Monetary Policy and the Mortgage Market

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Monetary Policy since Covid

1. Large fluctuations in monetary policy (MP) since 2020
   - in 2020–21, Fed cut rates to zero and undertook QE due to pandemic
   - in 2022–23, Fed raised rates sharply and began QT to fight inflation

2. Despite these large fluctuations, it is unclear what impact MP had on consumer demand, employment, and inflation
   - employment and consumer spending remained strong despite rate hikes
   - inflation fell despite tight labor market and strong growth

3. The one area where MP had a clear and strong impact is the mortgage market (and by extension housing)
   - when MP was loose, mortgage rates/spreads fell to historic lows and originations boomed
   - when MP was tight, mortgage rates/spreads rose sharply and originations collapsed

The fall and rise of mortgage rates
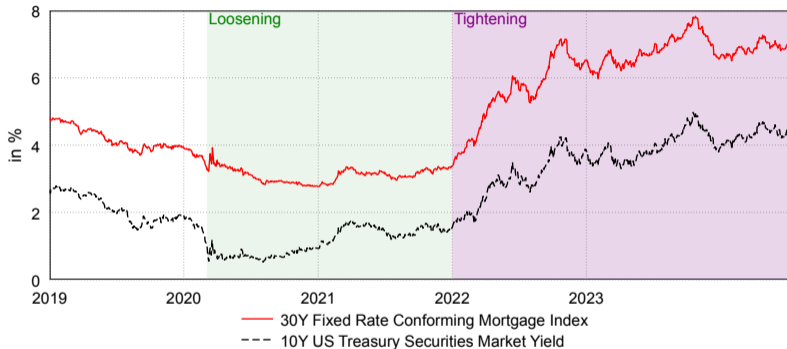
1. 2020–21: Mortgage rates fall to historic lows as Fed loosens (2.8% in Jan 2021)
2. 2022–23: Mortgage rates rise sharply when Fed tightens (7.8% in Oct 2023)
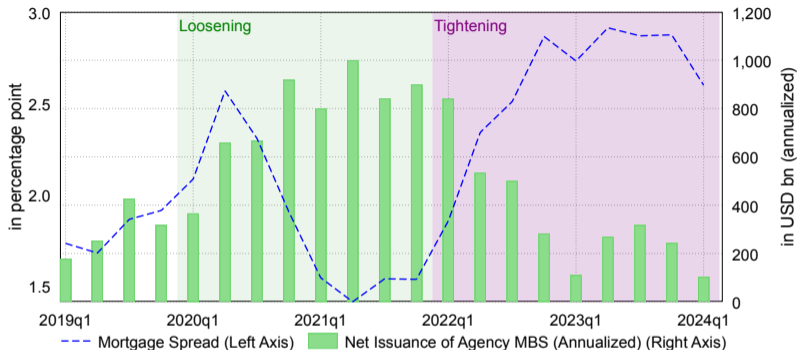
The fall and rise of mortgage spreads
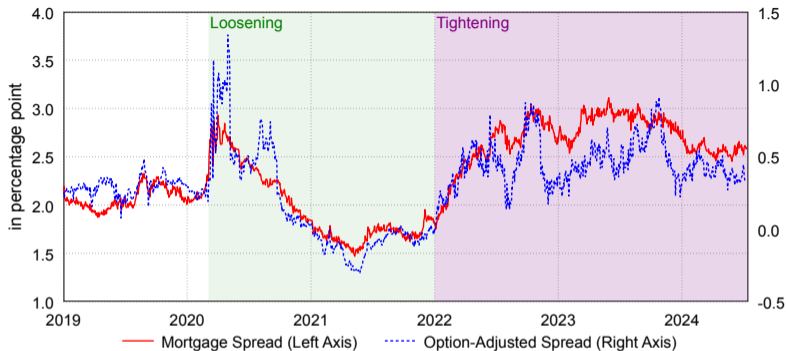
1. Mortgage rates fell and rose by more than Treasury yields
2. Mortgage spread = 30-year Mortgage rate − 10-year Treasury yield
   - captures disproportionate impact of MP on mortgage costs
   - option-adjusted spread removes the value of the prepayment option
3. Mortgage spreads narrowed when rates fell and widened when rates rose
   → mortgages became very cheap in 2020–21, expensive in 2022–23

