cross-sectional pattern is evidence of a distortion in the mortgage market.
- But somewhat similar patterns are visible in Denmark!
  - Where there are no government subsidies distorting choice.

Cross Section of Danish Mortgage Choice

- Andersen, Campbell, Cocco, Hansman, and Ramadorai (2023) is an ongoing study of cross-sectional mortgage choice in Denmark.
- We find that the ARM share is higher in two separate groups:
  - Young borrowers, first-time homebuyers, with low financial assets.
  - Middle-aged borrowers, with large houses and high financial assets.
- We believe that ARMs appeal differently to these two groups:
  - The first group is borrowing-constrained and a lower current interest rate permits higher current consumption. While rates may increase in the future, income will be higher by then.
  - The second group uses ARMs as a cheap way to lever a financial portfolio. If rates increase in the future, they can always delever and pay off the mortgage.

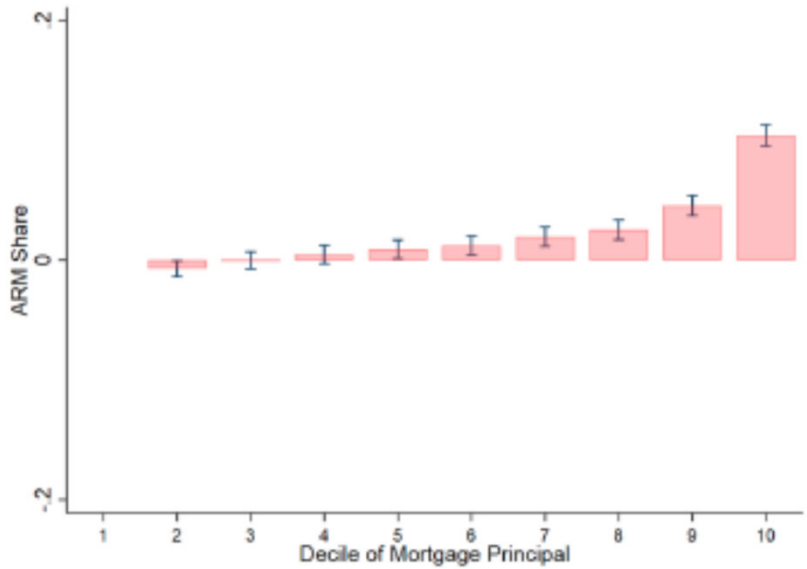
Univariate Relations with ARM Share



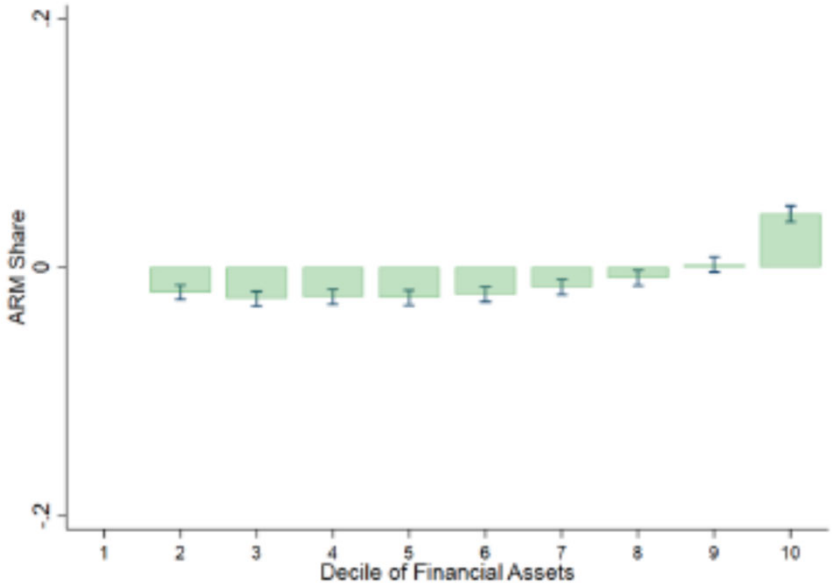
ARM borrowers are more likely to move within 3 years.

The poorest and the richest are the most likely to use ARMs.

Multivariate Relations with ARM Share



Mortgage principal to income predicts ARM share.



Financial assets to income has U-shaped effect on the ARM share.

Beyond Stylized Facts

- We are currently setting up, solving, and simulating a life-cycle model of mortgage choice.
  - An extension of Campbell and Cocco (2003, 2015).
  - The model has risky income, random interest rates, fixed costs of refinancing, LTV and PTI constraints, and choice between FRMs and ARMs.
- The goal is to show that ARMs appeal both to constrained young households and to older households with substantial financial assets and a desire for leverage.

Policy Implications

Some Thoughts on Mortgage Policy (1)

- Different countries have different mortgage systems, but the nature of these systems is highly persistent over time.
  - Hence a recommendation to radically change a mortgage system is likely to be "pie in the sky".
  - There is political resistance to institutional change (look at the GSEs!) and borrower resistance to novel mortgage products.
- Nonetheless, the traditional US FRM does not deserve the strong political support it has received in this country.
  - The US might be better off if our system were to shift in the direction of the Canadian system with mortgage rates fixed for only 5 years, not 30.
  - Monetary policy would be more effective, and the banking system more stable.

