

Macro Shocks and Housing Markets

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Introduction

Global Financial Crisis and COVID-19 recessions [data]

Sharp recession	(Rising unemployment, market dislocations)
Conventional policy	(fiscal stimulus, monetary rate cuts)
Unconventional policy	(Treasury & MBS purchases)
GFC housing market	(Weak sales, falling prices)
Covid housing market	(Rising sales, record prices)

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1. COVID-19 was a different type of shock.
2. Economic conditions were different when it hit.

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2. Economic conditions were different when it hit.

Favorable shock to housing demand, and strong balance sheets.

COVID: Two policy episodes

Stimulus Period

Monetary stimulus - Fed funds drops to zero

Mortgage rates fall roughly 100 bp

Fiscal stimulus provided "excess savings"

- Excess savings for potential homebuyers was limited (Aladangady et al, 2022), \$8000 - \$10,000 dollars.
- Home prices rose 20% even initially, so down payments rose more than excess savings.
- Forebearance and unemployment enhancements helped financial security but could not be used for loan underwriting.

COVID: Mortgage rates and home prices

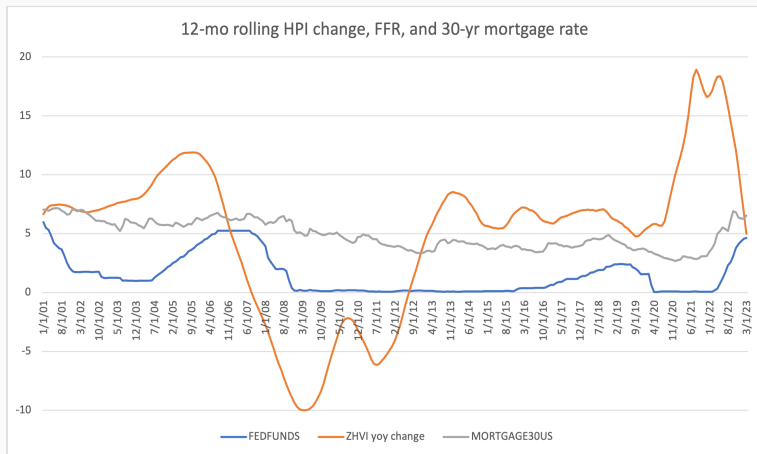


Figure 1: Annual Home Price Appreciation, Federal Funds Rate, and 30-year mortgage rate

COVID: Fiscal Support

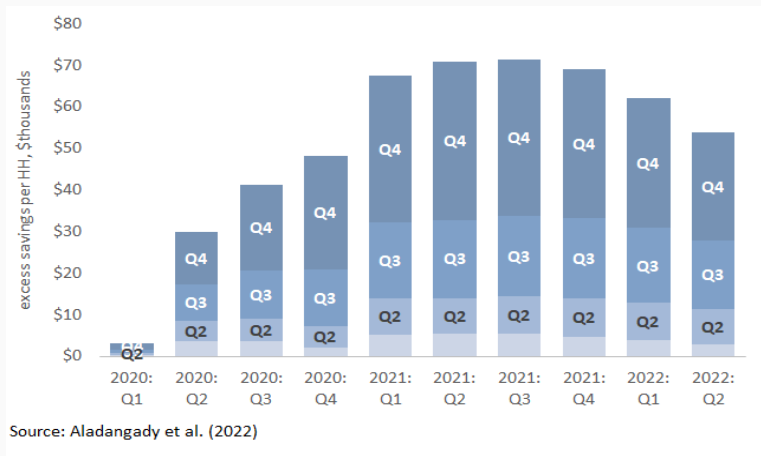


Figure 2: Estimated excess savings per household by income quartiles, thousands; first time home buyers track median income.