The rise and fall of mortgage originations
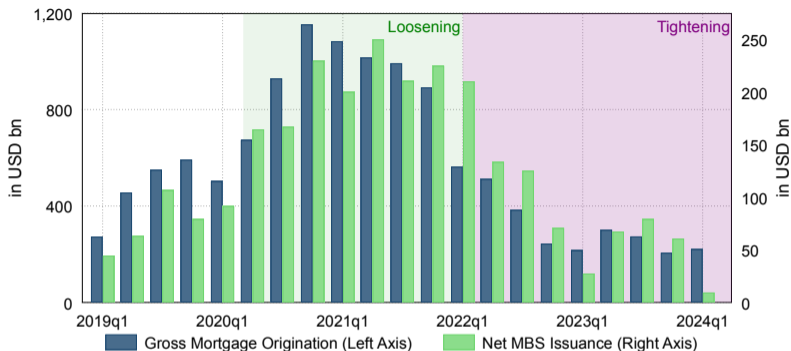
1. Mortgage originations surged 2020–21, collapsed during 2022–23
   - originations include refinancings, which do not create new credit but still boost spending
   - grew from $1.5T/year (2019) to $3.5T (2021), then fell to $1T (2023)
2. Net MBS issuance = change in total MBS dollars outstanding
   - captures net increase in securitized mortgage credit
   - tripled from $294B (2019) to $886B (2021), then collapsed to $235B (2023)

The rise and fall of mortgage credit *supply*

Legend: Loosening, Tightening

Left axis: in percentage point (1.5 to 3.0)
Right axis: in USD bn (annualized) (0 to 1,200)

- - - Mortgage Spread (Left Axis) ▮ Net Issuance of Agency MBS (Annualized) (Right Axis)

X-axis: 2019q1, 2020q1, 2021q1, 2022q1, 2023q1, 2024q1

1. Mortgage spreads (price) and mortgage originations (quantity) changed in *opposite* directions
   → **net shift in credit supply**
   - 2020–21 loose MP: mortgage supply expanded (spread fell and originations rose)
   - 2022–23 tight MP: mortgage supply contracted (spread rose and originations fell)

Why did mortgage credit supply change?

1. Standard New Keynesian theory (price rigidities) does not explain how monetary policy affects long-term *real* rates (e.g., Hanson and Stein, 2015)
   - certainly does not explain why MP disproportionately affects mortgage rates, *i.e., why it changes mortgage spreads*

2. We argue that monetary policy shifts the supply of mortgage credit by the two largest mortgage holders: banks and the Fed
   - for the Fed this is due to QE and QT
   - for banks we show it is due to the *deposits channel* of MP

3. Together, banks and the Fed bought over $2T of MBS during the loosening phase
   - these purchases are about 20% of the MBS market
   - during the tightening phase, they sold $1.2T

$\rightarrow$ MP induces large shifts in mortgage credit supply via QE and the deposits channel
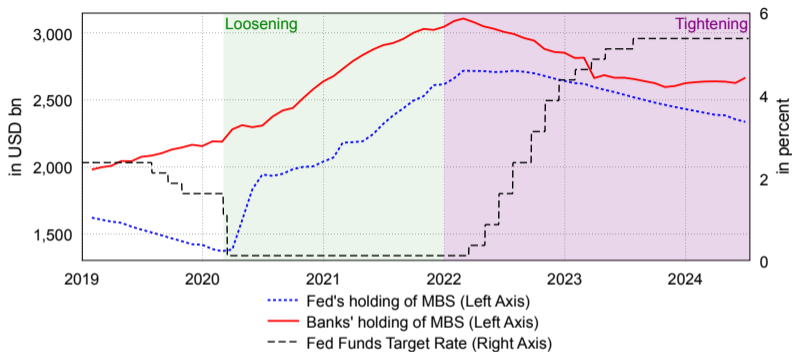
Banks and the Fed own 2/3 of all mortgages
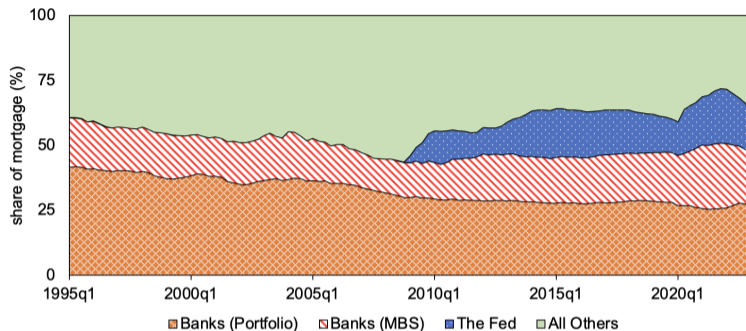
1. There is a common misconception that banks no longer play a major role in supplying mortgages credit due to securitization
2. In fact, banks have held about 50% of all mortgages for decades and their share has been stable
   - although non-banks (e.g., Rocket mortgage) now *originate* many mortgages, they immediately sell them to the GSEs, who securitize them into MBS and sell them to investors
   - it is these ultimate investors who determine the cost of mortgage credit
3. Main recent change has been the rise of the Fed, which reduced the share of other investors (e.g., mutual funds, pension funds, foreign investors)

