

# When Treasuries Crowd the Debt Market: Treasury Market Inelasticity and the Basis Trade

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# Motivation

Since the Global Financial Crisis,

- the Fed purchased  $\approx 40\%$  of long-term Treasuries through quantitative easing (QE).
- more recently, it has offloaded these holdings via quantitative tightening (QT).

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**QT by design:** maturing Treasuries run off the Fed's balance sheet without reinvestment.

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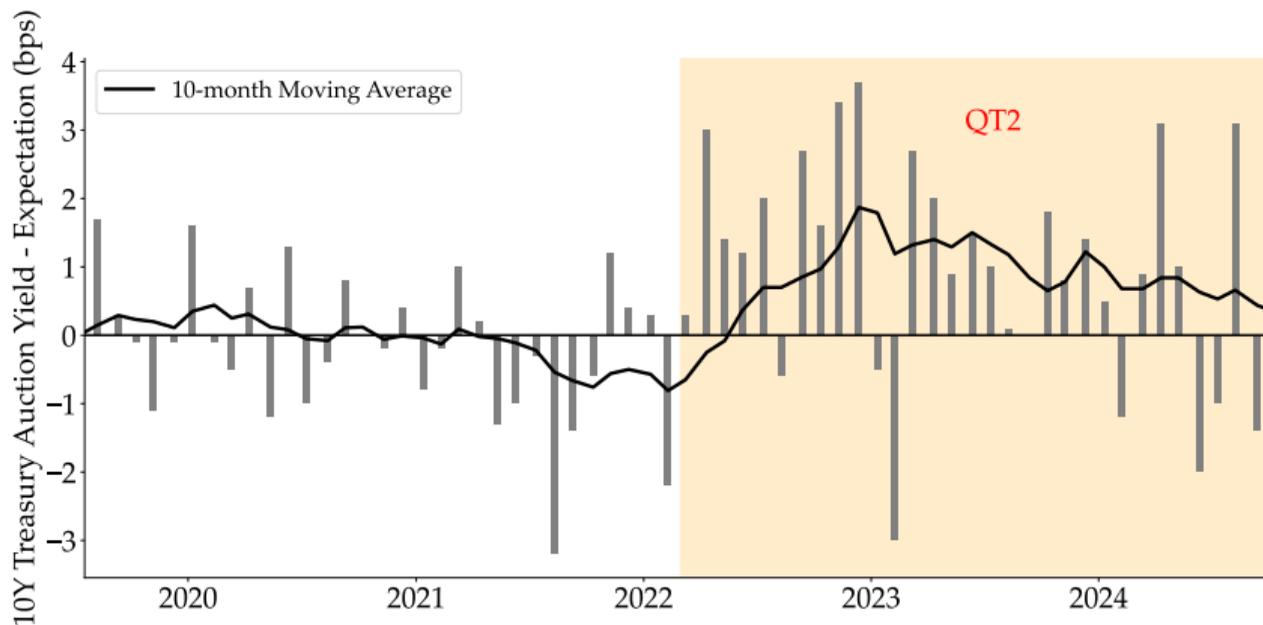
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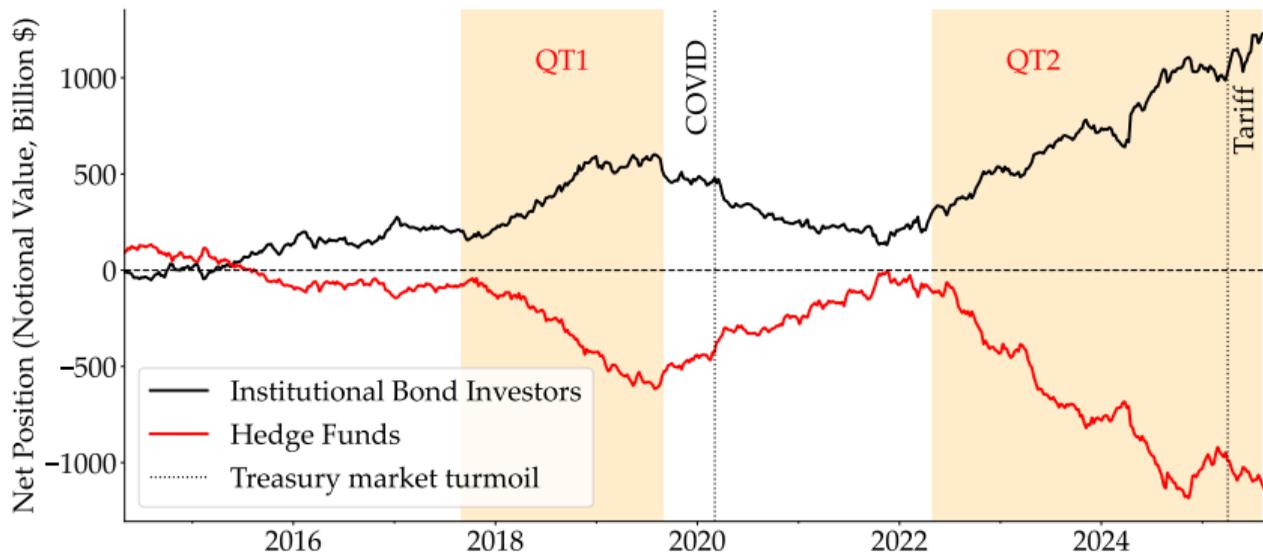
**But the recent QT episode has been anything but quiet.**

# Fact 1. Inelastic Demand in the Treasury Market



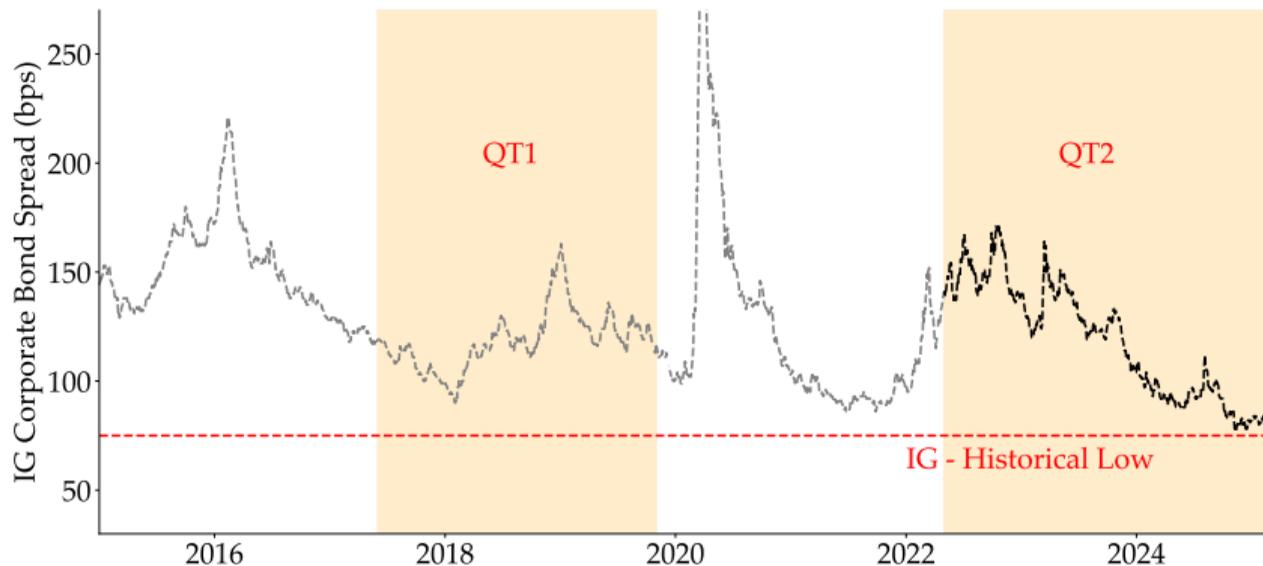
## Fact 2: Institutional Bond Investors Increasingly Purchase Treasury Derivatives Rather Than Cash Bonds

- Fact 1: Inelastic Treasury demand.

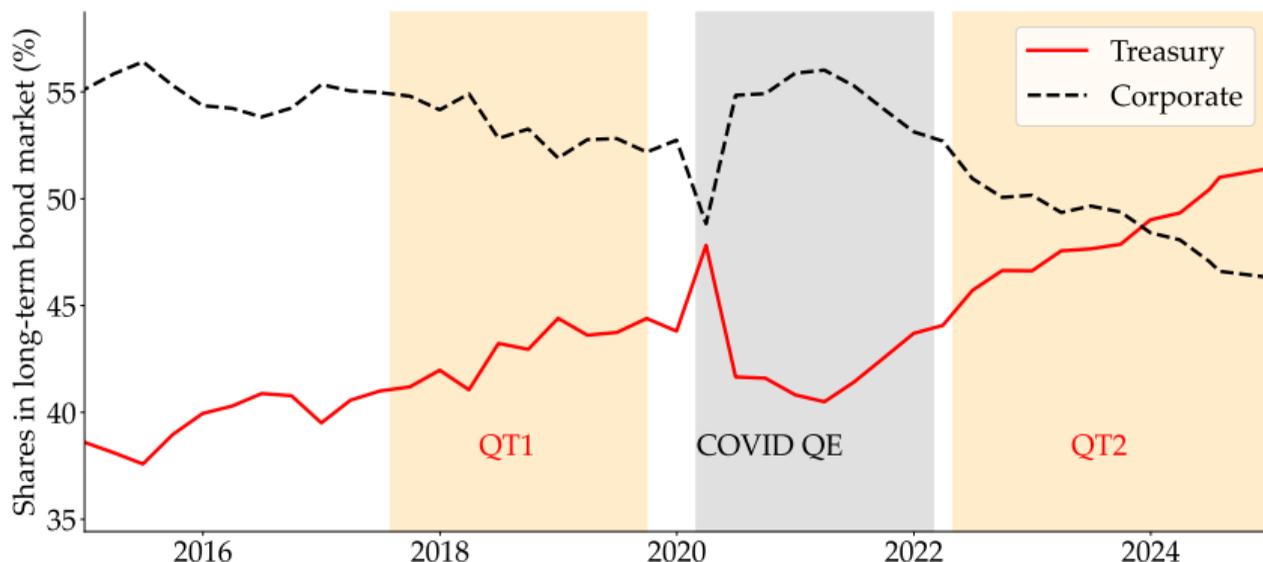


## Fact 3: Credit Spreads Have Fallen to Historical Lows Despite the Fed Tightening

- Fact 1: Inelastic Treasury demand.
- Fact 2: Treasury derivative usage.



# QT: Sharp Rise in Treasury Bonds Relative to Corporate Bonds



**Figure:** The Treasury share and corporate bond share in the long-term bond market

◀ Level Supply vs Demand

◀ Bond Market Composition

◀ Corporate Market Timing

◀ Share after 09 crisis

# This Paper: Higher Treasury Share, More Segmented Markets

- Institutional bond investors face **duration mandates** and **leverage constraints**.
- Corporate bonds efficiently satisfy duration mandate, also providing credit exposure.
- Corporate bond share  $\downarrow \Rightarrow$  investors rely more on Treasuries to meet duration mandates  $\Rightarrow$  tighter leverage constraints.

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- Corporate bond share  $\downarrow \Rightarrow$  investors rely more on Treasuries to meet duration mandates  $\Rightarrow$  tighter leverage constraints.
- $\Rightarrow$  weaker substitutability between Treasuries and corporate bonds  $\Rightarrow$  more segmented markets
  1. Treasury supply shocks spill over less to corporate bonds and stay in Treasury market.
  2. Constrained investors actively use Treasury derivatives for leverage.

# Key Idea: Corporate Bonds as a Preferred “Risk Bundle”

## Region 1: high corporate share

Asset	Liability
<b>\$10B</b> <i>Corp. Bond</i>	<b>Liability</b> <b>\$12B</b>
<b>\$2B Cash</b>	

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## Region 2: low corporate share

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“Synthetic corp. bond”

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“Synthetic corp. bond”

## Region 2: low corporate share

Asset	Liability
\$8B <i>Treasury</i>	Liability \$12B
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“Synthetic corp. bond”  
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Region 2: rebalance less between Treasuries and corporate bonds.

# Duration Mandate and Derivative Usage in Bond Investors' Words

## The 2024 US Treasury Market Conference

*"...we are looking to achieve a portfolio that has **the same cash flow dynamics and interest rate dynamics as our liabilities**...We are going to incorporate spread assets...into that asset allocation, and a lot of those [assets] will be shorter duration or intermediate duration...**We look to the derivatives markets to adjust the duration of our portfolios.**"*

— Joseph Demetrick, senior vice president at MetLife

*"...asset managers measure their performance against a **benchmark** that includes a high percentage of medium-term and long-term Treasuries...They invest in corporate bonds and other fixed income securities with credit risk because they offer higher yields than Treasuries. ...**they use Treasury futures to replicate the Treasury exposure.** That allows them to keep the credit exposure overweight that generates higher returns but still maintain **the target level of duration**..."*

— David Rogal, head of total return and inflation portfolios at BlackRock

# Results Preview

**Model:** The composition of asset supply shapes the degree of market segmentation

1. State-dependent Treasury supply effects across:
  - (1) Treasury market, (2) corporate bond market, (3) Treasury derivative market.
2. Hedge fund basis trade.

**Empirical Evidence:**

1. Aggregate level:
  - Novel Treasury supply shocks constructed from the Treasury issuance calendar.
  - **Stronger** effects on Treasury yield, but **weaker** pass-through to corporate bond market when bond investors are more constrained.
2. Micro-level evidence from data on bond investors' derivative positions.

**Policy Implications:** QE–QT asymmetry and optimal QT timing.

[References](#)[Closest Related Literature](#)

# Theoretical Framework

# Institutional Background

1. Fixed-income markets are *partially segmented* across asset classes and maturities.
2. Mutual funds, pension funds, and insurance companies trade across markets:
  - hold more than 60% of long-term Treasuries and corporate bonds;
  - are subject to **duration mandates** and **leverage constraints**.

	Duration mandate	(Financial) leverage constraint
<b>Bond Mutual Funds</b>	Bond benchmark index	Investment Company Act of 1940
<b>Pension Funds</b>	Retirement benefit payments	Employee Retirement Income Security Act of 1974
<b>Insurance Companies</b>	Life insurance policies and annuities	NAIC risk-based capital regulation; State-level insurance laws on borrowing limits

Their aggregate debt-to-asset ratio is below 1.5% (Financial Stability Board, 2023).

◀ Bond Allocators Share

◀ Facts from Micro Data

## Model Setup: Bond Supply

Three periods  $t \in \{0, 1, 2\}$ . At  $t = 0$ , the interest rate is fixed at  $i_0$ .

1. **Government (and the Fed)** supplies

- long-term Treasury bonds ( $T$ ) with quantity  $S_T$ ,
- short-term Treasury bills, with supply elastic to market demand.

2. **Representative firm** fulfills its financing needs by issuing

- short-term corporate bonds ( $S$ ) with quantity  $S_S$ ,
- long-term corporate bonds ( $L$ ) with quantity  $S_L$ .

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- long-term corporate bonds ( $L$ ) with quantity  $S_L$ .

- **Credit risk:** the firm may default at  $t = 1$ , and the **log default loss** follows

$$z_1 \sim \mathcal{N}(\bar{z}, \sigma_z^2), \quad \bar{z} > 0.$$

- **Duration risk:** the interest rate at  $t = 1$  follows  $i_1 = i_0 + \epsilon_1^i$ ,

$$\epsilon_1^i \sim \mathcal{N}(0, \sigma_i^2).$$

# Model Setup: Bond Supply

- Three risky assets:
  - Long-term Treasury: **duration risk**.
  - Long-term corporate bond: **duration risk** and **credit risk**  $\Rightarrow$  “**risk bundle**”.
  - Short-term corporate bond: **credit risk**.
- All bonds are zero-coupon bonds with face value equal to 1.
- One-period log excess returns follow

$$ex_1^T = 2y_0^T - i_1 - i_0$$

$$ex_1^L = 2y_0^L - i_1 - z_1 - i_0$$

$$ex_1^S = y_0^S - z_1 - i_0$$

# Model Setup: Bond Demand

Two kinds of investors:

1 **Bond allocator** can invest across markets (arbitrageur à la Vayanos and Vila (2021)).

$$\max_{w_T, w_L, w_S} \mathbb{E}_0[ex_1^{\text{portfolio}}] - \frac{\gamma}{2} \text{Var}_0[ex_1^{\text{portfolio}}]$$

$$\text{s.t. } ex_1^{\text{portfolio}} = w_T ex_1^T + w_L ex_1^L + w_S ex_1^S$$

$$w_T + w_L = \bar{D}$$

$$w_T + w_L + w_S \leq 1$$

**[Duration Mandate]**

**[Leverage Constraint]**

- *Cross-market bond mutual funds*
- *Insurance companies and pension funds*

◀ Micro foundation: duration mandate

# Model Setup: Bond Demand

Two kinds of investors:

- 1 **Bond allocator** can invest across markets (arbitrageur à la Vayanos and Vila (2021)).
- 2 **Specialized investor**  $g$  in market  $g \in \{T, L, S\}$ :

$$D_g = \varepsilon_g \mathbb{E}_0[ex_1^T], \quad \forall g \in \{T, L, S\}.$$

- *Foreign reserve managers* in government bonds.
- *Mandate-driven investors* (Gabaix and Koijen, 2021).

# Equilibrium Results under Two Regions

## Assumption (Fixed short-term credit spread)

*Short-term corporate bond specialists have perfectly elastic demand:  $\varepsilon_S \rightarrow \infty$ . Hence fix the short-term credit spread at a constant level.*

## Proposition (Equilibrium under two regions)

*The economy features a **slack region** and a **binding region**. Under the **binding region**, bond allocators hit the leverage constraint, and Treasury supply shocks have:*

- i) a **stronger** price impact on Treasury yield.*
- ii) a **weaker** price impact on long-term corporate bond yield.*

# Leverage Constraint Binds when Treasury Share is High

## Proposition (Boundary condition for two regions)

Denote  $\bar{S}_{Long} \equiv S_L + S_T$ . The boundary condition between slack region and binding region follows

$$g(\bar{S}_{Long}, S_T, \bar{D}) \equiv \underbrace{(\varepsilon_L + \varepsilon_T)S_T}_{\text{Treasury share}} + \underbrace{\varepsilon_T(\bar{D} - \bar{S}_{Long})}_{\text{Duration demand relative to supply}} + \text{const.} \quad \begin{cases} > 0 & \text{(binding region),} \\ < 0 & \text{(slack region).} \end{cases}$$

**More likely entering binding region under:**

1. **High Treasury share**  $\Rightarrow$  use more Treasuries for duration mandate.
2. High duration mandate ( $\bar{D}$ ) relative to total duration supply ( $\bar{S}_{Long}$ ).