Supply of single family housing responded weakly

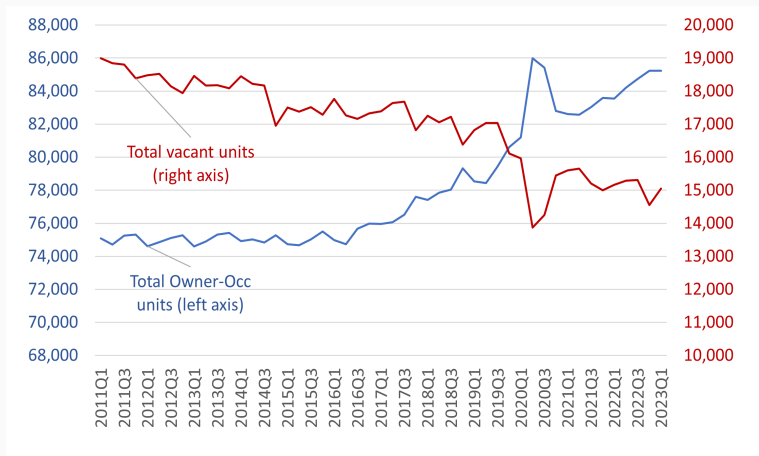


Figure 3: Stock of owner-occupied and vacant units (thousands) rose 13% over 12 years.

Supply of new housing

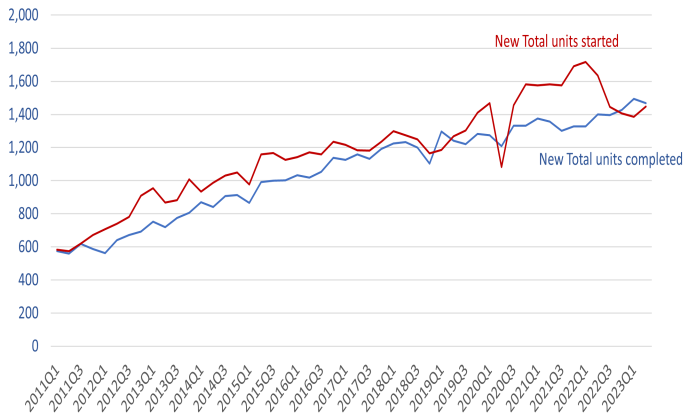


Figure 4: Flows of new owner-occupied units (thousands)

COVID: House Price Appreciation

Prices accelerated in H2 2020, rising 10% for the year and another 19% in 2021.

Stimulus was augmented by pandemic-driven demand for housing, especially single family homes.

- Working from home rose from 5% of days pre-COVID to 60% in late 2020, stabilizing at 30% from 2021 through 2023.

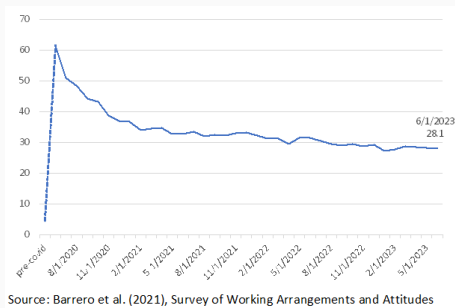


Figure 5: Working from home, Barrero, Bloom, and Davis (2021)

Second phase: Tightening

Fed tightening began in March 2022, eventually raising Fed funds by 500+ bp, and tapering asset purchases starting June 2022.

Mortgage rates rose from 3% to 6.9% by October 2022.

Yet, house prices remain near their summer 2022 peak.

Second phase: Tightening

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How to understand prices?

- Balance sheets remain strong.
- Incomes and employment remain robust.
- Pandemic-driven demand seems persistent (recall WFH).
- Supply remains on-trend: not expanding.