Fed's MBS Holdings under QE

Fed's holding of MBS (Left Axis) — — — Fed Funds Rate (Right Axis)
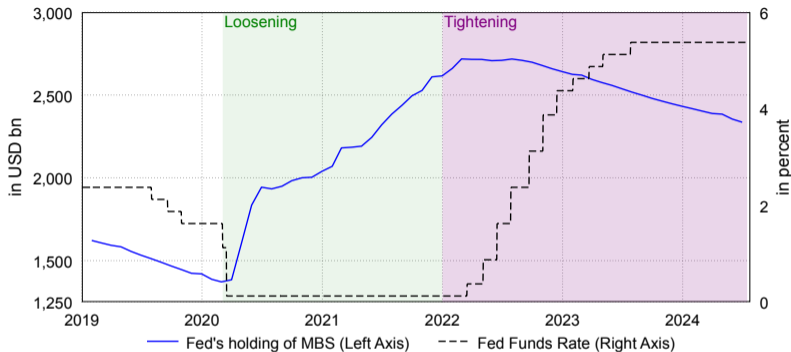
1. Under QE, the Fed increased its MBS holdings by \$1.3T, from \$1.4T in 2019Q1 to \$2.7T in 2022Q1
   - equal to about 13% of the total stock of residential MBS
2. From 2022Q2 to 2023Q4, under QT, the Fed decreased its MBS holdings by \$0.3T, from \$2.7T to \$2.4T
   - the Fed is price insensitive: it buys/sells MBS regardless of price

Banks' MBS Holdings

Legend:
- ······ Fed's holding of MBS (Left Axis)
- —— Banks' holding of MBS (Left Axis)
- - - - Fed Funds Target Rate (Right Axis)

1. From 2020-21 banks bought about $1T in MBS (50% increase)
2. From 2021Q4 to 2023Q4, they decreased their MBS holdings by $0.5T
3. Banks and the Fed bought MBS when prices were high (spreads were low) and sold when prices were low (spreads were high)
→ Suggests their buying/selling was moving prices, not responding to them. Why?

Banks buy and sell MBS because of deposits
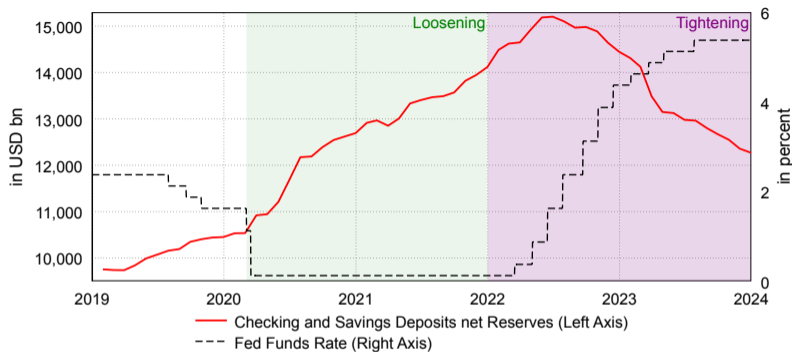
1. In 2020–21 banks had large inflows of "low-beta" deposits (savings + checking)
   - these deposits grew by $4.3T (net of the increase in reserves)
   - we net out reserves to avoid counting deposits created by QE
2. In 2022–23 banks had large outflows of low-beta deposits
   - $1.6T decrease in savings + checking deposits (net of reserves)
3. Low-beta deposits have low and insensitive rates → they function like long-term debt
   → banks invest low-beta deposits in long-term fixed-rate assets (primarily mortgages)
   - Drechsler, Savov, Schnabl (2021)

Why do deposits flow in and out?

