

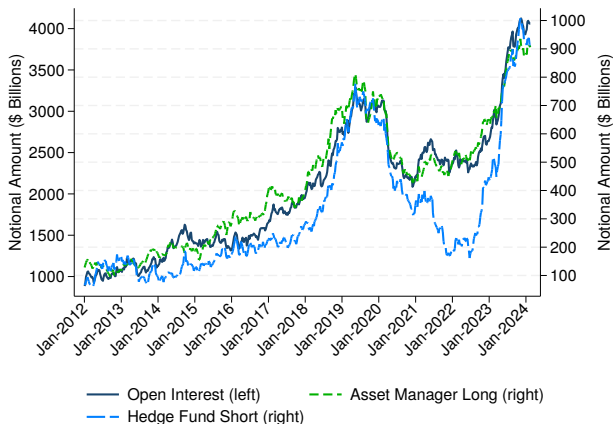
Reaching for Duration and Leverage in the Treasury Market

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Disclaimer: The views expressed in this presentation are those of the speaker and do not necessarily represent the views of the Board of Governors of the Federal Reserve System.

Motivating Fact: Time-Series Variation in U.S. Treasury Futures



- ▶ **Open interest:** 2015: \$735B \implies 2023: \$2.2T.
 - ▶ Short side: hedge funds **cash-futures basis trade**.
Schrimpf et al (2020), Barth and Kahn (2021), Banegas et al. (2021)
- ▶ **The long positions are mostly held by asset managers**
 - ▶ $\approx 60\%$ of open interest as of January 2024

Treasury futures: a primer

- ▶ A Treasury futures contract is an agreement to transact in the future at a price agreed upon today.
 - ▶ The short position “delivers” a Treasury note/bond to the long position.
 - ▶ Contracts are distinguished by the Treasuries that eligible for delivery
- ▶ A Treasury futures position is a *synthetic* position in a Treasury bond (the “cheapest to deliver”)
- ▶ Investors must post initial margin and maintain a minimum level of margin throughout the life of the contract

This paper — who holds long Treasury futures and why?

Within asset managers, the answer appears to be mostly **mutual funds**.

- ▶ \$600B in long Treasury futures in 2023.

Why should we care?

1. Important for understanding who holds Treasury market *risk*
2. Constitutes an under-studied form of Treasury market leverage
 - ▶ **Direct leverage effect:** mutual funds have leveraged Treasury exposures
 - ▶ **Indirect leverage effect:** motivates hedge fund leverage through the Treasury cash-futures basis trade
 - ▶ Purchase a Treasury note or bond
 - ▶ Short the corresponding Treasury futures contract
 - ▶ Finance the purchase of the note/bond by borrowing in repo using the note/bond as collateral

Brief Summary

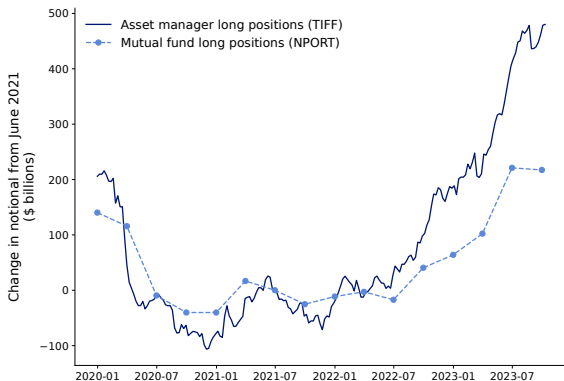
Why do mutual funds hold so many futures?