Some Thoughts on Mortgage Policy (2)

- Mortgage forbearance in a recession can be powerfully stabilizing.
  - Experience of the COVID-19 pandemic.
  - But it should be built into mortgages ex ante and appropriately priced.
- Refinancing options are hard to manage and benefit sophisticated borrowers at the expense of lower-income unsophisticated borrowers.
  - Policy should favor plain-vanilla ARMs (without teaser rates) or automatically refinancing FRMs over traditional FRMs.
  - Points are particularly pernicious. Borrowing closing costs should increase mortgage balance (without violating LTV limits), not interest rates.
- To minimize the lock-in problem, policy should favor ARMs, assumability, and portability of mortgages.

Some Thoughts on Mortgage Policy (3)

- We should not assume that the mortgages we have are the best that can be designed.
- Policy should make space for innovative mortgages with features such as:
  - Inflation indexation of principal (negative amortization in nominal terms)
  - Indexation of principal to home values (shared appreciation mortgages).
- A “regulatory sandbox” for innovation can be useful, with more careful regulation of any products that start to take off.

References (1)

- Agarwal, Sumit, John Driscoll, and David Laibson, 2013, “Optimal Mortgage Refinancing: A Closed-Form Solution”, *Journal of Money, Credit and Banking* 45, 591-622.
- An, Xudong, Larry Cordell, Liang Geng, and Keyoung Lee, 2022, “Inequality in the Time of COVID-19: Evidence from Mortgage Delinquency and Forbearance”, unpublished paper.
- Andersen, Steffen, John Y. Campbell, Kasper Meisner Nielsen, and Tarun Ramadorai, 2020, “Sources of Inaction in Household Finance: Evidence from the Danish Mortgage Market”, *American Economic Review* 110, 3184-3230.
- Andersen, Steffen, John Y. Campbell, Joao Cocco, Chris Hansman, and Tarun Ramadorai, 2023,”Heterogeneous Mortgage Choice: Evidence from Denmark”, work in progress.
- Auclert, Adrien, 2019, "Monetary Policy and the Redistribution Channel”, *American Economic Review* 109, 2333-2367.

References (2)

- Badarinza, Cristian, John Y. Campbell, and Tarun Ramadorai, 2018, "What Calls to ARMs? International Evidence on Interest Rates and the Choice of Adjustable-Rate Mortgages", *Management Science* 64, 2275–2288.
- Beraja, Martin, Andreas Fuster, Erik Hurst, and Joseph Vavra, 2019, "Regional Heterogeneity and the Refinancing Channel of Monetary Policy", *Quarterly Journal of Economics* 134, 109-183.
- Campbell, John Y., 2006, "Household Finance", *Journal of Finance* 61, 1553-1604.
- Campbell, John Y., 2016, "Restoring Rational Choice: The Challenge of Consumer Financial Regulation", *American Economic Review: Papers and Proceedings* 106, 1-30.
- Campbell, John Y., Nuno Clara, and Joao Cocco, 2021, "Structuring Mortgages for Macroeconomic Stability", *Journal of Finance* 76, 2525-2576.
- Campbell, John Y. and Joao Cocco, 2003, "Household Risk Management and Optimal Mortgage Choice", *Quarterly Journal of Economics* 118, 1449-1494.
- Campbell, John Y. and Joao Cocco, 2015, "A Model of Mortgage Default", *Journal of Finance* 70, 1495-1554.

References (3)

- Cherry, Susan, Erica Xuewei Jiang, Gregor Matvos, Tomasz Piskorski and Amit Seru, 2021, "Government and Private Household Debt Relief during COVID-19", NBER Working Paper 28357.
- Di Maggio, Marco, Amir Kermani, Benjamin J. Keys, Tomasz Piskorski, Rodney Ramcharan, Amit Seru, and Vincent Yao, 2017, "Interest Rate Pass-Through: Mortgage Rates, Household Consumption, and Voluntary Deleveraging", *American Economic Review* 107, 3550-3588.
- Fisher, Jack, Alessandro Gavazza, Lu Liu, Tarun Ramadorai, and Jagdish Tripathy, 2022, "Refinancing Cross-Subsidies in the Mortgage Market", unpublished paper.
- Fonseca, Julia and Lu Liu, 2023, "Mortgage Lock-In, Mobility, and Labor Reallocation", unpublished paper.
- Gabaix, Xavier, Arvind Krishnamurthy, and Olivier Vigneron, 2007, "Limits of Arbitrage: Theory and Evidence from the Mortgage-Backed Securities Market", *Journal of Finance* 62, 557-595.
- Gabaix, Xavier and David Laibson, 2006, "Shrouded Attributes, Consumer Myopia, and Information Suppression in Competitive Markets", *Quarterly Journal of Economics* 121, 505-540.

References (4)

- Gerardi, Paul Willen, and David Zhang, 2023, “Mortgage Prepayment, Race, and Monetary Policy”, *Journal of Financial Economics* 147, 498-524.
- Hanson, Samuel, 2014, “Mortgage Convexity”, *Journal of Financial Economics* 113, 270-299.
- Zhang, David, 2023, “Closing Costs, Refinancing, and Inefficiencies in the Mortgage Market”, unpublished paper.