Interest rate on checking and savings deposits
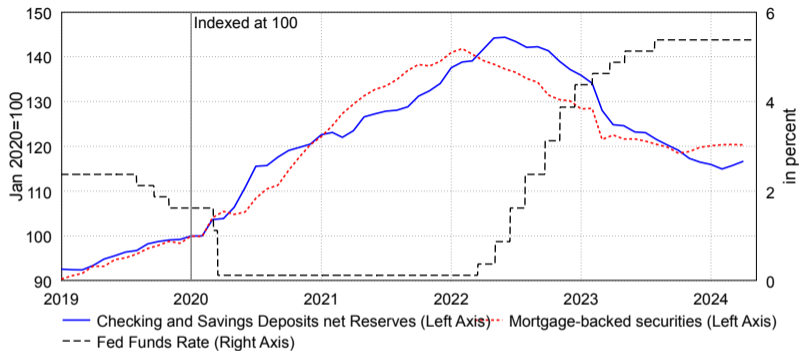--- Fed Funds Rate
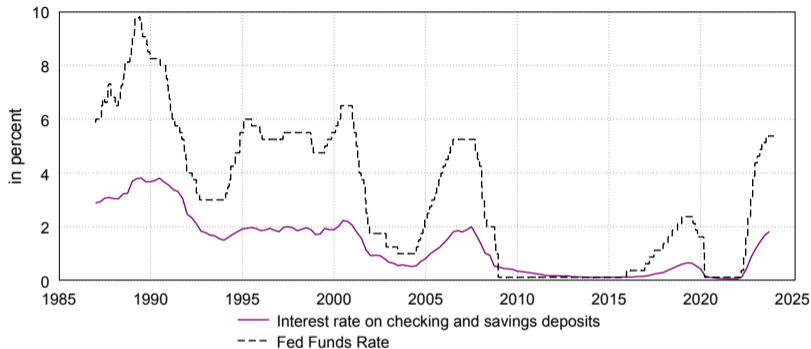
1. Deposits channel of monetary policy (DSS, 2017): MP (short-term rate) drives the flow of deposits in and out of the banking system

2. Banks have deposit market power → keep deposit rates low as the Fed raises rates
   - makes deposits expensive to hold → deposits flow out
   - deposits flow back in when the Fed cuts rates

The deposits channel of MP has been robust over time

Legend:
— Savings and Checking Deposits net Reserves (YoY %) (Left Axis)
····· Fed Funds Rate (YoY Δ) (Right Axis)
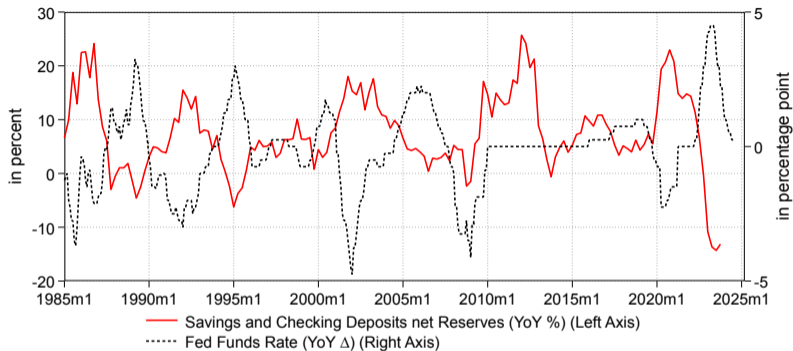
1. When the Fed raises rates, banks keep deposit rates low → makes deposits expensive to hold → some deposits flow out
   - bank earns large profits (spreads) on deposits that stay
   - the reverse occurs when the Fed decreases rates → deposits flow *in*
2. Explains why deposits flowed in from 2020-2021 and flowed out from 2022-2023

Banks invest low-beta deposits in MBS

Checking and Savings Deposits net Reserves (Left Axis) ···· Mortgage-backed securities (Left Axis)
--- Fed Funds Rate (Right Axis)

1. Banks invest low-beta deposits in long-term fixed-rate assets
   - deposits have low beta → deposit rate is insensitive to market rate → functions like long-term debt → banks hedge by buying long-term fixed rate assets (DSS, JF 2021)
   - the largest category of such assets is MBS
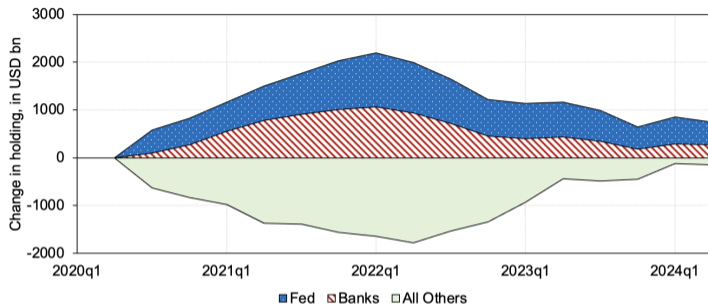   → Banks invest a substantial share of deposit inflows into MBS