1. MFs track a benchmark to (partially) resolve principal-agent concerns
 - ▶ For fixed income MFs, this is often the Bloomberg Agg Index
 - ▶ Importantly, this index has significant Treasury holdings
2. When other debt assets (MBS, CLOs) become attractive, MFs sell Treasuries and buy the more attractive assets
 - ▶ This introduces benchmark tracking error — a widening gap between **portfolio duration** and **benchmark duration**
3. To reduce this gap, MFs **reach for duration** by buying Treasury futures

Cross-sectional variation

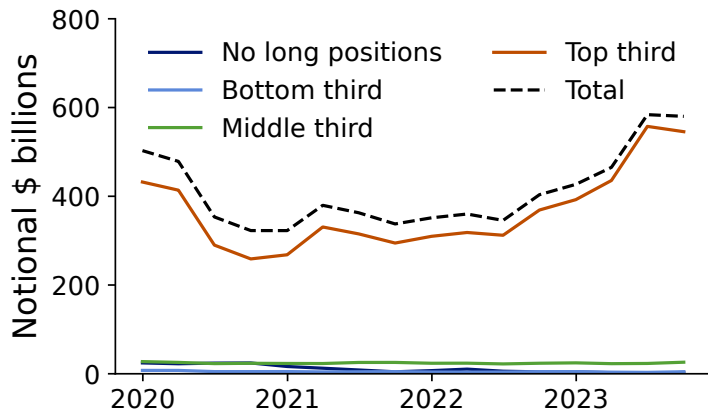
- ▶ Segmentation due to investor preferences (hypothesis)
 - ▶ Credit risk vs. duration
- ▶ Evidence from: prospectuses, fund characteristics, flows

Mutual funds' aggregate Treasury futures positions



<i>Notional \$B</i>	Q4 2019	Q2 2021	Q2 2023
Asset manager	888	682	1,087
Mutual fund	474	354	579
2-year only			
Asset manager	347	166	346
Mutual fund	181	122	299

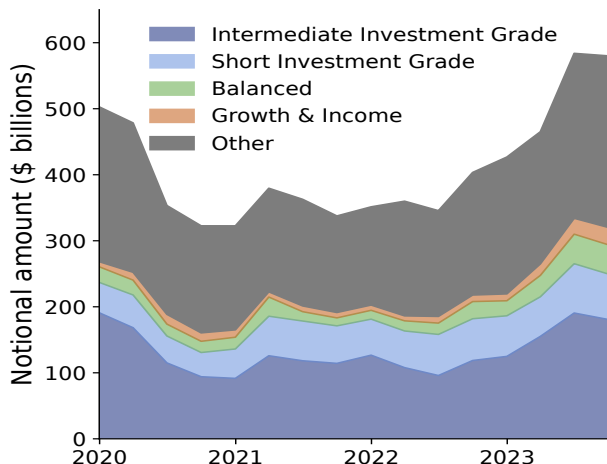
Persistence in Treasury futures positions



There is a persistent set of funds that hold large Treasury futures positions.

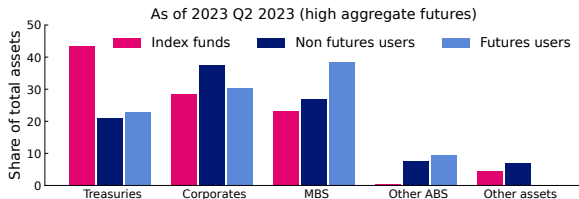
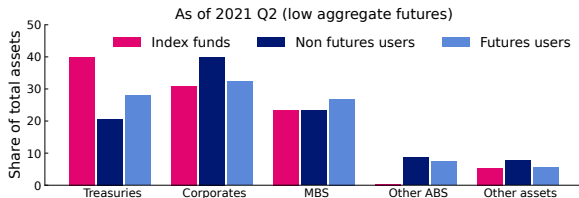
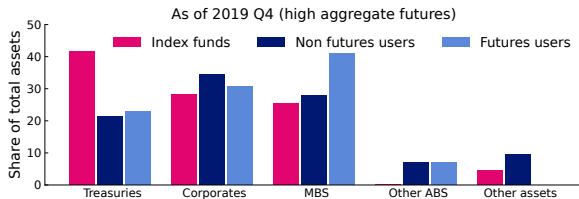
- ▶ *High futures holders in 2023 account for 83% of futures in 2019.*
- ▶ 97% of funds that did not have long futures in 2023 did not in 2019; 77% of funds that did in 2023 also did in 2019.