◀ Comparative analysis

# Allocator Portfolio Balancing Relates Three Markets

- Allocator ensures “no-arbitrage” between long- and short-term bonds:

$$\underbrace{\mathbb{E}_0[ex_1^L] - \mathbb{E}_0[ex_1^T]}_{\text{long-term credit spread}} = \underbrace{\mathbb{E}_0[ex_1^S]}_{\text{short-term credit spread}} - \underbrace{\lambda}_{\text{shadow cost of leverage constraint}}$$

- $\lambda > 0$ : accept lower spread for the long-term credit  $\rightarrow$  preference for long-term corp.

◀ Data: term structure of credit spread

# How do Treasury Supply Shocks Affect Bond Yields?

$$\underbrace{\mathbb{E}_0[ex_1^L] - \mathbb{E}_0[ex_1^T]}_{\text{long-term credit spread}} = \underbrace{\mathbb{E}_0[ex_1^S]}_{\text{short-term credit spread}} - \underbrace{\lambda}_{\text{shadow cost of leverage constraint}}$$

Yield

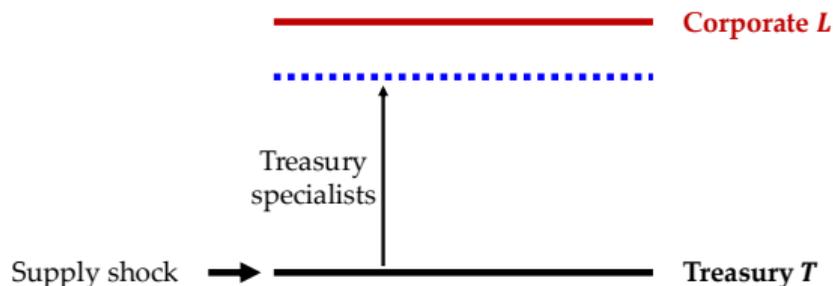
————— Corporate *L*

Supply shock → ————— Treasury *T*

**1. Positive Treasury supply shock hits the Treasury market**

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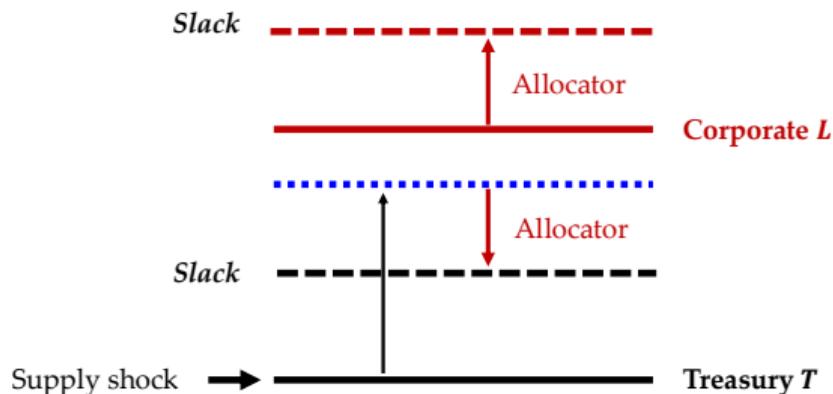
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**2. Undiversified treasury specialists drive up treasury yield**

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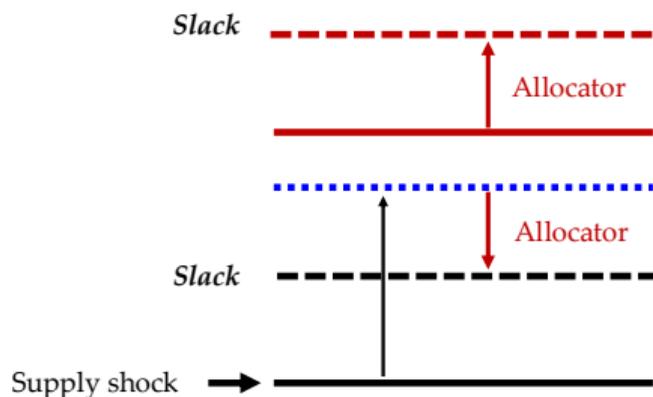


**3. Treasuries being cheaper, the allocator:**

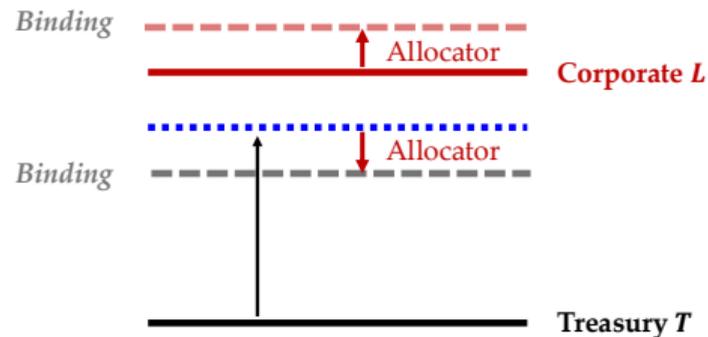
- (1) rebalances from corporate bonds to Treasuries.
- (2) adds short-term bonds to regain credit exposure.

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- 3. Treasuries being cheaper, the allocator:**  
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- 4. Binding region: less rebalancing**

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5. Supply shock in the binding region: (1) greater price impacts on Treasuries and (2) narrower long-term credit spread.

## Extension: Model with Treasury Derivatives

**Hedge funds (and dealers):** long cash Treasuries (T) and short Treasury derivatives (D)

- Choose the derivative supply  $S_D$ :

$$\max_{S_D} S_D \mathbb{E}_0[ex_1^T - ex_1^D] - \frac{\kappa}{2} (S_D \sigma)^2$$

- $\frac{\kappa}{2} (S_D \sigma)^2$ : balance sheet costs of holding cash bond/risk of basis trade.

◀ Intermediation cost

- Derivative supply curve:

$$S_D = \varepsilon_D \mathbb{E}_0[ex_1^T - ex_1^D], \text{ with supply elasticity } \varepsilon_D \equiv \frac{1}{\kappa \sigma^2}$$

◀ Price convergence

◀ Future basis trade and swap trade

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**Allocator:** duration mandate can be met with cash bonds or derivatives:

$$\text{[Duration Mandate]} \quad w_L + w_T + w_D = \bar{D}$$

# Benefit of Basis Trade: Partially Restore Treasury Market Elasticity

Proposition (Basis trade **partially** restores Treasury market elasticity)

$$\text{Treasury market elasticity} : \underbrace{\varepsilon_{TT}^{\text{Slack}}}_{\text{slack region}} > \underbrace{\varepsilon_{TT}^{\text{BasisTrade}}}_{\text{binding region} + \text{basis trade}} > \underbrace{\varepsilon_{TT}^{\text{Binding}}}_{\text{binding region}}$$

**Bond market “No-arbitrage condition”:**

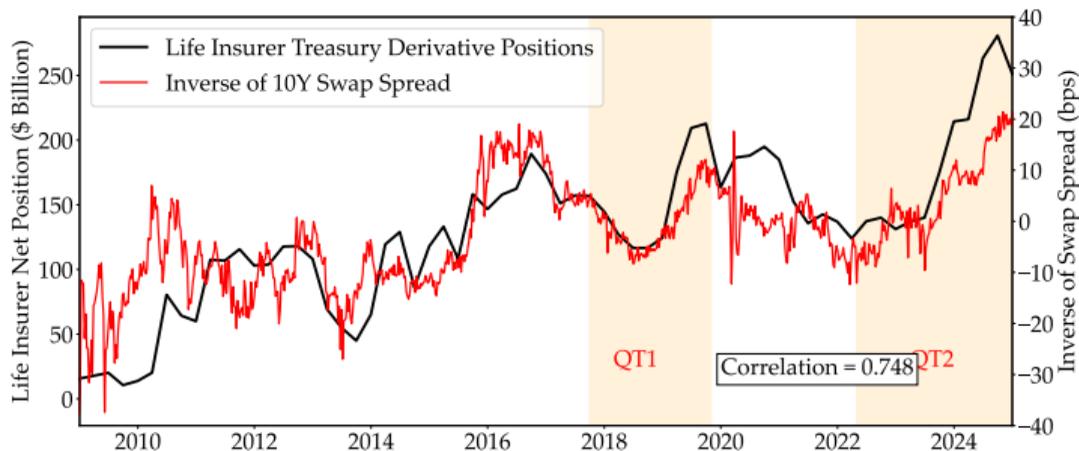
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- Derivative spread = rental cost of hedge funds/dealers' balance sheets.

# Derivative Spread as Allocators' Leverage-constraint Measure

## Proposition (Basis Trade and Derivative Spread)

1. Higher Treasury share and duration mandate  $\bar{D} \Rightarrow$  more constrained balance sheet  $\Rightarrow$  higher derivative positions.
2. Higher derivative positions  $\Rightarrow$  wider derivative spread charged by HFs/Dealers.



# Summary: Model Predictions to Test with Data

## 1. Bond allocators become more leverage constrained when:

- the Treasury share in the debt market  $S_T$  is large.
- facing a higher duration mandate  $\bar{D}$ .

## 2. When they are more constrained:

- take larger positions in Treasury derivatives, fueling basis trade;
- $\Rightarrow$  Treasury derivative spreads widen  $\Rightarrow$  proxy for constraints *in the aggregate level*.

◀ Robustness: future spread, demand-supply decomposition.

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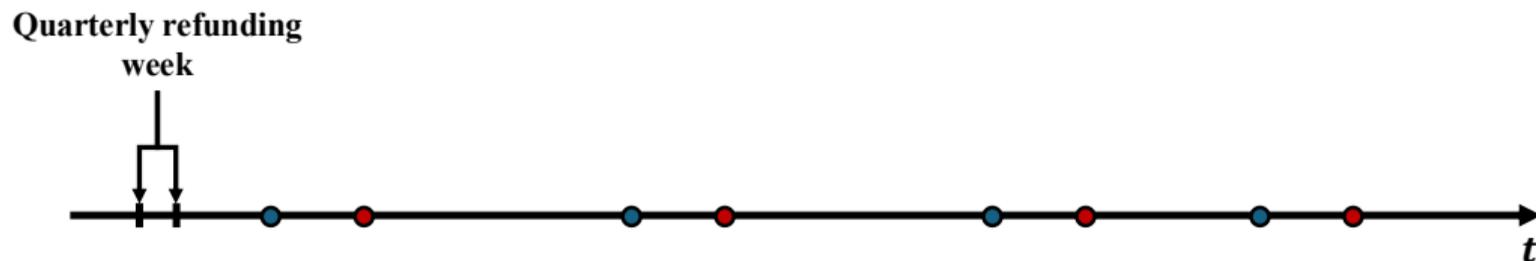
◀ Robustness: future spread, demand-supply decomposition.

## 3. Consequences of tighter allocator constraints: Treasury supply shocks

- have a **larger** price impact on Treasuries;
- have a **smaller** price impact on corporate bonds, compressing credit spreads.

# Empirical Evidence

# Treasury Supply Shocks from Quarterly Treasury Refunding Cycle



## Step 1: Quarterly refunding week $\Rightarrow$ Supply shocks 1

1. Monday: borrowing estimate for the current quarter and next quarter.

$$\text{Shock } 1_t = \frac{\widetilde{\text{Borr. Est}}_t}{D_t} = \frac{\text{Borr. Est}_t^t - \text{Borr. Est}_{t-1}^t}{D_t}$$

2. Wednesday: allocation of borrowing estimate into different bonds.

# Treasury Supply Shocks from Quarterly Treasury Refunding Cycle

February 2, 2004  
JS-1133

## Treasury Announces Market Financing Estimates

The Treasury Department announced today that it expects net borrowing of marketable debt to total \$177 billion in the January – March 2004 quarter. The projected cash balance on March 31 is \$20 billion. In the last quarterly announcement on November 3, 2003, Treasury announced that it expected net borrowing to total \$160 billion with an end-of-quarter cash balance of \$20 billion. This increase in borrowing is due to lower receipts, primarily from an increase in tax refunds, and higher outlays.

Treasury also announced that it expects net borrowing of marketable debt to total \$75 billion in the April – June 2004 quarter. The projected cash balance on June 30 is \$45 billion.

During the October – December 2003 quarter, Treasury's net marketable borrowing totaled \$113 billion and the cash balance on December 31 was \$33 billion. On November 3, Treasury announced that it expected net marketable borrowing to total \$117 billion with an ending quarter cash balance of \$35 billion. The decrease in borrowing is primarily attributable to lower outlays.

Additional financing details relating to Treasury's Quarterly Refunding will be released at 9:00 A.M. on Wednesday, February 4.

US TREASURY FINANCING SCHEDULE FOR 1ST QUARTER 2004  
BILLIONS OF DOLLARS

ISSUE	ANNOUNCEMENT DATE	AUCTION DATE	SETTLEMENT DATE	OFFERED AMOUNT	5-MO 5-MO	MATURING AMOUNT	NEW MONEY
<b>4-WEEK AND 3&amp;6 MONTH BILLS</b>	12/24	12/29	1/2	12.00	A	15.00	A 51.00
	12/31	1/5	1/8	9.00	A	17.00	A 45.00
	1/8	1/12	1/15	8.00	A	16.00	A 44.00
	1/15	1/20	1/22	9.00	A	18.00	A 46.00
	1/22	1/26	1/29	14.00	A	16.00	A 46.00
	1/29	2/2	2/5	18.00	A	17.00	A 43.00
	2/5	2/9	2/12	20.00	A	19.00	A 40.00
	2/12	2/16	2/19	22.00	A	20.00	A 41.00
	2/19	2/23	2/26	24.00	A	20.00	A 46.00
	2/26	3/1	3/4	25.00	A	20.00	A 51.00
	3/4	3/8	3/11	25.00	A	20.00	A 51.00
	3/11	3/15	3/18	22.00	A	18.00	A 51.00
	3/18	3/22	3/25	18.00	A	18.00	A 54.00
				<b>693.00</b>		<b>509.00</b>	<b>84.00</b>
<b>CASH MANAGEMENT BILLS</b>							
13-Day Bill	12/29	12/30	1/2	15.00		15.00	0.00
11-Day Bill	Matures 1/15	3/2	3/4	20.00		20.00	0.00
	Matures 3/15						
<b>COUPONS</b>					CHANGE IN SIZE		
5-Year Note	1/5	1/7	1/15	16.00	A	15.22	0.78
10-Year TIPS	1/5	1/8	1/15	12.00	A + 1.00		12.00
2-Year Note	1/26	1/29	2/2	26.00	A	24.55	1.45
3-Year Note	2/4	2/10	2/17				24.00
5-Year Note	2/4	2/11	2/17	16.00			16.00
10-Year Note	2/4	2/12	2/17	17.00		11.82	5.18
2-Year Note	2/23	2/25	3/1	26.00		23.74	2.26
5-Year Note	3/8	3/15	3/17	16.00			16.00
10-Year Note (R)	3/8	3/15	3/22	13.00			13.00
2-Year Note	3/22	3/24	3/31	27.00	1.00	24.54	2.46
				<b>193.00</b>		<b>92.97</b>	<b>100.03</b>

R = Recapturing  
A = Announced

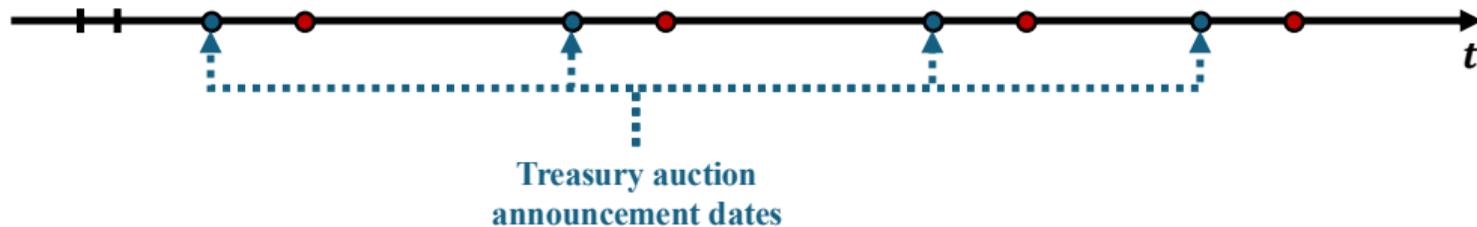
Treasury announced a Q1 borrowing need of \$177 billion on 2/2/04

NET CASH RAISED THIS QUARTER: 177.13

Refunding week in 2004 Q1:

$$\text{Borr. Est}_t = \text{Borr. Est}_t^t - \text{Borr. Est}_{t-1}^t = \$177 \text{ B} - \$160 \text{ B} = \$17 \text{ B}$$

# Treasury Supply Shocks from Quarterly Treasury Refunding Cycle



## Step 2: Auction announcement $\Rightarrow$ Supply shocks 2

- announce **the real offering amount** several days before auction;
- announce 1–3 bonds simultaneously

$$\text{Shock } 2_t = \sum_m \frac{\text{Duration}_m}{\text{Duration}_{10Y}} \tilde{S}_{m,t} = \sum_m \frac{\text{Duration}_m}{\text{Duration}_{10Y}} \left( S_{m,t} - S_{m,t}^{\text{tentative}} \right)$$

Example:

◀ Auction Ann

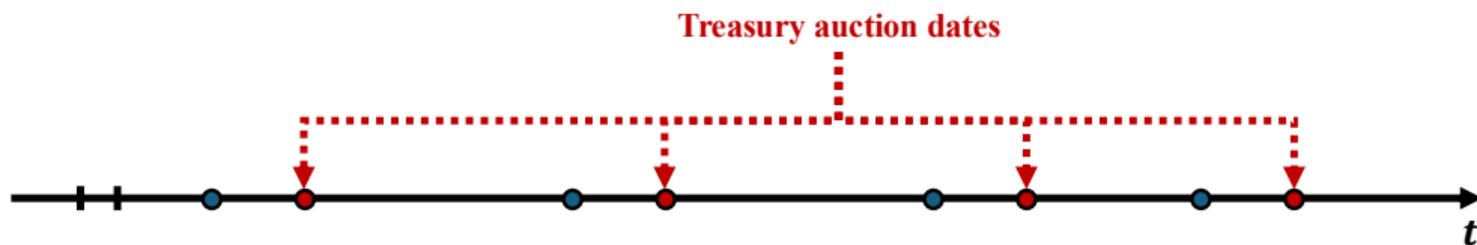
◀ Auction Results

Time Series:

◀ Refunding Ann

◀ Auction Ann

# Treasury Supply Shocks from Quarterly Treasury Refunding Cycle



## Step 3: Auction result release $\Rightarrow$ Supply shocks 3

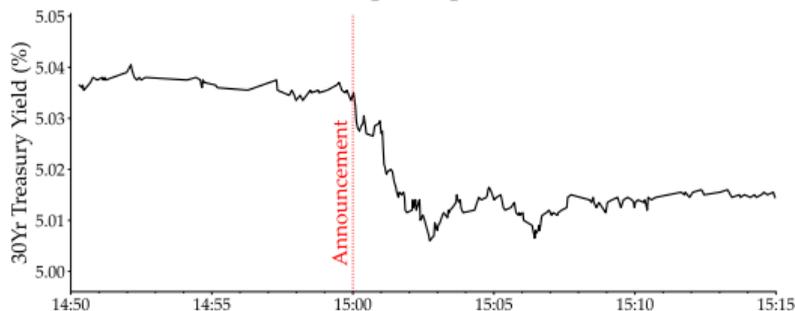
- release the winning yield and **bid-to-cover ratio** within 2 mins after the auction close.
- **bid-to-cover ratio** summarizes auction results (Ray et al., 2024).