Banks invest deposits in MBS (cross section)
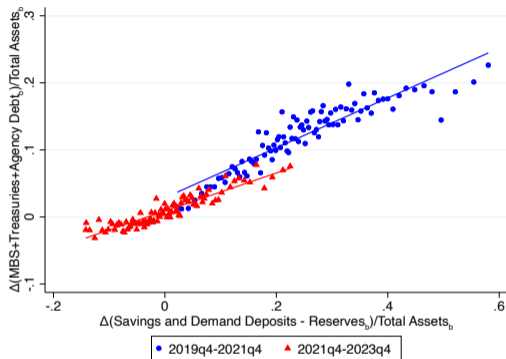
1. The relationship between deposit growth and long-term fixed-rate asset purchases (right, MBS + treasuries) also holds in the cross section
   - holds for both loosening phase (blue circles) and tightening phase (red triangles)

Bank and the Fed vs. other MBS investors

1. Other MBS investors (asset managers, foreign investors) are not directly affected by MP
   - instead, they are sensitive to the price (spread) of MBS

2. When banks and the Fed bought MBS, these other investors sold
   - to get them to sell, the mortgage spread had to fall (MBS price had to rise)
   - during tightening, to get them to buy, the mortgage spread had to rise

Putting it all together
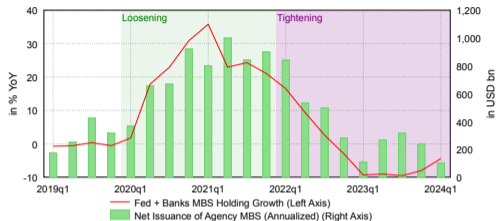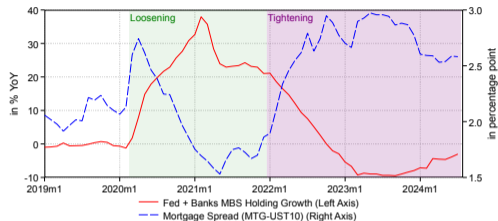
1. Monetary policy drove the supply of mortgage credit
   - it did so through the Fed under QE/QT
   - and through banks under the deposits channel
2. When the Fed + banks bought, they drove down mortgage costs and originations surged
3. When the Fed + banks sold, they drove up mortgage costs and originations collapsed
$\rightarrow$ Explains why MP had a disproportionate impact on mortgage credit/housing

Beyond the recent cycle

Deposits and Bank MBS holdings

Bank MBS Holdings and the MBS Spread
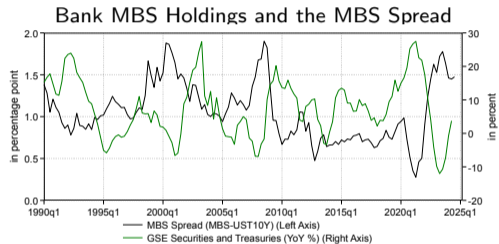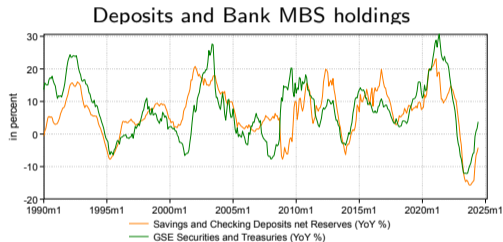
1. While QE/QT is recent, MP has always driven banks' supply of mortgage credit
2. Implies the mortgage market will continue to be central for MP transmission

Model: setup

1. Simple model to quantify the impact of MP on mortgage credit via QE and deposits channel

2. Time $t \geq 0$. Asset: MBS with endogenous yield R_t^{MBS}

3. Fed MBS purchases: F_t, exogenously given (QE)

4. Bank MBS purchases B_t in proportion to deposits (DSS, 2021):

$$B_t = \alpha^B D_t$$

   - α^B = MBS portfolio share
   - D_t = deposits

5. Investor MBS purchases I_t depend on their spread:

$$I_t = \alpha^I (R_t^{MBS} - R_t) + \epsilon_t^I$$

   - α^I = investors' demand elasticity for MBS
   - ϵ_t^I = latent demand shock (e.g., flight to safety)

Model: market clearing

1. MBS Supply

$$S_t = -\alpha^S R_t^{MBS} + \epsilon_t^S$$

   - $\alpha^S =$ mortgage borrowers' elasticity w.r.t. mortgage *rate*
   - $\epsilon_t^S =$ latent supply shock (e.g., work-from-home)