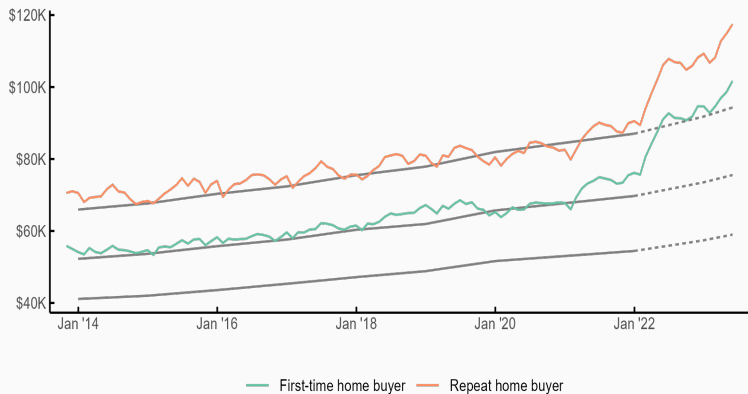
Is this enough?

Data Trends: Mortgage rates



Figure 6: eMBS mortgage interest rates for first time and repeat homebuyers, Freddie Mac 30 year fixed mortgage rate

Data Trends: Homebuyer incomes



Source: eMBS, Census Bureau, Author Estimates

Figure 7: First time and repeat homebuyer incomes compared to 40th, median, and 60th percentile ACS incomes

Use Garriga et al (2021) model of house pricing that allows for heterogeneity; we model repeat and first-time buyers.

Calibrate to data from preCOVID 2019, Stimulus 2020-21, and Tightening 2022-23.

Use the Stimulus period home price appreciation to identify the demand shock relative to 2019.

Calculate the implied impact of rate Tightening in 2022-23, given measured incomes and supply.

With log utility, relative consumption of housing services is given by

$$h_{it} = \gamma_i \frac{C_{it}}{p_t^h \left[1 - \Delta_{t+1}^h - \Delta_{t+1}^\phi \right]}, \quad \forall i, t \quad (0.1)$$

γ scales up relative demand for housing. The steady state expression for home prices, driven by demand (income, preferences) and financial conditions (interest rates, leverage):

$$p^h = \frac{r^d}{\underbrace{(1 - \phi)r^d + \phi r^m}_{\text{Direct Effect}} + \underbrace{\phi r^m (1 + r^d) \sum_{i=1}^I \left(\frac{N_i \gamma_i h_i}{\bar{H}} \right)}_{\text{Indirect Effect}}} \underbrace{\left(\frac{1 + r^d}{r^d} \right) \sum_{i=1}^I N_i \frac{\gamma_i y_i}{\bar{H}}}_{\text{Fundamentals}}$$

Table 1: Model Baseline Parameter Values

Parameter	Symbol	Baseline
Number of Types	I	2
Type 1 Buyer Income	y_1	65
Type 2 Buyer Income	y_2	80
Number of Type 1	N_1	0.46
Number of Type 2	N_2	0.54
Fixed Housing Supply	\bar{H}	100
Outside Interest Rate	r^d	0.0387
Mortgage Interest Rate before tax	r^m	0.0372
LTV constraint	ϕ	0.8
Tax benefit of mortgage balance	τ	0.25
Investor Housing Preference	γ	0.18

Notes: Parameters used in the baseline calibration.

Table 2: Alternative Scenarios: rates, income, supply, preferences

Parameter	Symbol	Stimulus	Tightening
Number of Types	I	2	2
Type 1 Buyer Income	y_1	70	76
Type 2 Buyer Income	y_2	85	90
Number of Type 1	N_1	0.42	0.41
Number of Type 2	N_2	0.58	0.59
Fixed Housing Supply	\bar{H}	104	105
Outside Interest Rate	r^d	0.037	0.0585
Mortgage Interest Rate	r^m	0.030	0.0530
LTV Constraint	ϕ	0.8	0.8
Investor Housing Preference	γ	0.21	0.21

Notes: Parameters used in the alternative policy episodes.

Table 3: Price Appreciation in Alternative Policy Scenarios

Parameter	Symbol	Stimulus	Tightening
House P Apprec (relative to baseline)	Δp^h	40.67%	-10.86%
House P Apprec (relative to peak)	Δp^h		-36.63%
Type 1 DTI increase over baseline	DTI(100)	23.21%	27.04%
Type 1 DTI increase over baseline	DTI(h_2)	33.18%	35.79%

Notes: Steady-state alternative solutions implied by the model.