Example: [◀ Auction Ann](#) [◀ Auction Results](#)

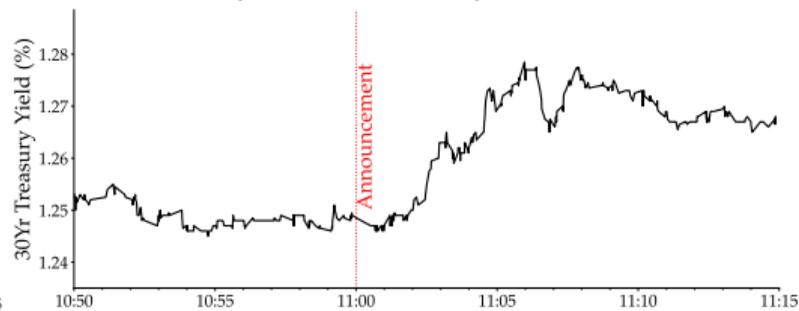
Time Series: [◀ Refunding Ann](#) [◀ Auction Ann](#)

# Intraday Treasury Price Response to Shocks

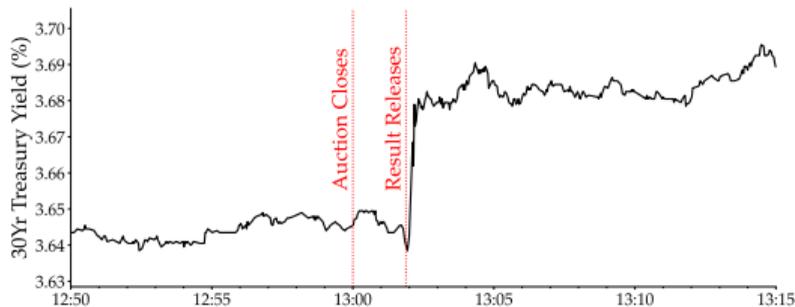
**Supply shocks 1** — Oct 30, 2023:  
\$76bn below the prior-quarter forecast.



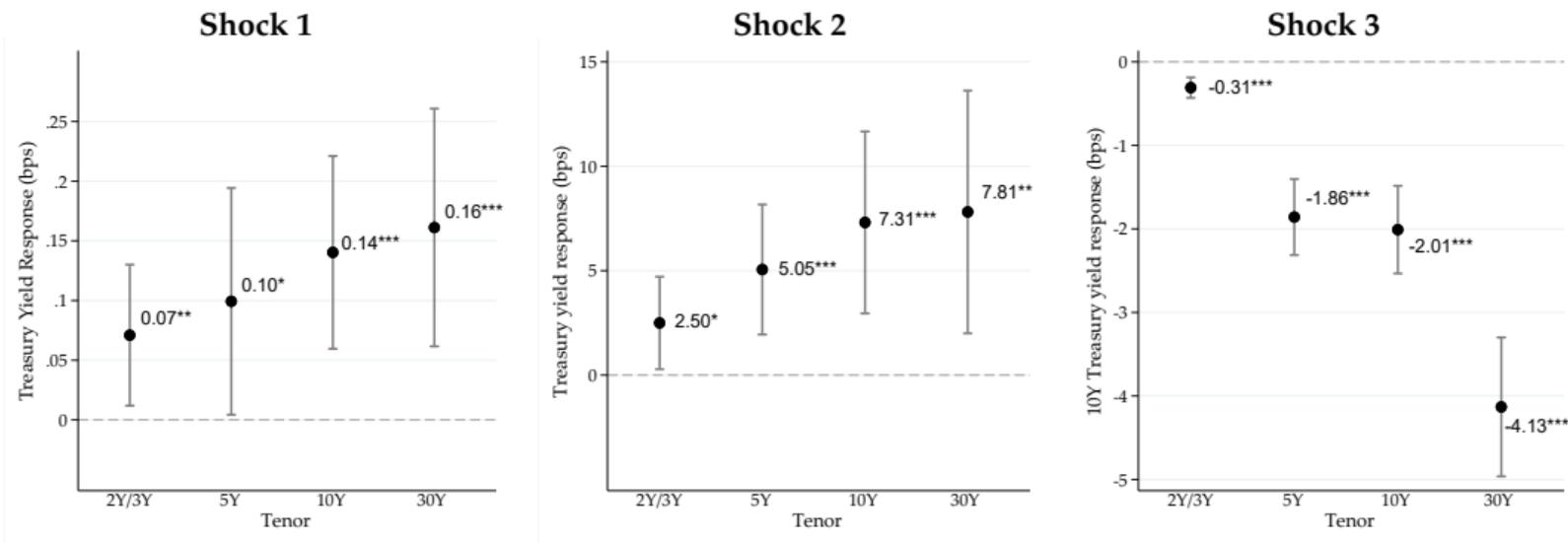
**Supply shocks 2** — Apr 2, 2020:  
+\$1bn 10-year and +\$1bn 30-year vs. schedule.



**Supply shock 3** — 30-year auction, Feb 9, 2023:  
bid-to-cover in the bottom 25% historically.



# Average High-frequency Effects by Tenor



In terms of 10Y-equivalent Treasuries

- Shock 1: Supply  $\uparrow$  by \$100B  $\Rightarrow$  10Y yield  $\uparrow$  0.53 bps (**lower bound**).
- Shock 2: Supply  $\uparrow$  by \$100B  $\Rightarrow$  10Y yield  $\uparrow$  7.31 bps.
- Shock 3: Bid submissions  $\downarrow$  by \$100B  $\Rightarrow$  10Y yield  $\uparrow$  8.33 bps.

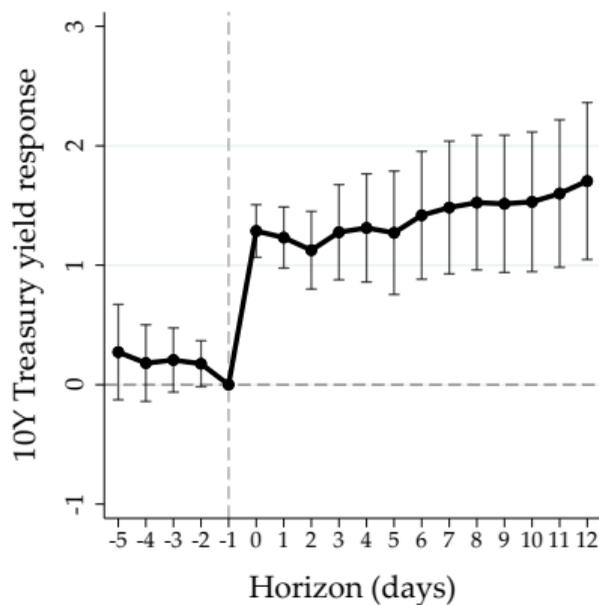
# Less Elastic Treasury Market when Allocators are More Constrained

- Most constrained:  $Q_{swap\ spread} = 1$ .
- Least constrained:  $Q_{swap\ spread} = 4$ .
- Auction days: supply shocks under the most constrained region are  $1.7\times$  stronger than under the least constrained region.

VARIABLES	(1)	(2)	(3)
	Shock 1	Shock 2	Shock 3
	$\Delta y_{10\ min}$	$\Delta y_{10\ min}$	$\Delta y_{10\ min}$
$Shock_t$	0.677** (0.266)	30.04** (11.98)	-2.522** (0.518)
$Shock_t \times Q_{Swap\ Spread_t^{10Y}} = 2$	-0.536* (0.289)	-24.77** (12.17)	0.730* (0.314)
$Shock_t \times Q_{Swap\ Spread_t^{10Y}} = 3$	-0.555** (0.272)	-25.27* (13.61)	1.264*** (0.317)
$Shock_t \times Q_{Swap\ Spread_t^{10Y}} = 4$	-0.859*** (0.292)	-29.74** (13.45)	1.020** (0.314)
$Q_{Swap\ Spread_t^{10Y}} = 2$	0.362 (0.229)	-0.206 (0.330)	-1.742* (0.890)
$Q_{Swap\ Spread_t^{10Y}} = 3$	0.428** (0.178)	-0.178 (0.340)	-2.724** (0.924)
$Q_{Swap\ Spread_t^{10Y}} = 4$	0.281 (0.178)	-0.237 (0.352)	-2.107* (0.953)
Observations	366	725	1,096
R-squared	0.118	0.112	0.116
Maturity FE	Y	Y	Y

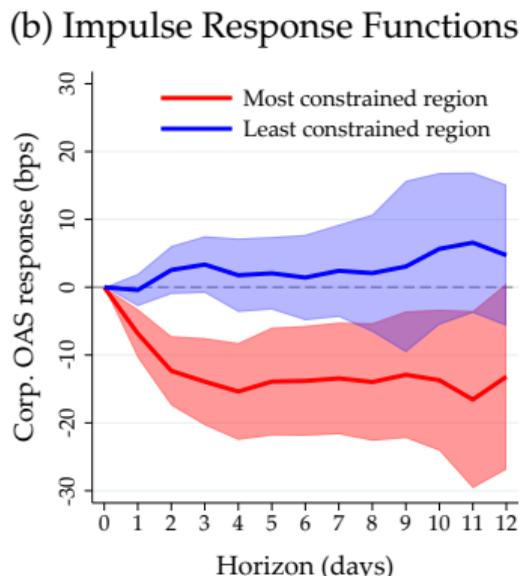
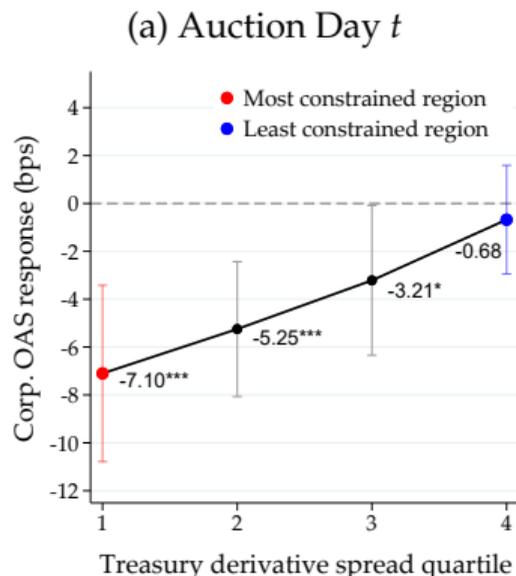
# Treasury Auction Supply Effects are Persistent

$$\Delta y_{t-1 \rightarrow t+h}^{10Y} = \alpha_h + \beta_h \Delta y_t^{10Y, 10\text{min}} + \text{Controls}_t + \varepsilon_{t,h}$$



# Weaker Pass-through to Corporate Bonds Under Constrained Region

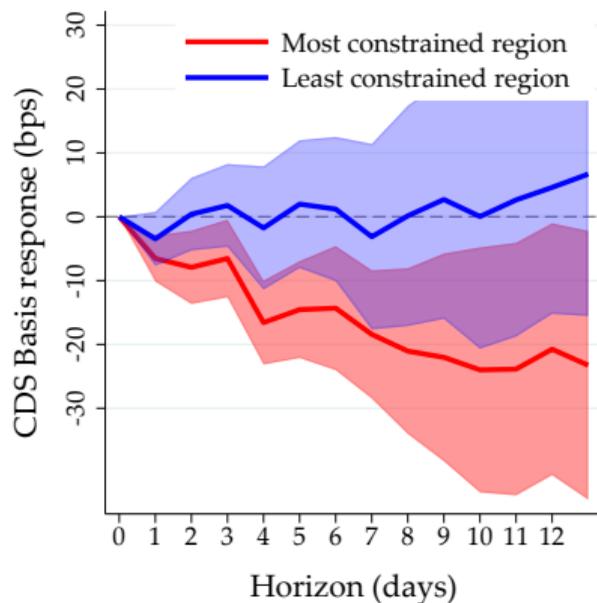
$$\text{Auction day-}t: \Delta OAS_{t-1 \rightarrow t+h} = \alpha_h + \beta_h \Delta y_t^{10Y} + \sum_{j=1}^3 \Delta OAS_{t-j-1 \rightarrow t-j} + \text{Controls}_t + \varepsilon_{t,h}$$



Most constrained region: 1%  $\uparrow$  in 10Y Treasury yield on auction days,

- AAA bond credit spread  $\downarrow$  7.10 bps in the same day,  $\downarrow$  12 bps in a week

# Weaker Pass-through to Corporate Bonds Under Constrained Region



Remove the credit default component:  
IG Bond CDS Basis = Credit Spread - IG Bond CDX spread.

◀ Time series: Credit Spread Converges to CDS

# Does Micro Data Support the Mechanism?

## 1. Global Bond Mutual Funds Holdings from MorningStar.

- Monthly/quarterly asset holdings starting from 2008Q1-2024Q4.
- $\approx 60\%$  of funds provide details of derivative holdings.
  - Derivative positions: contract name, direction, notional amount and market value.
  - Identify 156,664 long Treasury future positions and 103,588 short positions by name matching.

## 2. US insurance company holdings from NAIC statutory filings.

- NAIC schedule D: Quarterly asset holdings starting from 2008Q1-2024Q4.
- NAIC schedule DB: detailed derivatives positions on future and interest rate swaps.
  - Identify 32,497 long Treasury futures positions and 19,002 short positions.
  - Identify 505,485 received-fixed IRS positions and 384,781 pay-fixed swap positions.

# Investors' Bond and Derivative Positions Align with Model Predictions

## Bond Mutual Funds:

- Future users are primarily actively-managed funds benchmarked to Bloomberg aggregate bond index, with duration between 6–8 year. [◀ Derivative Users](#)
- Underweight Treasuries and overweight corporate bonds for outperforming benchmark index. [◀ Active Allocation](#)
- Face duration gap when corporate bonds are scarce, actively use Treasury futures for duration exposure. [◀ Mutual fund future usage](#) [◀ Future Positions by Tenor](#)

## Life Insurance companies:

- Target at long-term liability (typically 15—25 years.) [◀ Duration distribution](#)
- Primarily use interest rate swaps for duration exposures. [◀ Insurer derivative usage](#)

[◀ Return to Institutional Background](#)

# More Derivative Usage when Treasuries Crowd the Debt Market

VARIABLES	Mutual Funds				Life Insurance Companies			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Derivative dollar duration (DV01 in k\$)				Derivative dollar duration (DV01 in k\$)			
$Swap\ Spread_t^{10Y}$	-1.516*** (0.413)			-0.915** (0.454)	-26.94** (11.56)			-22.09*** (4.726)
$\Delta Treasury\ Share_t$		37.75*** (10.71)		20.83* (11.82)		464.2*** (93.74)		203.8** (91.14)
$Bond\ index\ duration_t$			36.14*** (12.93)	23.07** (10.14)				
$y_t^{10Y}$							-274.0*** (86.71)	-307.4*** (69.57)
Observations	46,197	46,197	46,197	46,197	7,107	7,107	7,107	7,107
R-squared	0.401	0.401	0.401	0.402	0.514	0.514	0.513	0.516
Firm FE	Y	Y	Y	Y	Y	Y	Y	Y
Controls	Y	Y	Y	Y	Y	Y	Y	Y

# Policy Implications

# Model Implies a QE-QT Asymmetry

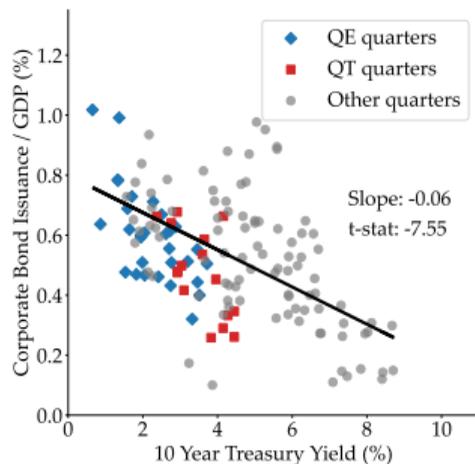
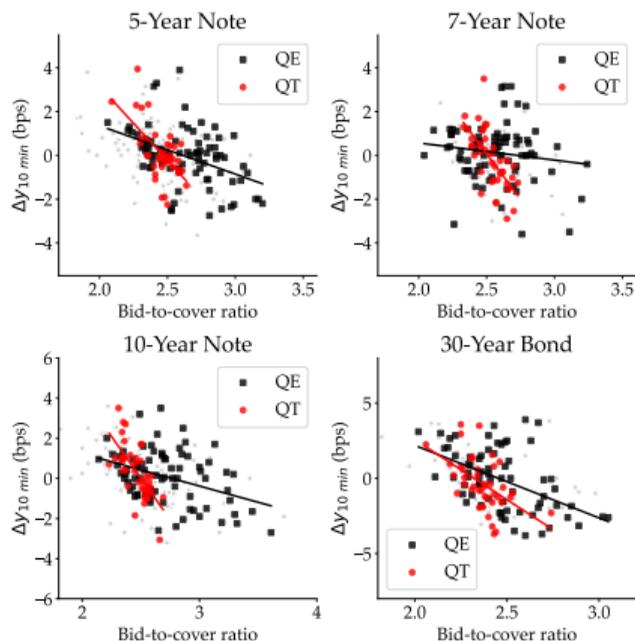


Figure: Quarterly Long-term Corporate Bond Issuance (>10Y).