2. Market clearing:

$$F_t + B_t + I_t = S_t$$

3. Can estimate in scaled changes (stationary)

$$\frac{\Delta F_t}{S_{t-1}} + \frac{\Delta B_t}{S_{t-1}} + \frac{\Delta I_t}{S_{t-1}} = \frac{\Delta S_t}{S_{t-1}}$$

Model: equilibrium

1. The equilibrium MBS spread is

$$R_t^{MBS} - R_t = -\frac{1}{\alpha^I + \alpha^S}(F_t + \alpha^B D_t) - \frac{\alpha^S}{\alpha^I + \alpha^S}R_t - \frac{1}{\alpha^I + \alpha^S}(\epsilon_t^I - \epsilon_t^S)$$

2. The MBS spread is
   - decreasing in Fed and bank purchases F_t and $B_t = \alpha^B D_t$
   - decreasing in the level of rates R_t due to lower demand by mortgage borrowers
   - decreasing in the latent investor demand shock ϵ_t^I net of the latent supply shock ϵ_t^S

$\rightarrow$ Need to identify α^I and α^S to quantify impact of Fed and bank purchases on mortgage spread and quantity

Identification

1. OLS regression of investor holdings on MBS spread to identify their demand elasticity is biased because the spread depends on the latent demand shock:

$$\widehat{\alpha}^I_{OLS} = \frac{Cov(I_t, R_t^{MBS} - R_t)}{Var(R_t^{MBS} - R_t)} = \alpha^I - \frac{1}{\alpha^I + \alpha^S} \frac{Var(\epsilon_t^I)}{Var(R_t^{MBS} - R_t)} < \alpha^I$$

   - same OLS bias for supply elasticity α^S due to latent supply shock

2. In the model, Fed purchases F_t are exogenous and hence a valid instrument:

$$\widehat{\alpha}^I_{IV} = \frac{Cov(I_t, F_t)}{Cov(R_t^{MBS} - R_t, F_t)} = \frac{-\frac{\alpha^I}{\alpha^I + \alpha^S}}{-\frac{1}{\alpha^I + \alpha^S}} = \alpha^I$$

3. Identification assumption: the macro conditions that drive Fed purchases (output, inflation) are uncorrelated with latent MBS demand and supply shocks
   - can control for macro conditions and check sensitivity of results
   - if Fed cares about MBS market directly, Fed purchases would rise when the MBS spread is high and we would not find anything
   - estimate regressions pre-Covid (up to 2019) and apply to 2020–23

First stage: Fed MBS purchases shrink mortgage spreads

	(1)	(2)	(3)	(4)	(5)	(6)
			Δ Mortgage spread			
Δ Fed MBS	−4.233***	−4.430***	−5.294***	−4.385***	−5.632***	−4.519**
	(0.985)	(0.899)	(1.039)	(1.317)	(1.287)	(2.125)
Δ Fed Treasury		1.635*				1.319
		(0.864)				(2.457)
ZLB			0.041		0.039	
			(0.085)		(0.076)	
Δ Fed funds rate			−0.218**		−0.246***	
			(0.087)		(0.080)	
Δ GDP gap				0.008	0.015	
				(0.054)	(0.041)	
Δ Inflation gap				0.072	0.115	
				(0.104)	(0.075)	
Expected Δ Fed Net MBS						−7.170
						(4.443)
Constant	0.047	0.014	0.077	0.040	0.071	0.043
	(0.041)	(0.037)	(0.059)	(0.045)	(0.062)	(0.059)
Obs.	40	40	40	40	40	28
R^2	0.310	0.362	0.426	0.324	0.459	0.218

1. Mortgage spread shrinks when Fed purchases MBS
   - robust to controlling for observable macro conditions
   - holds for *unexpected* Fed purchases (using survey of forecasters)
2. Magnitude: if Fed buys 10% of MBS ⇒ mortgage spread shrinks by 42 bps

Bank MBS purchases and deposits

	(1) 1990–19	(2) 2010–19	(3) 1990–19	(4) 2010–19	(5) 1990–19	(6) 2010–19	(7) 1990–19	(8) 2010–19
				Δ Bank MBS / Total				
Δ Mortgage spread	−0.004 (0.006)				−0.004 (0.005)		−0.004 (0.005)	
Δ $\widehat{\text{Mortgage spread}}$		0.021 (0.022)				0.009 (0.020)		0.009 (0.015)
Δ Deposits			0.123*** (0.037)	0.211*** (0.046)	0.124*** (0.037)	0.175** (0.081)	0.141*** (0.047)	0.185*** (0.066)
ZLB							−0.003 (0.003)	−0.003 (0.004)
Δ Fed funds rate							0.001 (0.001)	−0.002 (0.005)
Δ GDP gap							−0.001 (0.001)	0.003 (0.002)
Δ Inflation gap							−0.003 (0.003)	0.002 (0.005)
Constant	0.014*** (0.002)	0.013*** (0.002)	0.007** (0.003)	−0.002 (0.004)	0.007*** (0.003)	0.000 (0.006)	0.007** (0.003)	−0.000 (0.006)
Obs.	120	40	120	40	120	40	120	40
R^2	0.010	0.124	0.187	0.389	0.198	0.404	0.231	0.474