Model Scenarios: Summary

Stimulus

- Given the decline in mortgage rates and rising income, prices would have risen 22% without any demand shift.
- Increasing the preference parameter from .18 to .21 (16.7%) results in a total 41% price increase, matching home price appreciation from 2020 to 2022.
- Still very sensitive to rates: reducing the rate stimulus by 30bp, reduces implied SS home price appreciation by 10 pp or 25%.

Tightening

- Even with permanently higher demand and higher incomes, the increase in mortgage rates during 2022 would more than reverse the observed appreciation, resulting in a home price decline of 36.7% compared to peak.

Data Trends

Yet home prices remain at or near historic highs from last summer, despite 200-300+ bp rate increases?

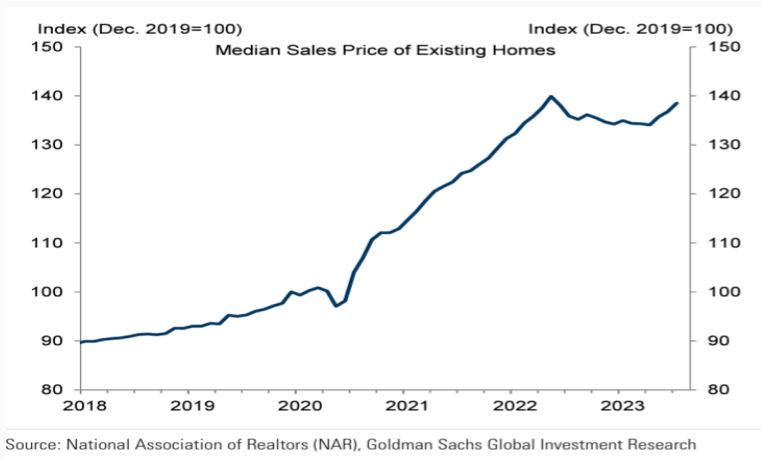


Figure 8: Median sales price of existing homes through August 2023.

Distribution of mortgage rates and market rate

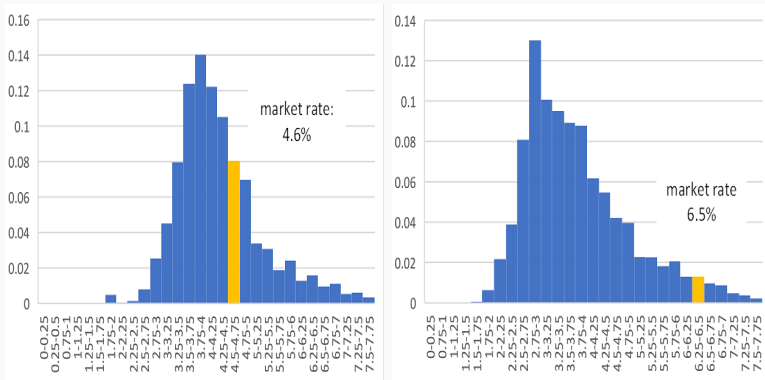


Figure 9: 30-year mortgage fixed rate distribution in 2018 (left) and 2023 (right)

Houses on offer

The median mortgage is 300 bp below market, and 71% of mortgages are 200 bp or more below market.

Fonseca and Lin (2023): each 100 bp gap between market rate and actual rate reduces probability of sale by .68 pp; empirically, homes for sale have fallen 40% from their historic rate of 7% to 4.2%.

If only a share of homes are for sale, the market clearing condition is replaced by

$$N_1 h_1 + (\rho_1 - \rho_2) N_2 h_2 = \rho_1 N_2 h_2 + \Delta H, \quad (0.3)$$

$$\text{or} \quad N_1 h_1 = \rho_2 N_2 h_2 + \Delta H, \quad (0.4)$$

equating demand from first time homebuyers ($N_1 h_1$) plus remaining existing homeowners who sell (share ρ_1) and do not exit (share ρ_2), with the supply from existing homeowners who sell plus new home completions. On net, new home buyers purchase new construction and the homes of existing owners who exit.