- **QE**: low interest rate  $\Rightarrow$  **high** corporate bond supply  $\Rightarrow$  **corporate share**  $\uparrow$ .
- **QT**: high interest rate  $\Rightarrow$  **low** corporate bond supply  $\Rightarrow$  **corporate share**  $\downarrow$ .

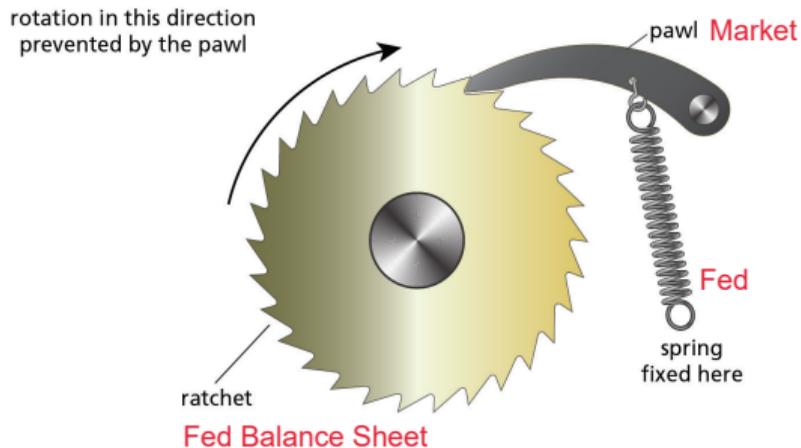
# Model Implies a QE-QT Asymmetry



**Figure:** Treasury Market is Less Elastic under QT than QE.

- 10Y Treasury bid ↓ by \$100B ⇒ 10Y yield ↑ **25.7 bps (QT)** vs ↑ **11.1 bps (QE)**

# Model Implies a QE-QT Asymmetry



*"[QE] tends to be deployed in response to bad news, but isn't reversed when the bad news ends. As a result, the stock of bonds held by central banks ratchets up, expanding their balance sheets into the longer term."*

– Mervyn King (former Governor, Bank of England), *Quantitative Easing Is a Dangerous Addiction*, 2021

# How Can Policymakers Manage Basis Trade Risks?

**Should we fully restrict basis trade?**

**No, basis trade reduces Treasury refunding cost.**

Timing	Policy	Channel
<i>Ex ante</i>	Timing QT: <u>offloading before rate hikes</u>	Offloading Treasuries when corporate bonds are not scarce.
	<ol style="list-style-type: none"> <li>1. Develop a central-clearing repo market</li> <li>2. Exempt dealers' Treasury positions in trading accounts from SLR (Liang and Zhu, 2025)</li> </ol>	Improve dealers' Treasury absorption capacity when basis trade unwinds.
<i>Ex post</i>	Backstop HF basis trade positions (Kashyap et al, 2025)	Purchase cash bonds <u>&amp;</u> sell derivative simultaneously.

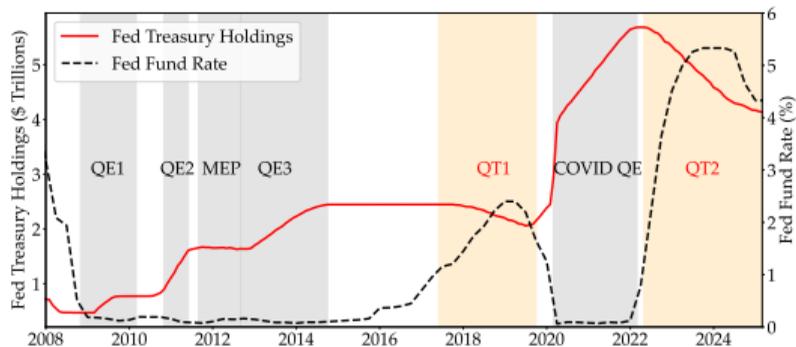
## Conclusion: When Treasuries Dominate the Debt Market

- High Treasury share raises debt market segmentation.
- Treasury supply shocks have big price impacts on Treasuries and weak pass-through to corporate bonds.
- Institutional bond investors leverage via Treasury derivatives, fueling basis trade.
- QE & QT effects depend on debt market structure.

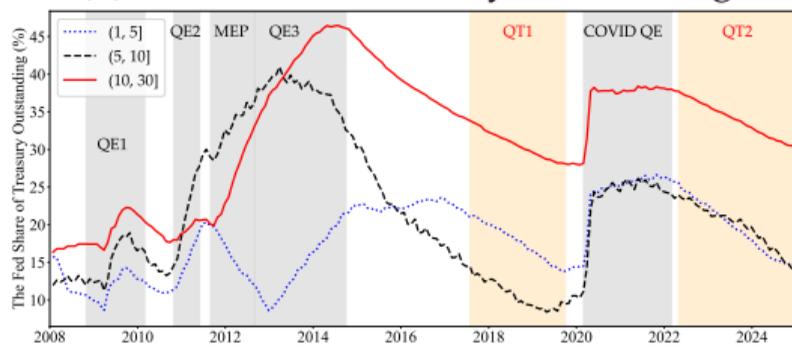
# Appendix

# Treasury holdings of the Federal Reserve

(a) Treasury holdings amount

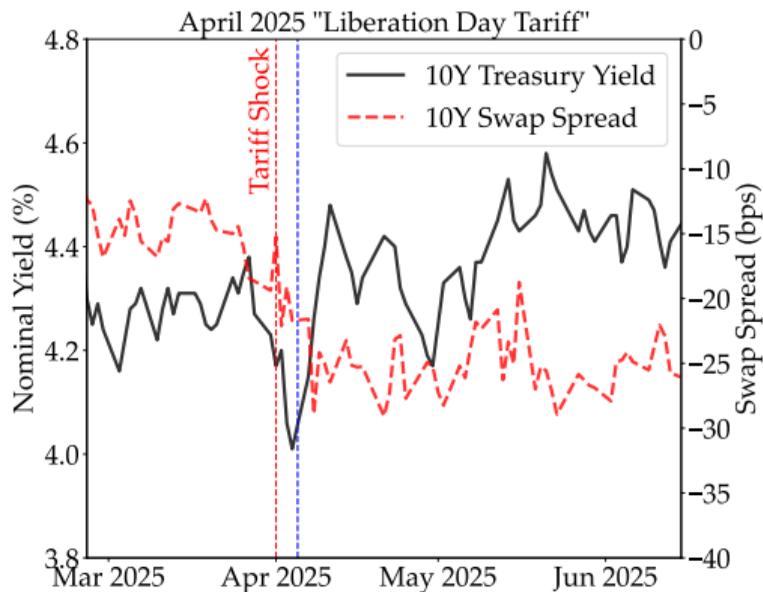
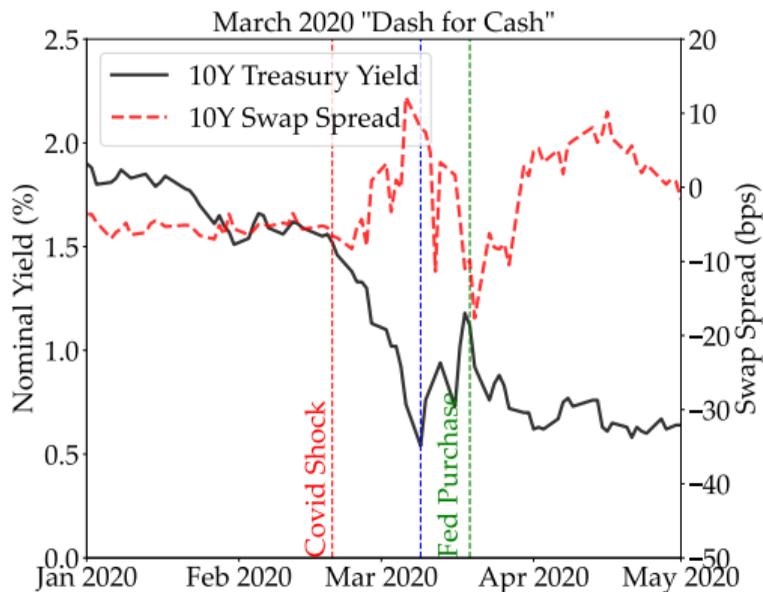


(b) Share in the Treasury outstanding



Return

# US Treasury market Turmoil in March 2020 and April 2025



# Basis Trade

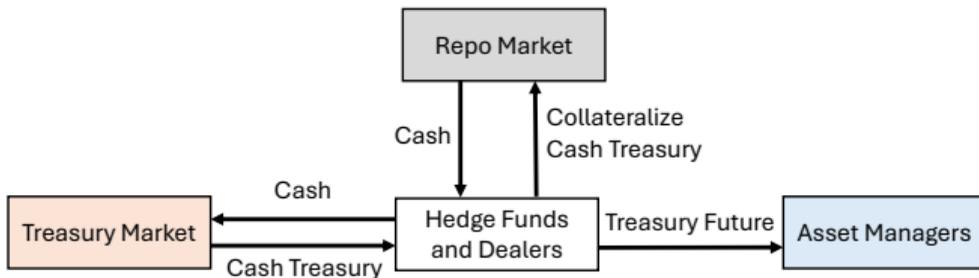


Figure: Treasury future

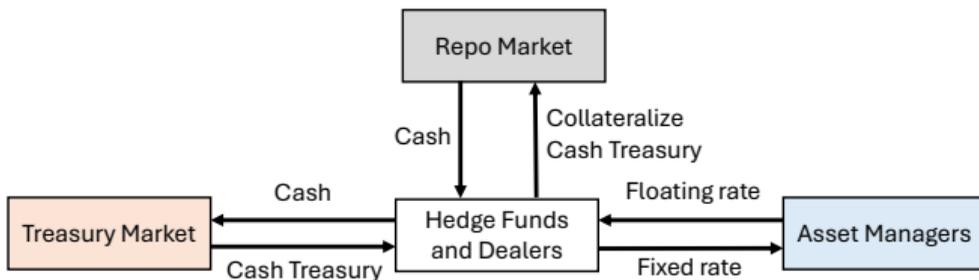


Figure: Interest rate swap

# Convergence Trade on Treasury Futures

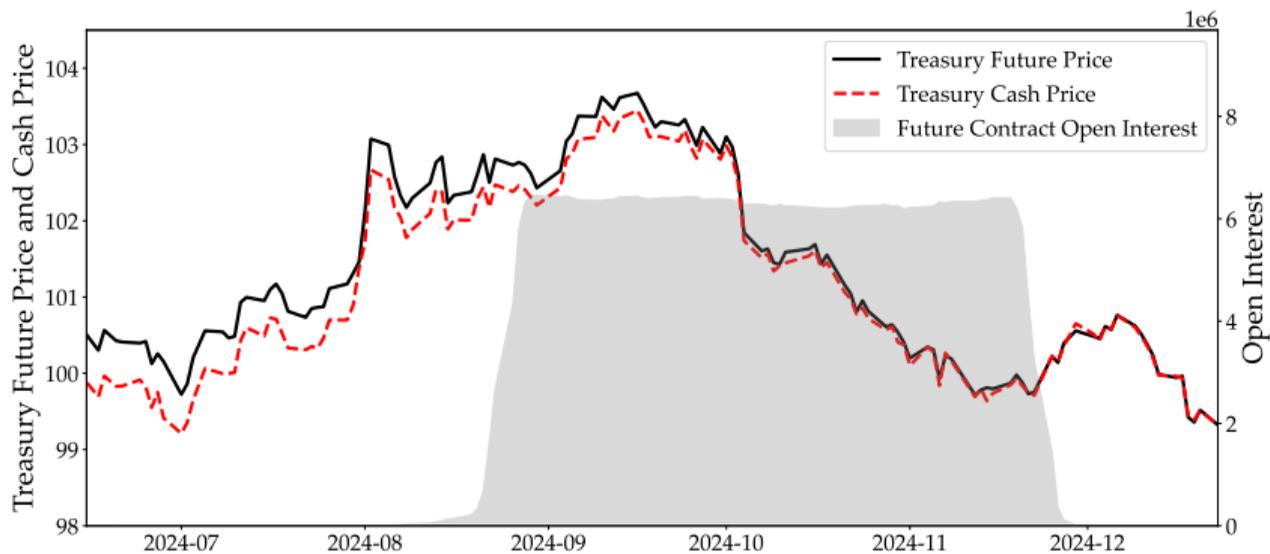


Figure: Convergence of Treasury Future Prices and Cash Price

[◀ Return](#)[◀ Return to Model](#)

## Dealers and Hedge Funds' Intermediation Costs

1. Dealers: **supplementary leverage ratio (SLR)** requirement by holding cash Treasuries on the balance sheet.
2. Hedge funds are subject to (Market Risk Advisory Committee, 2024):
  - **Counterparty risks.**
  - **Repo rollover risks.**
  - **Margin requirements.**

◀ Return

## The Long-term IG Credit Spread Converges to the CDS Spread



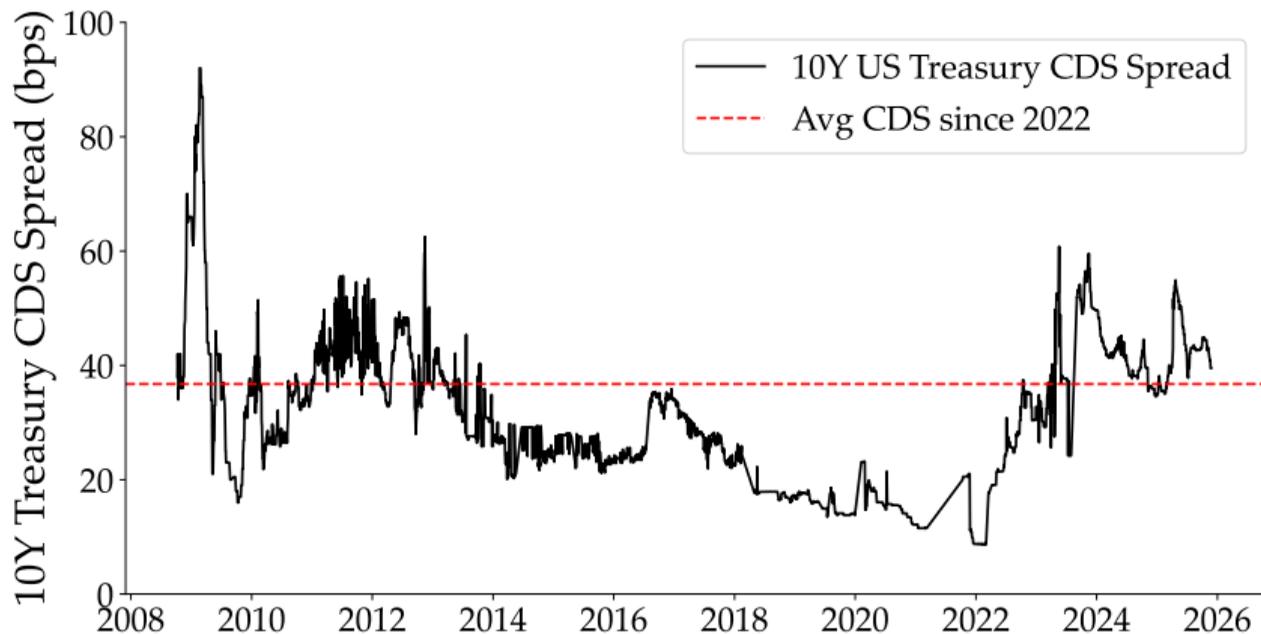
Figure: 10–15Y US IG corporate credit spread minus 10Y IG Bond CDX spread.

- Credit spread typically exceeds CDS spread, reflecting funding and liquidity premia associated with holding cash bonds.