1. Bank MBS purchases are insensitive to the mortgage spread (OLS or IV)
   - driven instead by deposits
   - coefficient similar to MBS portfolio share
→ Banks hedge deposits with MBS as in DSS (2021)

Investor MBS purchases

	Δ Investor MBS / Total						
	(1) 1990–19	(2) 1990–19	(3) 2010–19	(4) 2010–19	(5) 2010–19	(6) 2010–19	(7) 2010–19
Δ Mortgage spread	0.092*** (0.035)	0.065*** (0.019)	0.104** (0.051)	0.099*** (0.035)			
Δ Mortgage spread (hat)					0.338*** (0.084)	0.210*** (0.033)	
Δ Mortgage spread, lag (hat)							0.193*** (0.034)
ZLB		−0.113*** (0.016)		−0.057*** (0.017)		−0.043** (0.019)	−0.059*** (0.020)
Δ Fed funds rate		−0.012* (0.006)		0.011 (0.017)		0.035* (0.021)	0.025 (0.023)
Δ GDP gap		−0.003 (0.005)		−0.009 (0.011)		−0.005 (0.012)	−0.001 (0.017)
Δ Inflation gap		−0.016 (0.016)		−0.043* (0.022)		−0.048*** (0.013)	−0.030** (0.013)
Constant	0.054*** (0.011)	0.075*** (0.008)	−0.008 (0.013)	0.031** (0.013)	−0.008 (0.015)	0.016 (0.017)	0.023 (0.019)
Obs.	120	120	40	40	40	40	40
R^2	0.161	0.667	0.222	0.644	0.728	0.805	0.805

1. Unlike banks, investor MBS purchases are highly sensitive to the mortgage spread
   - IV estimate significantly higher, consistent with OLS bias
   - implies $\widehat{\alpha}_{IV}^{I} = 0.21 \rightarrow$ when spread widens by 100 bps, investors buy 21% of MBS

Supply elasticity

	Δ Mortgage Originations / Total					
	(1) 2010–19	(2) 2010–19	(3) 2010–19	(4) 1990–19	(5) 1990–19	(6) 1990–19
Δ Mortgage rate	−0.039*** (0.012)			−0.070*** (0.012)		
Δ Mortgage rate, lag		−0.065*** (0.011)	−0.070*** (0.008)		−0.104*** (0.013)	−0.108*** (0.017)
ZLB			−0.042*** (0.013)			−0.040** (0.018)
Δ Fed funds rate			−0.015 (0.018)			0.005 (0.012)
Δ GDP gap			−0.014* (0.008)			−0.008 (0.008)
Δ Inflation gap			0.002 (0.011)			0.009 (0.021)
Constant	−0.003 (0.010)	−0.005 (0.008)	0.029*** (0.009)	0.003 (0.012)	−0.004 (0.010)	0.007 (0.012)
Obs.	40	40	40	116	116	116
R^2	0.210	0.566	0.736	0.231	0.506	0.535

1. Mortgage originations depend on mortgage rate, not spread $\Rightarrow$ cannot use Fed purchases instrument
   - OLS estimate for gross mortgage originations: $\widehat{\alpha}^S_{Gross} = 0.108$
   - use first stage coefficient $\widehat{\beta}^{Firststage} = -\frac{1}{\alpha^I + \alpha^S}$ and $\widehat{\alpha}^I_{IV}$ gives $\widehat{\alpha}^S_{Net} = 0.043$