Mortgage Lock: existing home sales fell 40%

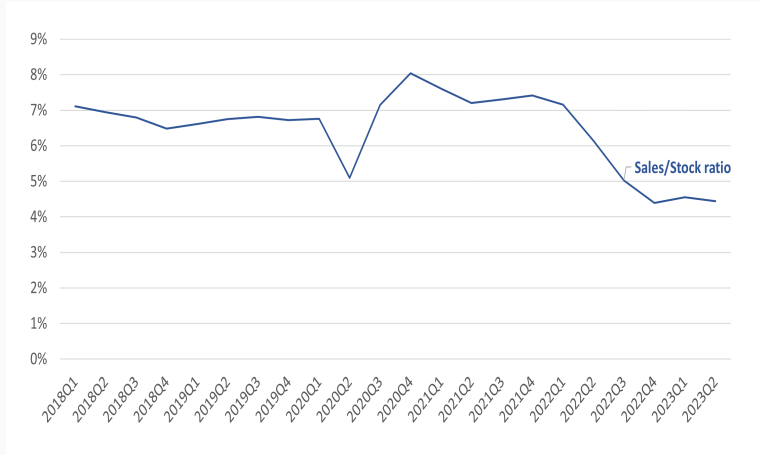


Figure 10: Sales of existing homes relative to the stock of existing owner-occupied homes

In the Baseline and Stimulus scenarios, using a Calvo model and empirical measures of ρ_i changes prices by less than 1% compared to the steady state prices.

In the Tightening scenario, the results change, in two steps:

- Calibrate a neutral moving model, choosing forced sales to match model results.
- Replace the calibrated forced sales with actual sales of existing homes.
- Fewer homes for sale increases price by 20%.

Model Scenarios: Tightening

Table 4: Moving Model with Rate Lock

Parameter	Symbol	Neutral	2022 Supply	2023 y_i
Probability of existing sale	ρ_1	0.05	0.042	0.042
Probability sale and exit	ρ_2	0.014	0.0062	0.0062
New completions/stock	$\Delta H/H$	0.007	0.007	0.007
Share of first time buyers/H	N_1	0.02	0.02	0.02
House P Apprec from peak	Δp^h	-36.4%	-14.9%	-4.6%
Type 1 Housing per buyer	h_1	95.3	81.9	82.4
Type 2 Housing per buyer	h_2	110.2	94.8	94.5

Notes: Neutral case matches the steady state by construction. Choosing ρ_1 and ρ_2 to match the data constrains supply: home price appreciation rises by 12 pp. Raising home buyer income to match 2023 data: home price appreciation rises by another 10 pp, so that overall home price decline is 4.6%. Housing per buyer drops below median.

Implications

o Policy

- Low mortgage rates fueled the boom and "rate lock"
- Restricted supply for sale, counterintuitively supports prices, despite rate increases.
- Frustrates tightening policy

o Future policy

- Low fixed rates imply little response to rate cuts (no refis)
- Rate lock implies little response to rate increases
- Future policy mechanisms limited
- Housing supply is a remaining lever
- Affordability is a major challenge

Conclusions

o Policy

- 2020-21 Stimulus, especially monetary, added to 17% demand shock driving 40% HPI
- Restricted supply for sale, perhaps due to rate lock and preferences, supports prices, despite rate reversal.