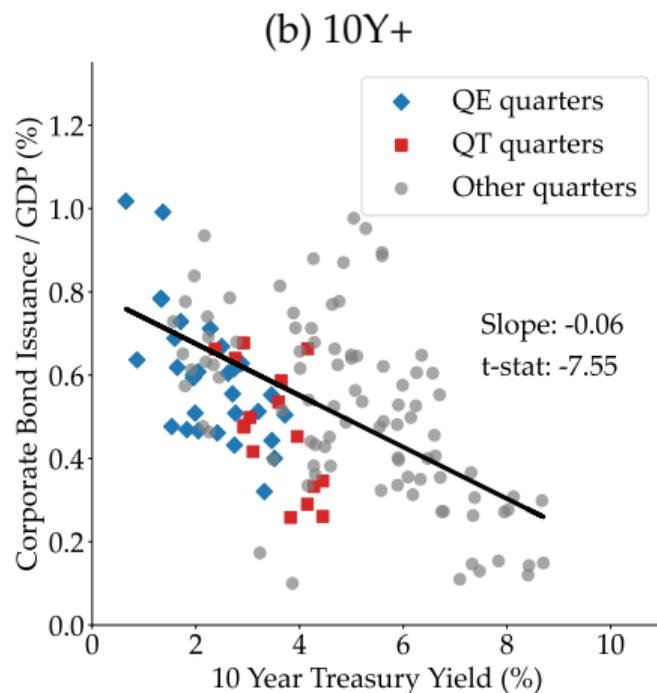
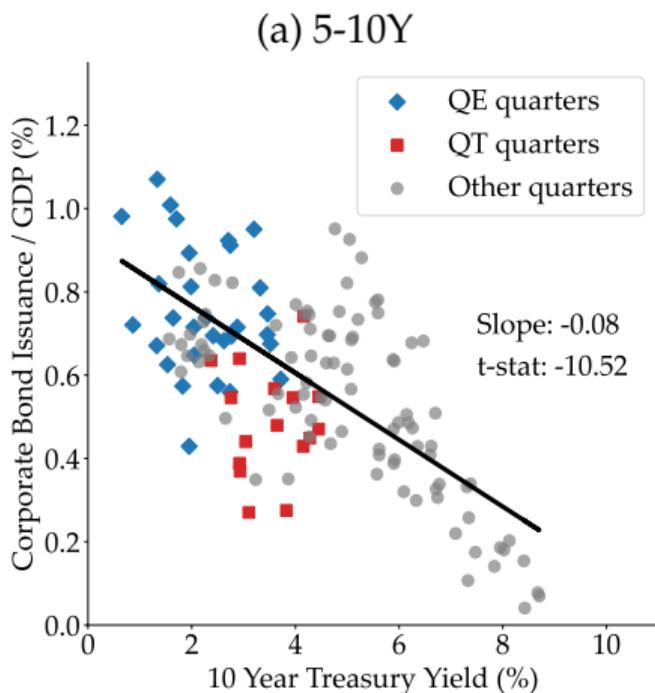
◀ Return to opening

◀ Return to passthrough

# 10Y Treasury Credit Default Spread



# Corporate Market Timing: Corporate Bond Quarterly Supply



Data source: LSEG Debt New Issues Deals Data. 1990Q1-2024Q4.

◀ Return

# Composition of US Bond Market

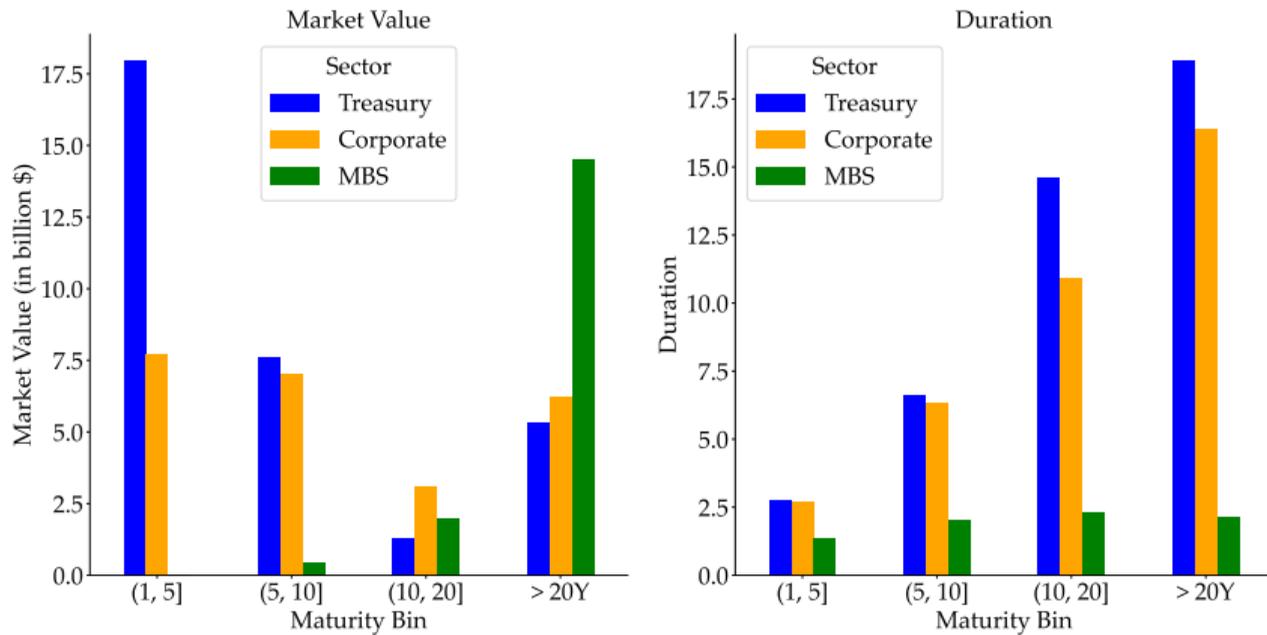


Figure: US bond market composition (2021Q1)

Note: The figure shows the composition of the iShares Core US Aggregate Bond ETF.

# References

## Market segmentation theory

- Preferred-habitat: Tobin (1958, 1969); Vayanos and Vila (2021); Greenwood et al. (2023, 2018); Ray et al. (2024)
- Arbitrageur balance sheet friction: He et al. (2022); Kekre and Lenel (2022)

## Unconventional monetary policy

- Effects: Gagnon et al. (2011); Vissing-Jorgensen and Krishnamurthy (2011); Swanson (2011); D'Amico and King (2013); Du et al. (2024); D'Amico and Seida (2024)...
- Pass-through: Gilchrist and Zakrajšek (2013); Gilchrist et al. (2015); Acharya et al. (2025); Eren et al. (2025)
- State-dependence: Acharya and Rajan (2024); Haddad et al. (2024); Jiang and Sun (2024)

## Treasury supply effects

- Treasury supply shocks: Greenwood et al. (2010); Wang and Zhao (2024); Lou et al. (2013); Fleming and Liu (2016); Ray et al. (2024); Phillot (2025); Wiegand (2025)
- Crowding in and crowd out: Friedman (1978); Pinardon-Touati (2021); Li et al. (2025)

## Interest rate derivative basis trade

- Hedge funds: Schrimpf et al. (2020); Barth and Kahn (2020); Vissing-Jorgensen (2021)
- Policy implications: Kashyap et al. (2025); Liang (2025)

# References and Positioning

## Market segmentation

- Greenwood et al. (2018); Ray et al. (2024)
- This paper: the composition of asset supply endogenously shapes the degree of market segmentation.

## Unconventional monetary policy

- Acharya and Rajan (2024); Haddad et al. (2024); Jiang and Sun (2024)
- This paper: QE–QT asymmetry arises from debt-market structure and investor constraints.

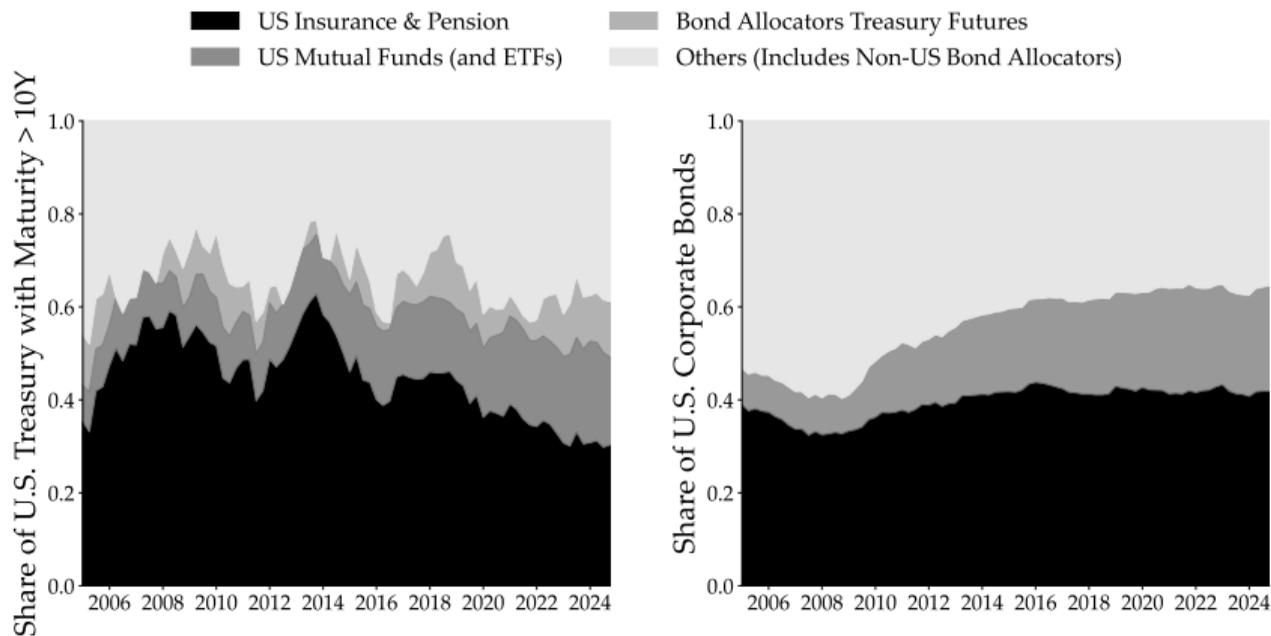
## Treasury supply effects

- Wang and Zhao (2024); Lou et al. (2013); Ray et al. (2024); Phillot (2025)
- This paper: comprehensive Treasury shock series from issuance calendars & high-frequency identification.
- Corporate bonds' "risk-bundle" property dampens government-debt crowding-out effects.

## Interest-rate derivative basis trades

- Barth and Kahn (2020); Kashyap et al. (2025)
- This paper: explains time variation in basis-trade activity, rationalizes its benefits and risks, and introduces new granular data on asset managers' derivative positions.

# Bond Allocators in Treasury and Corporate Bond Markets



Data Source: MorningStar, NAIC Statutory filings, US Financial Account, Traders in Financial Futures Report.

# Treasury Borrowing Estimate Announcement on February 2, 2004

February 2, 2004  
JS-1133

## Treasury Announces Market Financing Estimates

The Treasury Department announced today that it expects net borrowing of marketable debt to total \$177 billion in the January – March 2004 quarter. The projected cash balance on March 31 is \$20 billion. In the last quarterly announcement on November 3, 2003, Treasury announced that it expected net borrowing to total \$160 billion with an end-of-quarter cash balance of \$20 billion. This increase in borrowing is due to lower receipts, primarily from an increase in tax refunds, and higher outlays.

Treasury also announced that it expects net borrowing of marketable debt to total \$75 billion in the April – June 2004 quarter. The projected cash balance on June 30 is \$45 billion.

During the October – December 2003 quarter, Treasury's net marketable borrowing totaled \$113 billion and the cash balance on December 31 was \$33 billion. On November 3, Treasury announced that it expected net marketable borrowing to total \$117 billion with an ending quarter cash balance of \$35 billion. The decrease in borrowing is primarily attributable to lower outlays.

Additional financing details relating to Treasury's Quarterly Refunding will be released at 9:00 A.M. on Wednesday, February 4.

### US TREASURY FINANCING SCHEDULE FOR 1ST QUARTER 2004 BILLIONS OF DOLLARS

ISSUE	ANNOUNCEMENT DATE	AUCTION DATE	SETTLEMENT DATE	OFFERED AMOUNT		MATURING AMOUNT		NEW MONEY
				4-WK	6-MO	3-MO	6-MO	
<b>4-WEEK AND 3&amp;6 MONTH BILLS</b>	12/24	12/29	1/2	12.00	A 16.00	A 15.00	A 51.00	-8.00
	12/31	1/5	1/8	9.00	A 17.00	A 16.00	A 45.00	-3.00
	1/8	1/12	1/15	8.00	A 17.00	A 16.00	A 44.00	-3.00
	1/15	1/20	1/22	9.00	A 18.00	A 16.00	A 46.00	-3.00
	1/22	1/26	1/29	14.00	A 18.00	A 16.00	A 46.00	2.00
	1/29	2/2	2/5	19.00	A 19.00	A 17.00	A 43.00	12.00
	2/5	2/9	2/12	20.00	19.00	18.00	40.00	17.00
	2/12	2/16	2/19	22.00	19.00	20.00	41.00	20.00
	2/19	2/23	2/26	24.00	19.00	20.00	46.00	17.00
	2/26	3/1	3/4	25.00	19.00	20.00	51.00	13.00
	3/4	3/8	3/11	25.00	19.00	20.00	51.00	13.00
	3/11	3/15	3/18	22.00	18.00	18.00	51.00	7.00
	3/18	3/22	3/25	18.00	18.00	18.00	54.00	0.00
					<b>693.00</b>	<b>509.00</b>	<b>84.00</b>	
<b>CASH MANAGEMENT BILLS</b>								
13-Day Bill	12/29	12/30	1/2	15.00		15.00	0.00	0.00
11-Day Bill	Matures 1/15	3/2	3/3	20.00		20.00	0.00	0.00
	Matures 3/15							
<b>COUPONS</b>								
						CHANGE IN SIZE		
5-Year Note	1/5	1/7	1/15	16.00	A	15.22	0.78	
10-Year TIPS	1/5	1/8	1/15	12.00	A + 1.00		12.00	
2-Year Note	1/26	1/29	2/2	26.00	A	24.55	1.45	
3-Year Note	2/4	2/10	2/17	24.00			24.00	
5-Year Note	2/4	2/11	2/17	16.00			16.00	
10-Year Note	2/4	2/12	2/17	17.00		11.82	5.18	
2-Year Note	2/23	2/25	3/1	26.00		23.74	2.26	
5-Year Note	3/8	3/15	3/17	16.00			16.00	
10-Year Note (R)	3/8	3/15	3/22	13.00			13.00	
2-Year Note	3/22	3/24	3/31	27.00	1.00	24.54	2.46	
				<b>193.00</b>		<b>99.87</b>	<b>93.13</b>	
R = Reopening A = Announced				Treasury announced a Q1 borrowing need of \$177 billion on 2/2/04		<b>NET CASH RAISED THIS QUARTER:</b>	177.13	

Refunding week in 2004 Q1:

$$\widetilde{\text{Borr. Est}}_t = \text{Borr. Est}_t - \text{Borr. Est}_{t-1} = \$177 \text{ B} - \$160 \text{ B} = \$17 \text{ B}$$

# Example of Auction Announcement on March 8, 2004

5-YEAR NOTES AND 9-YEAR 11-MONTH 4% NOTES TO BE ISSUED MARCH 15, 2004

March 8, 2004

Offering Amount.....	\$16,000 million	\$11,000 million
Maximum Award (35% of Offering Amount)....	\$ 5,600 million	\$ 3,850 million
Maximum Recognized Bid at a Single Yield..	\$ 5,600 million	\$ 3,850 million
NLP Reporting Threshold.....	\$ 5,600 million	\$ 3,850 million
NLP Exclusion Amount.....	None	\$ 5,600 million
<b>Description of Offering</b>		
Term and type of security.....	5-year notes	9-year 11-month 4% notes (reopening)
Series.....	F-2009	B-2014
CUSIP number.....	912828 CC 2	912828 CA 6
Auction date.....	March 10, 2004	March 11, 2004
Issue date.....	March 15, 2004	March 15, 2004
Dated date.....	March 15, 2004	February 15, 2004
Maturity date.....	March 15, 2009	February 15, 2014
Interest rate.....	Determined based on the highest accepted competitive bid	4%
Amount currently outstanding.....	Not applicable	\$17,082 million
Yield.....	Determined at auction	Determined at auction
Interest payment dates.....	September 15 and March 15	August 15 and February 15
Minimum bid amount and multiples.....	\$1,000	\$1,000
Accrued interest payable by investor.....	None	\$3.18681 per \$1,000 (from February 15 to March 15, 2004)
Premium or discount.....	Determined at auction	Determined at auction
<b>STRIPS Information:</b>		
Minimum amount required.....	\$1,000	\$1,000
Corpus CUSIP number.....	912820 JZ 1	912820 JX 6
Due date(s) and CUSIP number(s) for additional TINT(s) .....	March 15, 2009 - - 912833 2B 5	Not applicable

The realized offering amounts for 10YR note was \$11 Billion, 2 billion less than tentative auction plan. The resulting surprises are

$$\tilde{S}_{\text{short-term},t} = \$0 \text{ billion}, \tilde{S}_{\text{short-term},t} = -\$2 \text{ billion}$$

# Example of Auction Result Release on March 11, 2004

BUREAU OF THE PUBLIC DEBT - WASHINGTON DC

FOR IMMEDIATE RELEASE  
March 11, 2004

CONTACT: Office of Financing  
202-691-3550

RESULTS OF TREASURY'S AUCTION OF 9-YR 11-MONTH NOTES

This issue is a reopening of a note originally issued February 17, 2004.

Interest Rate: 4%                      Issue Date:            March 15, 2004  
Series:            B-2014                      Dated Date:          February 15, 2004  
CUSIP No:        912828CA6                Maturity Date:       February 15, 2014

High Yield: 3.752%      Price: 102.034

All noncompetitive and successful competitive bidders were awarded securities at the high yield. Tenders at the high yield were allotted 34.31%. All tenders at lower yields were accepted in full.

Accrued interest of \$ 3.18681 per \$1,000 must be paid for the period from February 15, 2004 to March 15, 2004.