Counterfactual analysis

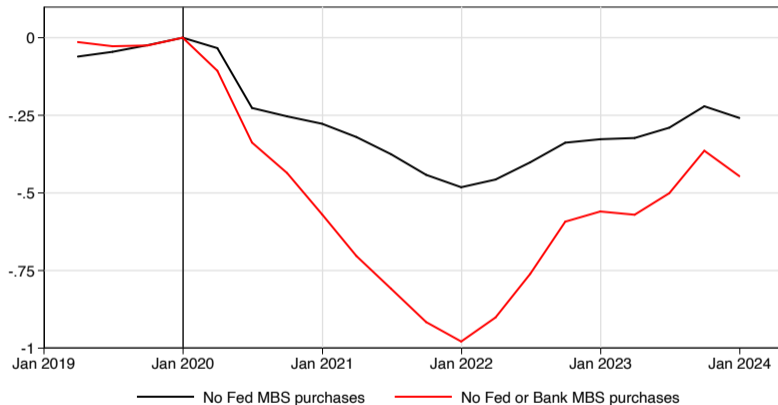1. Use $\widehat{\alpha}_{IV}^I$ and $\widehat{\alpha}_{IV}^S$, estimated pre-2019, to construct counterfactual MBS spreads, net issuance, and mortgage originations post-2020:

$$\Delta \widehat{Spread}_t = -\frac{1}{\widehat{\alpha}_{IV}^I + \widehat{\alpha}_{IV}^S} \times (\Delta F_t + \Delta B_t) \tag{1}$$

$$\Delta \widehat{NetMBS}_t = \frac{\widehat{\alpha}_{IV}^S}{\widehat{\alpha}_{IV}^I + \widehat{\alpha}_{IV}^S} \times (\Delta F_t + \Delta B_t) \tag{2}$$

$$\Delta \widehat{GrossOriginations}_t = \frac{\widehat{\alpha}_{Gross}^S}{\widehat{\alpha}_{IV}^I + \widehat{\alpha}_{IV}^S} \times (\Delta F_t + \Delta B_t) \tag{3}$$

Impact on MBS Spread
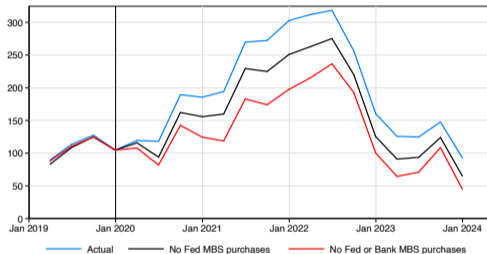

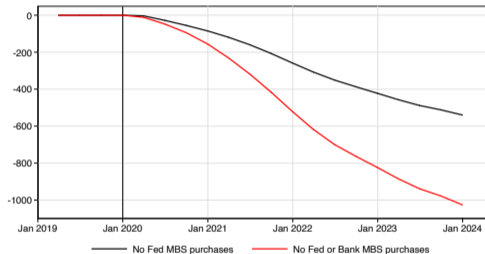Legend: — No Fed MBS purchases — No Fed or Bank MBS purchases

1. We estimate Fed and bank MBS purchases lowered MBS spreads by 100 BPS at the peak
   - Banks account for 50 bps or about half

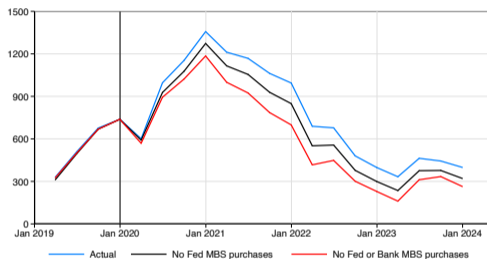# Impact on Net MBS Issuance

Net MBS Issuance, Quarterly
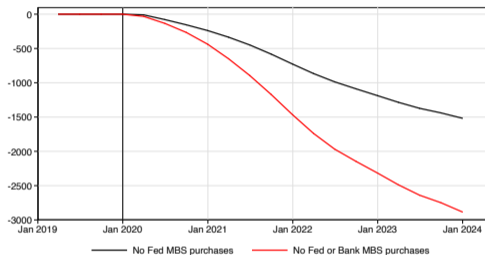
Net MBS Issuance, Cumulative

1. We estimate that at the peak, Fed and bank MBS purchases raised net issuance by about $100 billion per quarter
   - cumulative effect of about $1T

Impact on gross mortgage originations

Mortgage Originations, Quarterly — Mortgage Originations, Cumulative

1. At the peak, Fed and Bank MBS purchases raised gross originations (including refis) by about $300B per quarter
   - cumulative effect of about $3T
   - refis significantly impact household spending (Di Maggio et al., 2017; Eichenbaum et al., 2022; Agarwal et al., 2023)

Takeaways

1. Monetary Policy has a large impact on the supply of mortgage credit

2. It drives the mortgage credit supply of the two largest mortgage holders: banks and the Fed
   - for the Fed it does so directly via QE
   - for banks it does so via the deposits channel of MP

3. Mortgage markets are central to the transmission of monetary policy