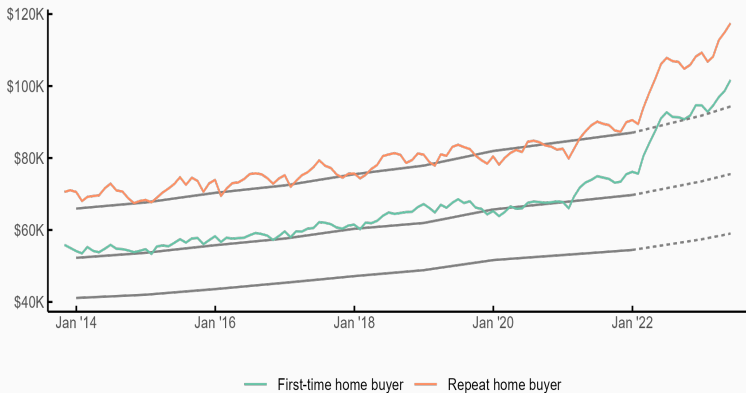
o Implications

- Rate lock implies less response to rate hikes
- Low fixed rates imply little response to rate cuts (no refis)
- Future policy mechanisms limited
 - Housing supply is a remaining lever
 - Affordability is a major challenge

o Future work

- Dynamic model - preliminary results in the paper; similar magnitudes
- Dynamic model with Calvo, or with state dependence

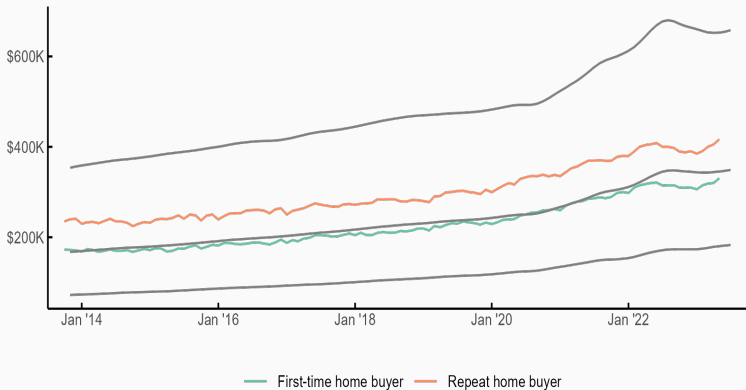
Data Trends: Homebuyer incomes



Source: eMBS, Census Bureau, Author Estimates

Figure 11: First time and repeat homebuyer incomes compared to 40th, median, and 60th percentile ACS incomes

Data Trends: Home prices



Source: eMBS, Zillow

Figure 12: Home prices for first time and repeat home purchasers compared to Zillow low, median, and high tier home price bands

Mortgage rate declines and spread compression

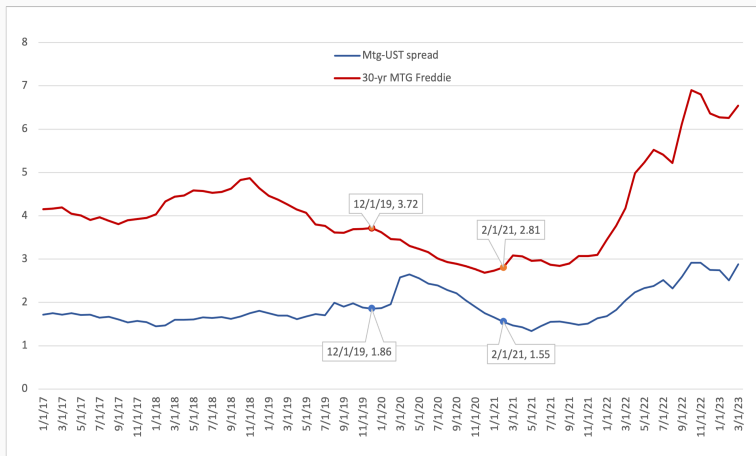


Figure 13: 30-year mortgage rate and Spread to 10-year US Treasuries

Model Scenarios: Tightening Summary

Calibrating buyer incomes to their 2023 levels, raises prices an additional 16.6%, so that in combination, prices are within 5% of the peak in 2022.

Housing per buyer falls below the SS median, suggesting poorer matches and smaller size homes.

Affordability crashes - FTHB would use 25% more of income to buy the average house, even allowing for their higher incomes.