AMOUNTS TENDERED AND ACCEPTED (in thousands)

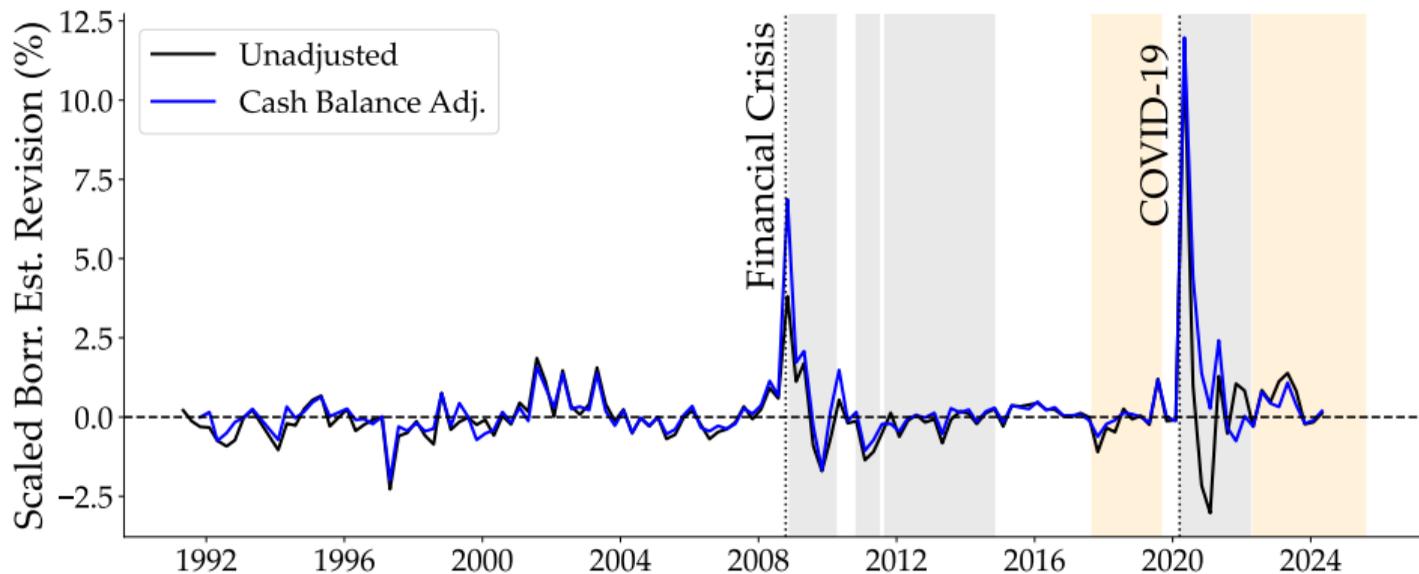
Tender Type	Tendered	Accepted
Competitive	\$ 19,852,035	\$ 10,956,550
Noncompetitive	43,495	43,495
FIMA (noncompetitive)	0	0
SUBTOTAL	19,895,530	11,000,045 1/
Federal Reserve	0	0
TOTAL	\$ 19,895,530	\$ 11,000,045

Median yield 3.730%: 50% of the amount of accepted competitive tenders was tendered at or below that rate. Low yield 3.660%: 5% of the amount of accepted competitive tenders was tendered at or below that rate.

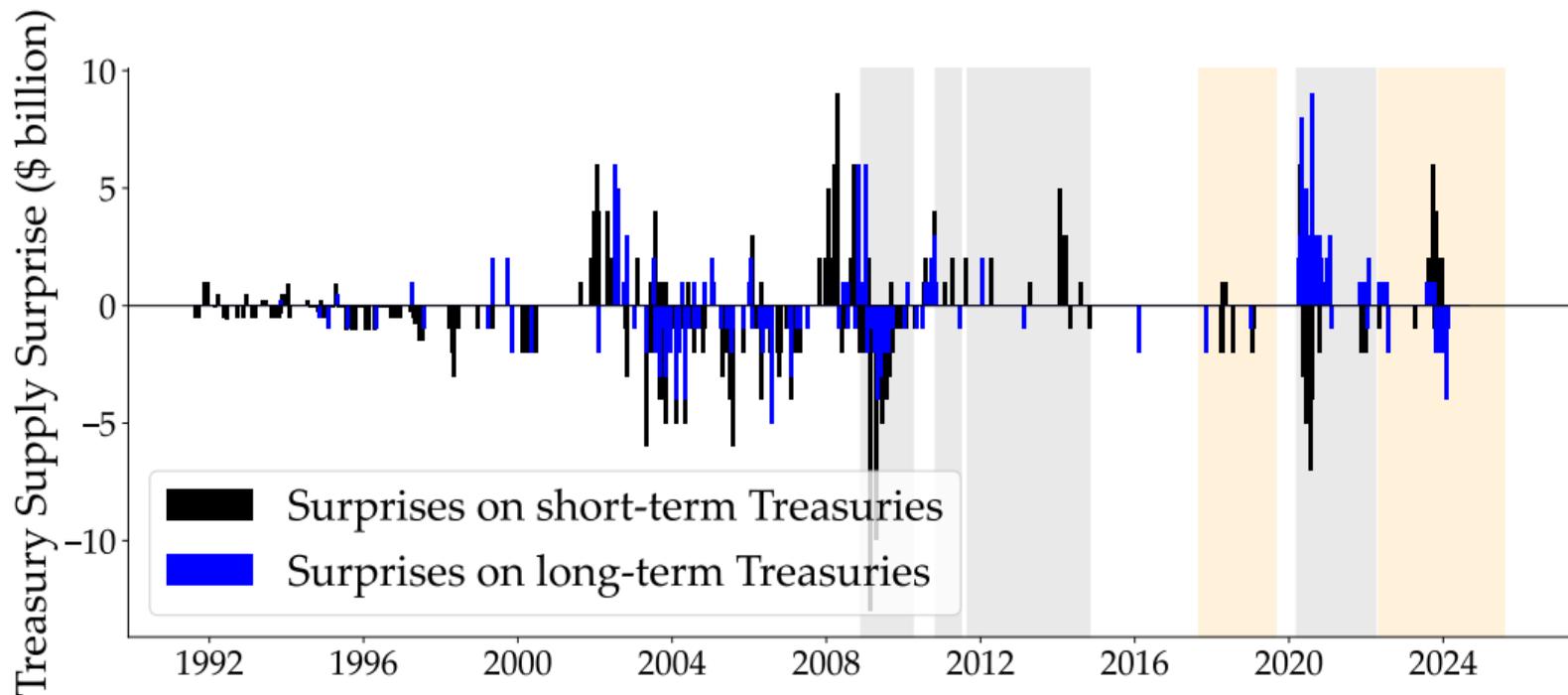
Bid-to-Cover Ratio = 19,895,530 / 11,000,045 = 1.81

1/ Awards to TREASURY DIRECT = \$26,573,000

# Treasury Supply Shocks on the Quarterly Refunding Dates

[Return](#)

# Treasury Supply Shocks on the Auction Announcement Dates



## Conversion to 10Y-equivalent Treasury

**Shock 1:** A 1% increase in total borrowing  $\Rightarrow$  10Y yield  $\uparrow$  0.14 bps.

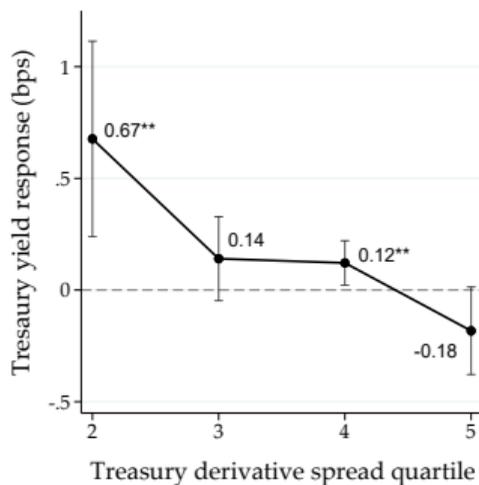
- Average total Treasury debt:  $\approx$  \$15T (2008–2024).
- Duration-weighted maturity of quarterly Treasury supply:  $\approx$  1.5 years (2008–2024).
- 1% increase in total borrowing  $\approx$  \$26.4B in 10Y-equivalent supply.
- $\Rightarrow$  10Y-equivalent supply  $\uparrow$  by \$100B  $\Rightarrow$  10Y yield  $\uparrow$  by  $0.14 \times \frac{100}{26.4} = 0.53$  bps.
- **Lower bound:** assumes issuance shares across maturities are unchanged. In practice, Treasury bills absorb major part of the increase.

**Shock 2:** 10Y-equivalent supply  $\uparrow$  by \$100B  $\Rightarrow$  10Y yield  $\uparrow$  7.31 bps.

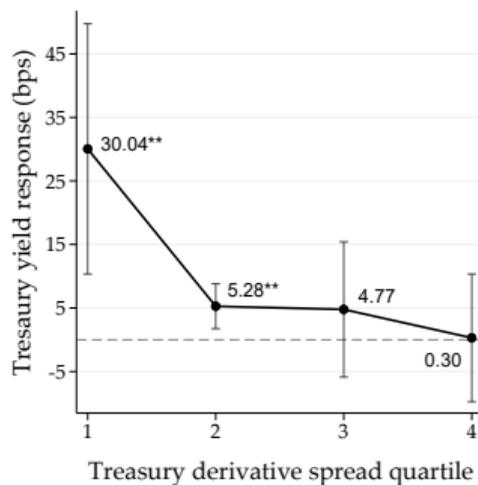
**Shock 3:** 10Y bid-to-cover  $\downarrow$  by 1  $\Rightarrow$  10Y yield  $\uparrow$  2.0 bps.

- Average 10Y auction offering:  $\approx$  \$24B (2008–2024).
- \$100B decline in bid submissions  $\Rightarrow$  10Y yield  $\uparrow$  by  $2.0 \times \frac{100}{24} = 8.33$  bps.

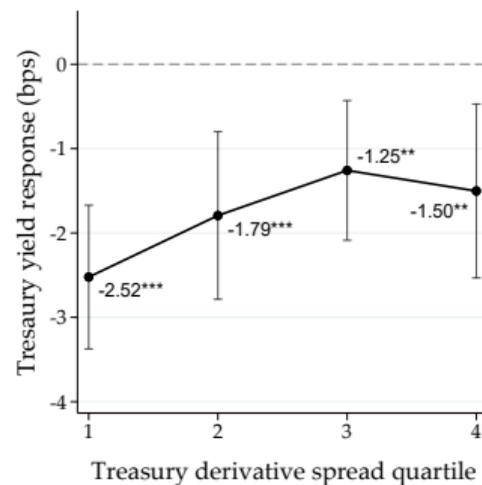
# Treasury Market is less elastic when Allocators are more constrained



(a) Shock 1



(b) Shock 2



(c) Auction results in each tenor

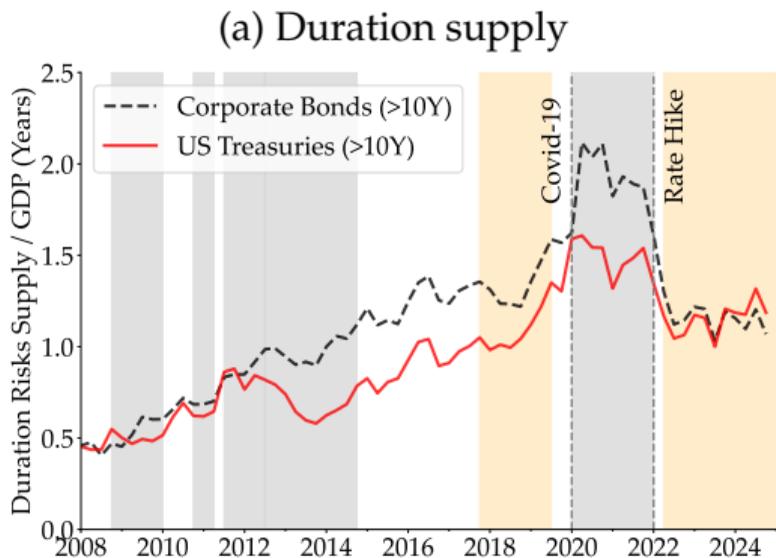
## QE Literature: Treasury Supply Effect Estimations

QE Operation	Studies	Average Effect Across Studies	Average Effect (per \$100bn)
QE1 (\$300bn)	47 bps – Gagnon et al. (2011) 41 bps – Krishnamurthy and Vissing-Jørgensen (2011) 35 bps – D’Amico et al. (2012) 30 bps – D’Amico and King (2013) 34 bps – Bonis, Ihrig, and Wei (2017)	37 bps	12.3 bps
QE2 (\$600bn)	18 bps – Krishnamurthy and Vissing-Jørgensen (2011) 55 bps – D’Amico et al. (2012) 21 bps – Meaning and Zhu (2011) 15 bps – Swanson (2011) 12 bps – Bonis, Ihrig, and Wei (2017)	24 bps	4 bps
MEP (\$667bn)	22 bps – Hamilton and Wu (2012) 17 bps – Meaning and Zhu (2012) 28 bps – Bonis, Ihrig, and Wei (2017)	22 bps	3.3 bps
QE3 (\$790bn)	60 bps – Engen, Laubach, and Reifschneider (2015) 31 bps – Bonis, Ihrig, and Wei (2017)	45.5 bps	5.8 bps
Total		128.5 bps	6.35 bps

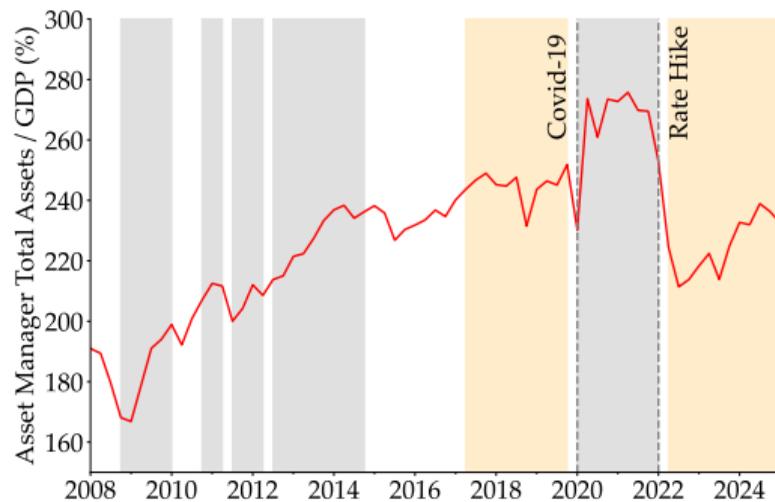
# Treasury Market is less elastic when Allocators are more constrained

	Shock 1 (1)	Shock 2 (2)	Shock 3 (3)
VARIABLES	$\Delta y_{10 \text{ min}}$	$\Delta y_{10 \text{ min}}$	$\Delta y_{10 \text{ min}}$
$Shock_t$	0.187** (0.0734)	7.811*** (2.890)	-1.369** (0.531)
$Shock_t \times \Delta Treasury Share_t$	0.320** (0.151)	14.66* (8.594)	-0.414* (0.180)
$\Delta Treasury Share_t$	-0.214* (0.123)	-0.00848 (0.123)	0.883 (0.495)
Observations	433	1,013	1,233
R-squared	0.0887	0.057	0.095
Maturity FE	Y	Y	Y

# Level of Duration Supply and Demand



(b) Total asset of institutional bond investors



- Duration supply =  $\frac{\text{Outstanding bond amount} \times \text{Weighted average duration}}{\text{GDP}}$ .
- Exclude Treasuries held by the Federal Reserves.

## Robustness Check on the Shocks

### 1. Do markets know the shocks?

Yes. Live news coverage of Treasury announcements from Bloomberg and Reuters.

### 2. Forecastable component in the shocks such that the shocks are overestimated?

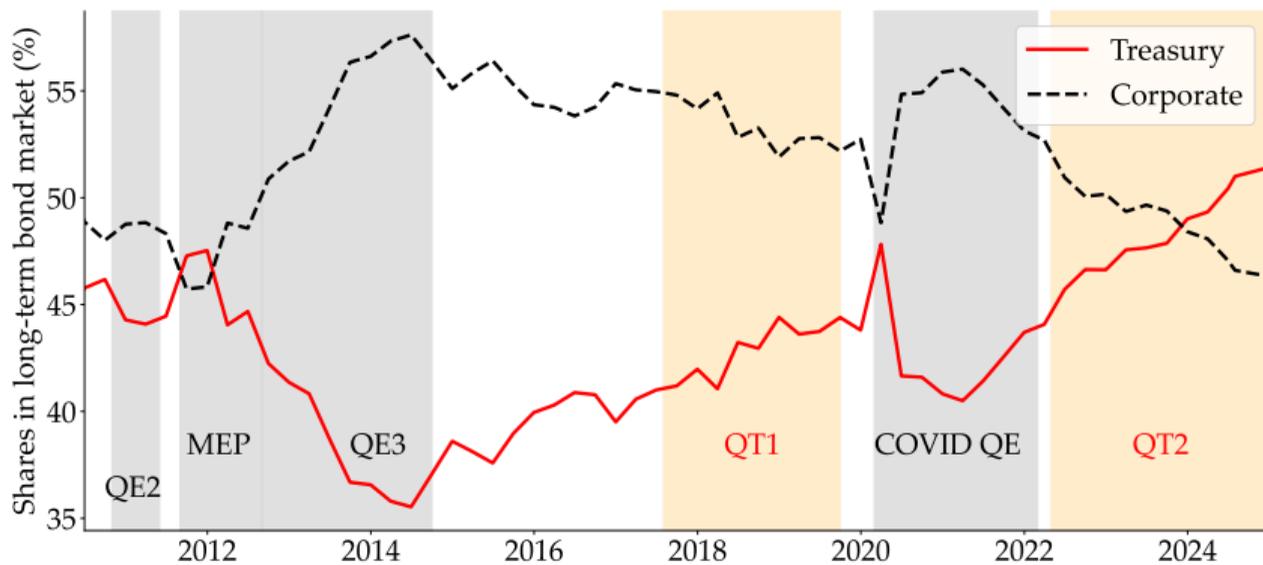
- Exclude quarters with forecastable fiscal expansion: 2008Q4, 2020Q2.
- Exclude predictable components from Shock 1: changes in the previous-quarter cash balance.
- Weak predictability of shocks using macro-financial variables: *GDP growth, unemployment rate, stock return, short-term rate, long-term rate, yield curve slope...* [◀ Result](#)
- Identification is valid if any bias in the shocks is not correlated with investors' constraint levels.

[◀ Return to shocks](#)

# Predictability of Shock 1

VARIABLES	$\frac{\text{Borr. Est.}_t}{D_t}$ (%)
$\Delta \log GDP_{t-1}$	0.0293 (0.116)
$\Delta \text{Unemp. rate}_{t-1}$	0.00355* (0.00197)
$\Delta \log \text{StockIndex}_{t-1}$	-0.0136** (0.00579)
$\Delta \text{FFER}_{t-1}$	-0.000146 (0.000302)
$\Delta 10Y \text{ Treasury}_{t-1}$	-6.10e-05 (0.00160)
$\Delta \text{Slope}_{t-1}$	-0.000463 (0.00236)
Constant	0.000140 (0.00154)
Observations	126
R-squared	0.141
$\text{Corr}(\text{Shock}, \text{Residual})$	0.927

# Composition of US Long-term Debt Market



**Figure:** The Treasury share and corporate bonds share in the long-term bond market

# Balance Sheet of Liability Driven Investors

(a) Liability driven investor

Asset	Liability
Long-term bond <b>B</b>	Liability (annuity) <b>L</b>
Short-term bond, equity, cash <b>S</b>	Equity <b>E</b>

(b) Bond mutual funds

Asset	Liability
Long-term bond <b>B</b>	Equity (AUM) <b>E</b>
Short-term bond, equity, cash <b>S</b>	

- LDI investors: immunize equity value  $E = B + S - L$  from interest rate changes.

$$w_B \equiv \frac{B}{L} = \frac{D_L}{D_B}$$

- Bond mutual funds: match duration of benchmark index  $D_I$ .

$$w_B \equiv \frac{D_I}{D_B}$$

# Treasury Market Elasticity in the Simplified Model

## Proposition

Consider the economy with perfectly elastic short-term corporate bond market. Comparing with the slack region, a marginal Treasury supply shock has

i) a stronger price impact on Treasury yield under the binding region:

$$\frac{\partial y_0^T}{\partial S_T} = \underbrace{\frac{1}{2} \frac{1}{\varepsilon_T + \varepsilon_L}}_{\text{slack region}} < \underbrace{\frac{1}{2} \frac{1}{\varepsilon_T + \varepsilon_L \frac{\varepsilon_A}{\varepsilon_A + \varepsilon_L}}}_{\text{binding region}}, \quad \text{with } \varepsilon_A \equiv \frac{1}{\gamma \sigma_z^2}$$

ii) a weaker price impact on long-term corporate bond yield under the binding region:

$$\frac{\partial y_0^L}{\partial S_T} = \underbrace{\frac{1}{2} \frac{1}{\varepsilon_T + \varepsilon_L}}_{\text{slack region}} > \underbrace{\frac{1}{2} \frac{1}{\varepsilon_T \frac{\varepsilon_A + \varepsilon_L}{\varepsilon_A} + \varepsilon_L}}_{\text{binding region}}, \quad \text{with } \varepsilon_A \equiv \frac{1}{\gamma \sigma_z^2}$$

## Treasury Market Elasticity in the Full Model

The economy features two equilibria region, with

i) *less elastic Treasury market under the binding region:*

$$\varepsilon_{TT} : \underbrace{2 \left( \varepsilon_T + \varepsilon_L \frac{\varepsilon_A + \varepsilon_S}{\varepsilon_A + \varepsilon_L + \varepsilon_S} \right)}_{\text{slack region}} > \underbrace{2 \left( \varepsilon_T + \varepsilon_L \frac{\varepsilon_A}{\varepsilon_A + \varepsilon_L} \right)}_{\text{binding region}} \quad (1)$$

ii) *weaker price impact on long-term corporate bond yields under the binding region:*

$$\frac{\partial y_0^L}{\partial S_T} = \underbrace{\frac{1}{2} \frac{1}{\varepsilon_T \frac{\varepsilon_A + \varepsilon_L + \varepsilon_S}{\varepsilon_A + \varepsilon_S} + \varepsilon_L}}_{\text{slack region}} > \underbrace{\frac{1}{2} \frac{1}{\varepsilon_T \frac{\varepsilon_A + \varepsilon_L}{\varepsilon_A} + \varepsilon_L}}_{\text{binding region}} \quad (2)$$

Specifically, when the market is fully segmented,  $\varepsilon_{TT} = \varepsilon_T$ . When the market is non-segmented,  $\frac{\partial y_0^L}{\partial S_T} = 0$ .

# Treasury Market Elasticity with Basis Trade

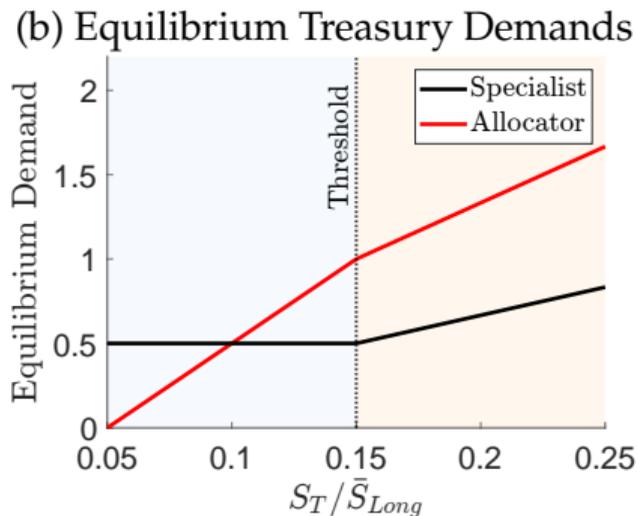
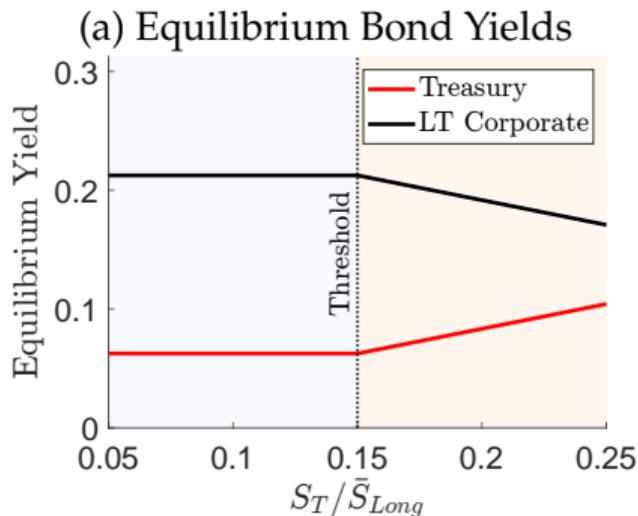
Treasury market elasticity:

$$\varepsilon_{TT} : \underbrace{2 \left( \varepsilon_T + \varepsilon_L \frac{\varepsilon_A + \varepsilon_S}{\varepsilon_A + \varepsilon_L + \varepsilon_S} \right)}_{\text{slack region, } \equiv \varepsilon_{TT}^{\text{Slack}}} > \underbrace{2 \left( \varepsilon_T + \varepsilon_L \frac{\varepsilon_A \left( 1 + \frac{\varepsilon_S}{\varepsilon_D} \right) + \varepsilon_S}{(\varepsilon_A + \varepsilon_L) \left( 1 + \frac{\varepsilon_S}{\varepsilon_D} \right) + \varepsilon_S} \right)}_{\text{binding region + basis trade, } \equiv \varepsilon_{TT}^{\text{BasisTrade}}} > \underbrace{2 \left( \varepsilon_T + \varepsilon_L \frac{\varepsilon_A}{\varepsilon_A + \varepsilon_L} \right)}_{\text{binding region, } \equiv \varepsilon_{TT}^{\text{Binding}}}$$

◀ Return

# Comparative Analysis

Holding total duration risk  $S_L + S_T$  and credit risk  $S_L + S_S$  fixed



Return

## Threshold Condition in the Full Model

The threshold condition for the *slack region* and *binding region* follows

$$g(S_T, S_L, S_S, \bar{D}) \equiv \frac{\varepsilon_T \varepsilon_S}{\Delta} S_L - \frac{\varepsilon_L \varepsilon_S}{\Delta} S_T - \frac{\varepsilon_A (\varepsilon_L + \varepsilon_T) + \varepsilon_T \varepsilon_L}{\Delta} S_S + 1 - \frac{\varepsilon_A (\varepsilon_L + \varepsilon_T) + \varepsilon_T (\varepsilon_L + \varepsilon_S)}{\Delta} \bar{D}$$

$$\begin{cases} \geq 0 & \text{(slack region),} \\ < 0 & \text{(binding region),} \end{cases} \quad \text{where } \Delta \equiv (\varepsilon_S + \varepsilon_A)(\varepsilon_L + \varepsilon_T) + \varepsilon_T \varepsilon_L$$

### Comparative analysis:

1. Holding total duration risk  $S_L + S_T$  and total credit risk  $S_L + S_S$  fixed. **A lower  $S_L$  increases the likelihood of entering the binding region.**
2. **Allocators with a higher duration mandate  $\bar{D}$  are more likely to bind.**

# Gap Between Long-term and Short-term Credit Spread

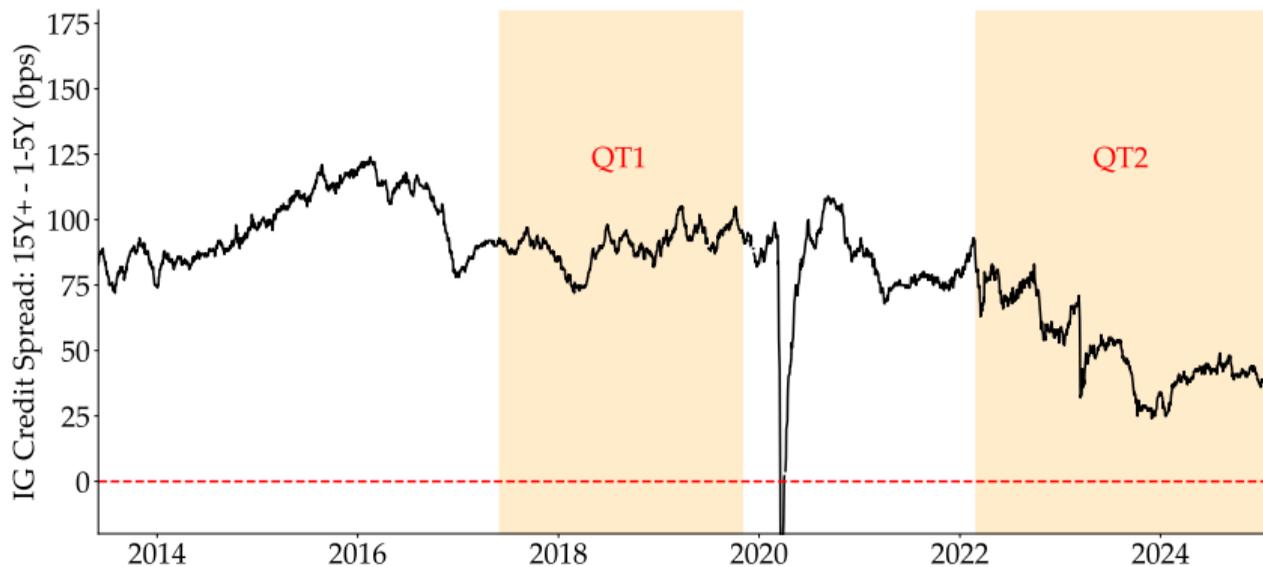


Figure: US Corporate Bond Credit Spread: 15+ Year - 1-5 Year.

# Limits of Treasury Market Elasticity

- Elasticity restored “*partially*” due to derivative basis charged by hedge funds.
- if hedge funds have perfect elastic supply = leverage freely  $\Rightarrow$  **slack region**

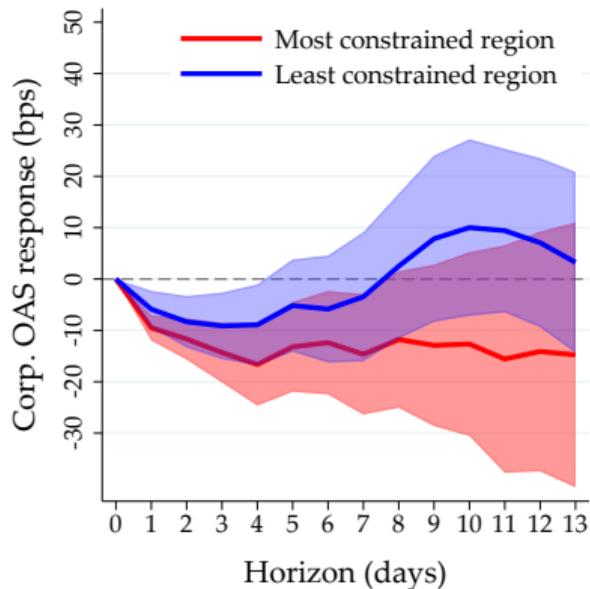
$$\lim_{\varepsilon_D \rightarrow \infty} \varepsilon_{TT}^{\text{BasisTrade}} = \varepsilon_{TT}^{\text{Slack}}$$

- if hedge funds have inelastic supply = no-leverage  $\Rightarrow$  **binding region**

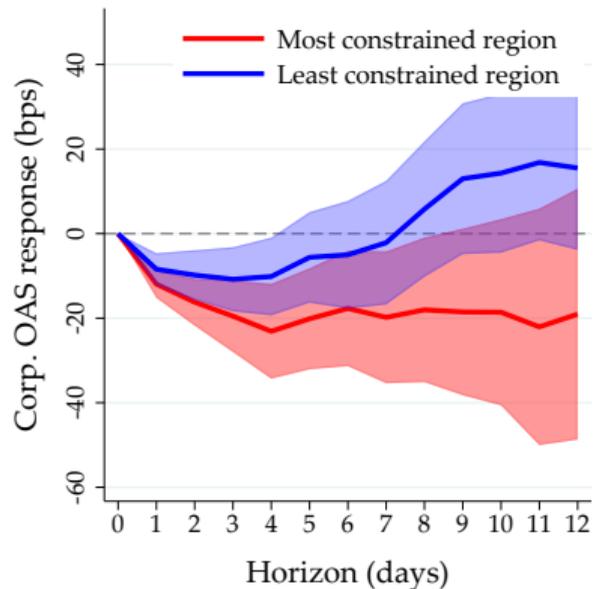
$$\lim_{\varepsilon_D \rightarrow 0} \varepsilon_{TT}^{\text{BasisTrade}} = \varepsilon_{TT}^{\text{Binding}}$$

# Pass-through to Lower Rating Bonds on Auction Days

(a) All Investment-grade bond



(a) BBB corporate bond



◀ Return

# Pass-through on Long-term Treasury Auction Days

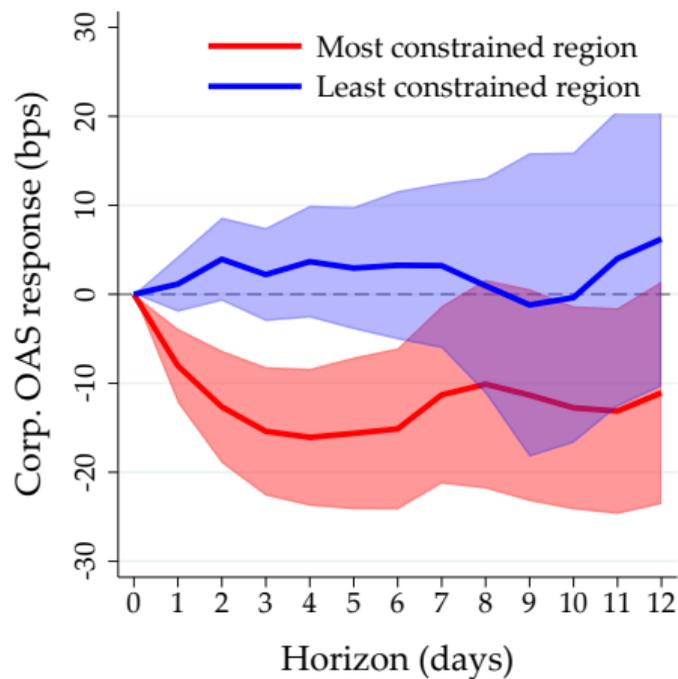


Figure: Long-term Treasury auctions only

## Swap Spread and CDS Basis

	Treasuries	Corporate Bond
Cash Bond	Treasury yield	Credit spread
Derivative	Swap rate	Credit default swap
Difference	Swap Spread	CDS Basis

- Typically:
  - CDS Basis  $> 0$ : funding cost and liquidity cost associated with holding cash bonds.
  - Swap spread = 0: equivalence of cash Treasuries and Treasury derivatives
- Now: CDS Basis  $\rightarrow 0$ ; Swap Spread  $\rightarrow -20$  bps.
- Funding cost of holding cash Treasury  $\uparrow$ ; holding cash corporate bond  $\downarrow$ .