Dynamic Model: allow for rate shocks out of steady state

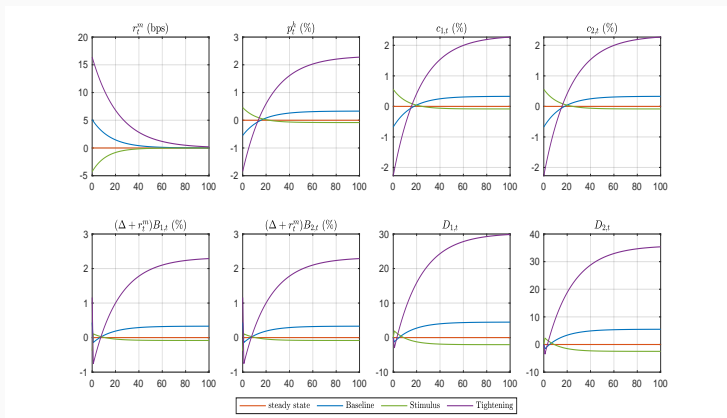


Figure 14: Impulse Responses to a 1-SD Mortgage Rate Shock with Deposit Rate Change

Dynamic Model: allow for rate shocks out of steady state

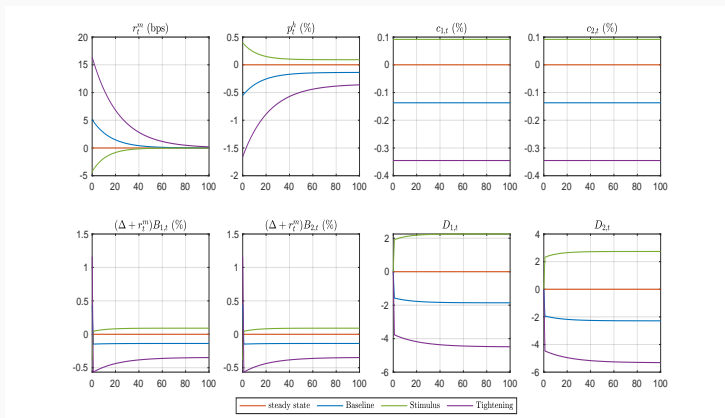


Figure 15: Impulse Responses to a 1-SD Mortgage Rate Shock with Fixed Deposit Rate

Table 5: Data Sources for Parameter Values

Parameter	Symbol	Source
Type 1 &2 Buyer Income	y_i	eMBS data
Share of each type	N_i	FRBNY CCredit Panel
Single Family Owner Occupied Units	\bar{H}	CPS/HVS data
Domestic Interest Rate	r^d	Bloomberg BB 7 year bond
Mortgage Interest Rate	r^m	Freddie Mac 30 year mtg
LTV constraint	ϕ	GSE Baseline
Tax benefit of mortgage balance	τ	Garriga et all, 2021
Median income of homeowners	y	2019 Survey of C Finance
Initial Housing Preference	γ	Inferred from SS PH/Y

Table 6: Steady State Baseline Solution

Parameter	Symbol	Baseline
House Price	p^h	3.99
Type 1 Housing Demand	h_1	88.92
Type 2 Housing Demand	h_2	109.44
Type 1 Consumption	c_1	57.08
Type 2 Consumption	c_2	70.25
Type 1 DTI increase at mean home	DTI(100)	12.46%
Type 1 DTI increase at median home	DTI(h_2)	23.08%

Table 7: Baseline and Stimulus with Moving

Parameter	Symbol	Baseline	Stimulus
Probability of existing sale	ρ_1	0.067	0.071
Probability sale and exit	ρ_2	0.027	0.024
New completions share of existing stock	$\Delta H/H$	0.0087	0.0098
Share of first time buyers/H	N_1/H	0.035	0.034
House Price chg to prev steady state	Δp^h	0.84%	0.67%

During the Baseline and Stimulus periods, the transactions of home buyers in the market give the same quantitative price as the Steady State.