# Pass-through to Corporate Bond Market: High Frequency Shocks

VARIABLES	(1)	(2)	(3)
	$h = 1$	$h = 2$	$h = 3$
$\Delta y_t^{10Y,10min}$	-6.018 (12.05)	-33.58* (18.63)	-34.74* (20.48)
$\Delta y_t^{10Y,10min} \times Q_{Swap\ Spread_t^{10Y}} = 2$	8.929 (14.60)	52.18** (24.06)	54.39* (28.86)
$\Delta y_t^{10Y,10min} \times Q_{Swap\ Spread_t^{10Y}} = 3$	6.566 (13.79)	14.22 (21.73)	7.498 (25.86)
$\Delta y_t^{10Y,10min} \times Q_{Swap\ Spread_t^{10Y}} = 4$	1.087 (13.56)	42.31** (21.44)	45.82* (26.07)
$Q_{Swap\ Spread_t^{10Y}} = 2$	0.161 (0.114)	0.437 (0.287)	0.470 (0.345)
$Q_{Swap\ Spread_t^{10Y}} = 3$	0.265** (0.113)	0.560* (0.318)	0.708* (0.399)
$Q_{Swap\ Spread_t^{10Y}} = 4$	0.244** (0.105)	0.512* (0.280)	0.459 (0.349)
Observations	1,035	1,035	1,035
R-squared	0.056	0.141	0.134
Controls	Y	Y	Y

$$\Delta OAS_{t-1 \rightarrow t+h}^{AAA} = \alpha_h + \beta_h \Delta y_t^{10Y,10min} + \sum_{j=1}^3 \Delta OAS_{t-j-1 \rightarrow t-j} + \text{Controls}_t + \varepsilon_{t,h}$$

Return

# Validating the Derivative Spread Measure

## 1. Supply side reason: time-varying per-unit derivative intermediation costs

- Limit sample to post-2009 period when comparing Treasury supply effects
- VAR decomposition confirms swap spreads are demand-side driven

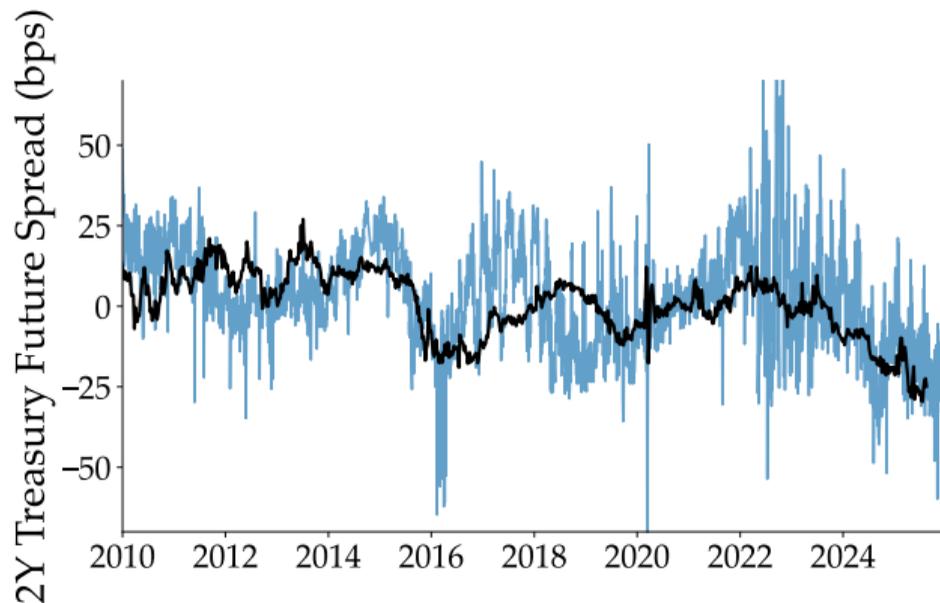
[◀ VAR Decomposition](#)

## 2. Other market participants influence swap spreads

- Futures swap spreads comove strongly with spot swap spreads

[◀ Future Spread](#)[◀ Return to Model Summary](#)

# Treasury Future Spread Correlated with Swap Spread

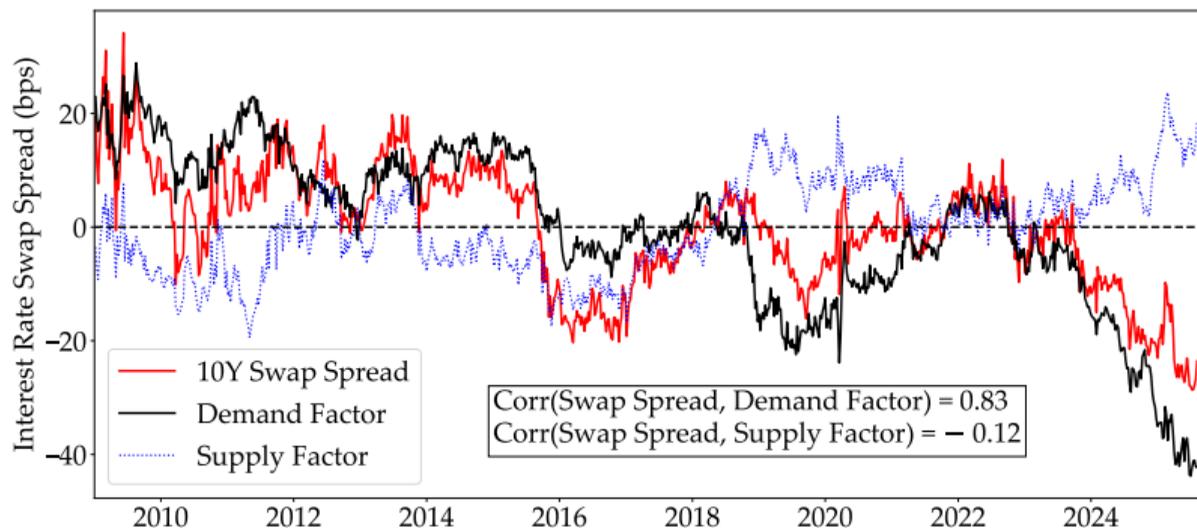


$$\text{Future spread} = \underbrace{\text{term repo rate}}_{\text{funding cost of holding cash Treasury}} - \underbrace{\text{implied repo rate}}_{\text{funding cost of holding Treasury future}}$$

Future spread < 0: Treasury future is overpriced. Long cash bond and short future.

[Return](#)

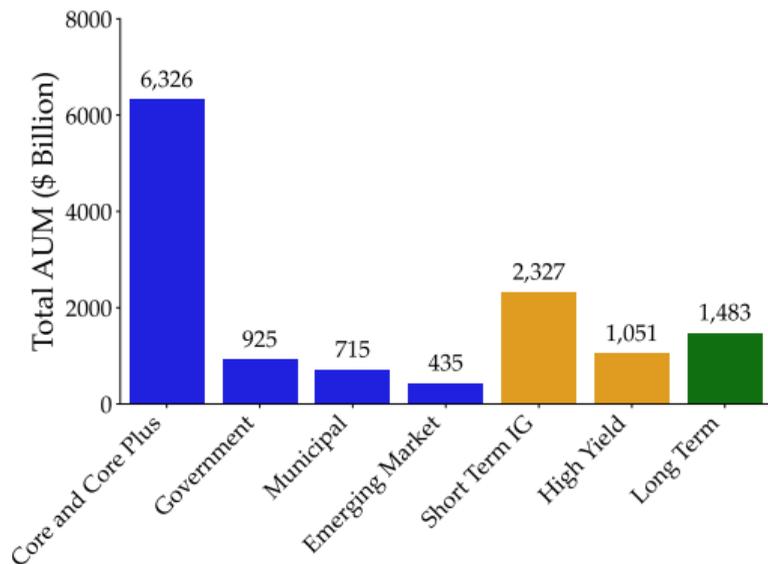
# VAR Decomposition of Swap Spread Hanson et al. (2024)



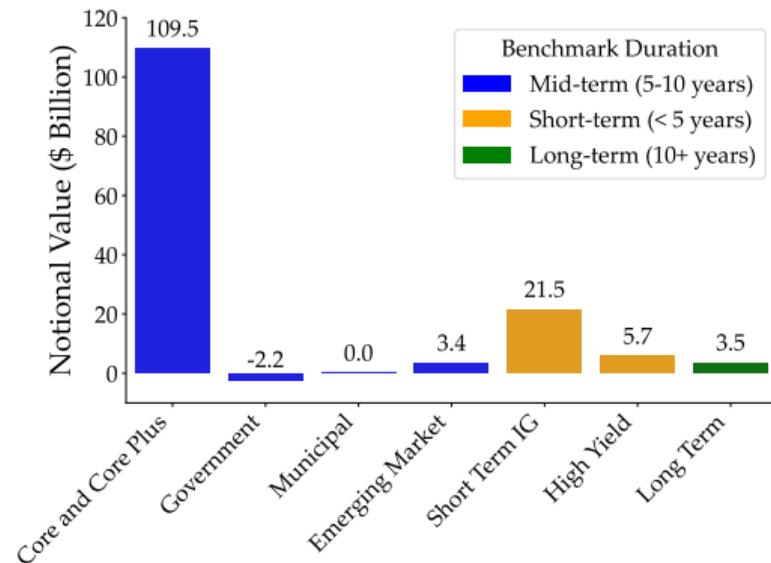
- Demand side: low swap spread due to high end-user demand
  - → **high** intermediation quantity.
- Supply side: low swap spread due to high HF/dealer per unit intermediation cost
  - → **low** intermediation quantity.

# Bond Mutual Funds: Who Uses Derivatives?

(a) Moringstar Global Bond Fund AUM (2024Q1)



(b) Moringstar Bond Fund Treasury Future Positions (2024Q1)



- Core and Core Plus funds are primarily benchmarked to the Bloomberg US Aggregate Bond Index (or Bloomberg US Universal Bond Index).

# Bond Mutual Funds: Index Benchmarking

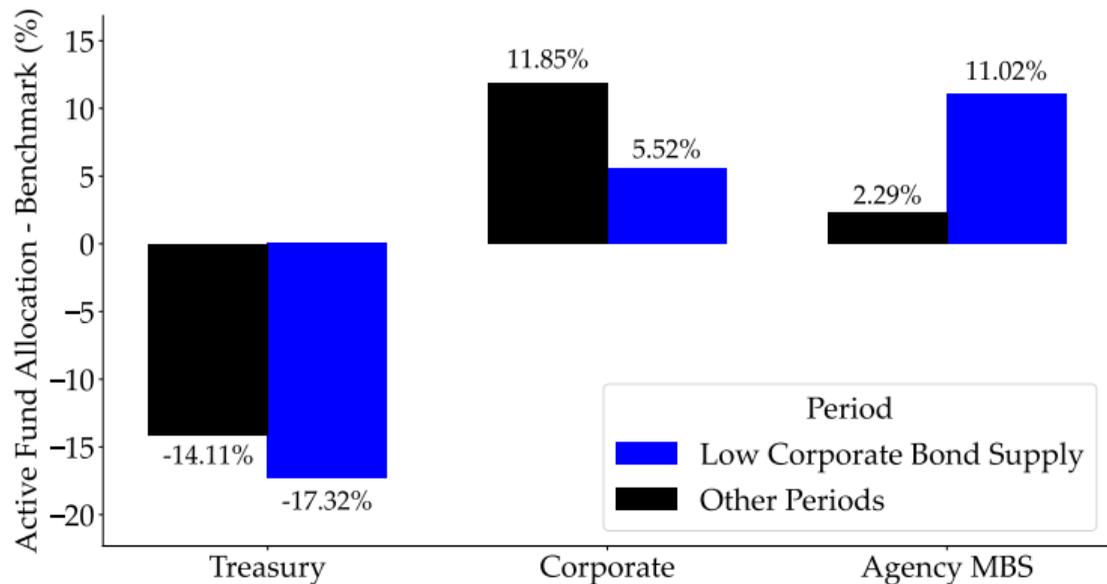
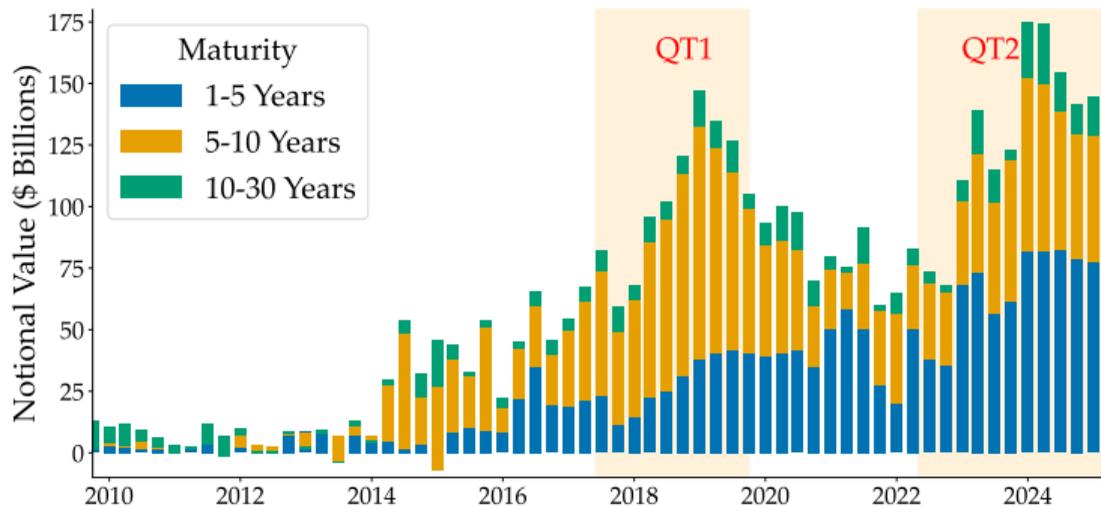


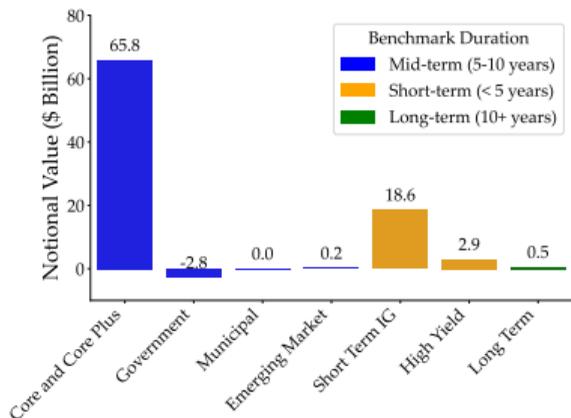
Figure: Active-managed fund asset allocation relative to Bloomberg benchmark index

# Bond Mutual Funds Treasury Future Usage

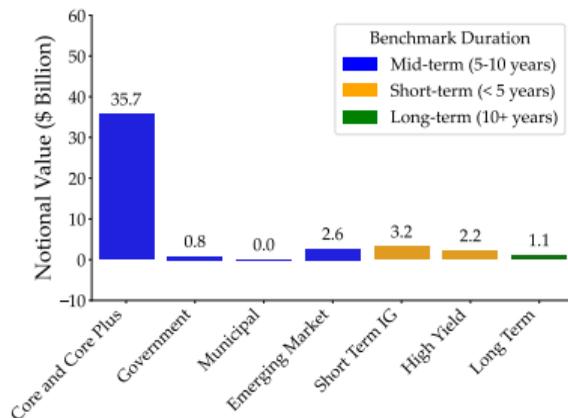
[Return](#)

# Bond Mutual Funds: Future Positions by Tenor

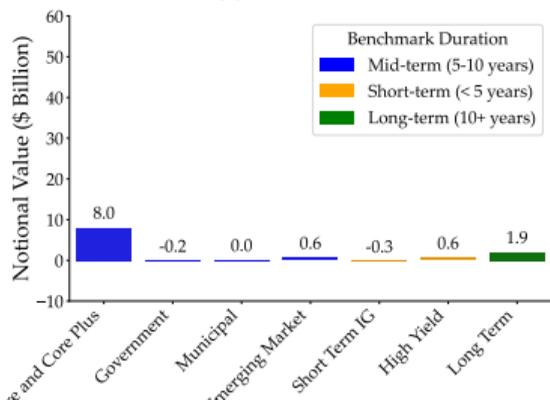
(a) 1-5 Y



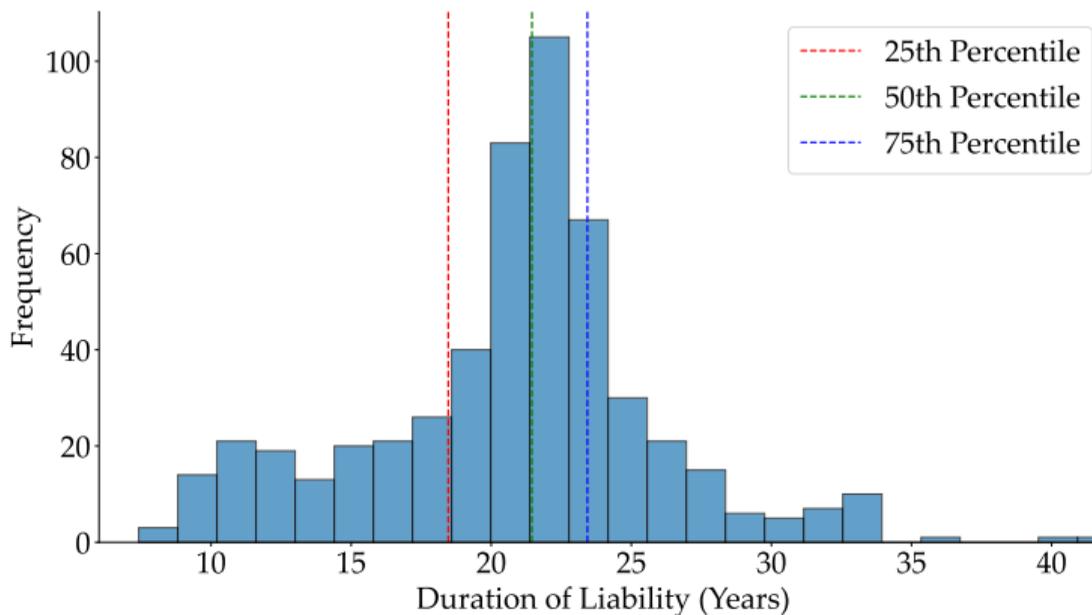
(b) 5-10Y



(c) 10Y +

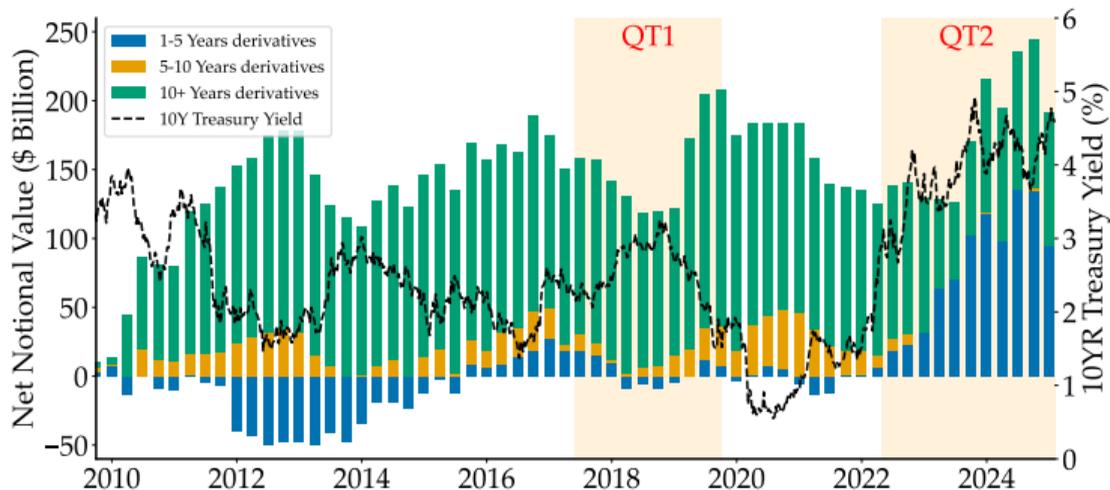

[Return](#)

# Life Insurance Company Duration



**Figure:** Distribution of US Life Insurance Company Liability Duration (2020)

# Life Insurance Treasury Derivative Usage

[Return](#)