Mutual fund styles and Treasury futures positions



- ▶ **Intermediate investment grade (IID) funds:** usually benchmarked to Bloomberg Aggregate Index
- ▶ **Short-intermediate/short investment grade funds:** similar to IID, but shorter maturities

Portfolio holdings of investment-grade debt mutual funds



Regression evidence on asset allocation: IID funds

$$\text{Asset allocation } (\%)_{it} = \alpha_i + \gamma_t + \beta \times \text{Futures to assets}_{it} + \epsilon_{it}$$

(Note that with fund fixed effects, identification is off intensive margin)

	Treasuries	MBS	Corporate Debt	ABS	Cash
Treasury futures to assets	-0.124*** (0.011)	0.037*** (0.011)	0.006 (0.009)	0.037*** (0.006)	0.011* (0.006)
Fund fixed effect	X	X	X	X	X
Time fixed effect	X	X	X	X	X
Observations	4,931	4,931	4,931	4,931	4,931

Why are Treasury futures and MBS complements?

IID funds tend to have duration targets

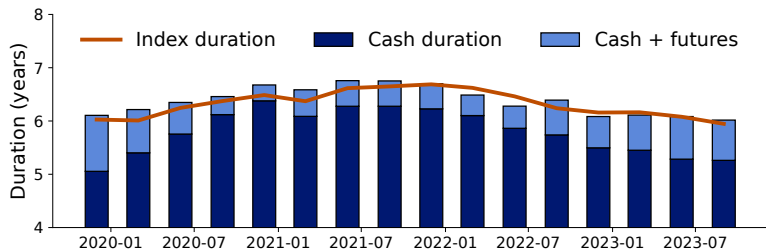
- ▶ Many IID funds have an explicit duration target in their prospectus.
 - ▶ **PACE Intermediate Fixed Income** “...within +/- 50% of the duration of the Bloomberg US Aggregate Bond Index...”
 - ▶ **Invesco Core Plus Bond Fund** “...within +/- 2 years of the benchmark index.”
- ▶ Others will target duration ranges:
 - ▶ **Janus Henderson Flexible Bond** ...average portfolio duration typically ranges between 3 and 7 years
- ▶ While fixed rate MBS and ABS are generally within investment scope, they have **very different duration** from Treasuries.

The duration gap

- ▶ When mutual funds shift from Treasuries to MBS, a duration gap from the benchmark emerges.

	Dec 2019		Jun 2021		Jun 2023	
	Share	Duration	Share	Duration	Share	Duration
U.S. Treasuries	21.63	9.30	29.74	9.41	21.79	9.19
MBS	39.11	3.31	26.44	3.88	38.98	3.61
Corporate debt	21.74	5.56	25.24	7.38	22.76	5.96
ABS	4.48	1.25	4.66	1.57	5.51	1.46
Other	13.05	4.77	13.93	5.67	10.95	4.71
Fut holder duration		5.05		6.28		5.27
Index fund duration		6.04		6.64		6.08

Futures fill the duration gap



Δ Treasury futures duration

Δ Cash duration	-0.360***	-0.358***	-0.417***
Fund fixed effect		X	X
Time fixed effect			X
R^2	0.070	0.100	0.149

Treasury futures and MBS returns

Why tilt towards MBS?

- ▶ Expected MBS returns predict higher Treasury futures growth.

<i>Dep var: AM Longs / Total Longs</i>		
	(1)	(2)
MBS returns		
TBA OAS	23.14*** (8.45)	12.62** (5.63)
Dollar Roll Spec	-61.30 (45.24)	-28.07 (19.97)
Month FE	X	X
Duration/Convexity		X
R ²	0.33	0.79
Adj. R ²	0.31	0.78

Speculative *Causal* Mechanism

- ▶ Dreschler et. al (2024): monetary policy tightening motivates MBS sales by banks and the Fed:
 1. Higher interest rates \rightarrow deposit outflows, banks sell MBS
 2. Fed reduces balance sheet, sell MBS

	Households		Asset Managers		Rest of World		Others	
	(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 Mortgage spread	0.031*** (0.012)		-0.001 (0.007)		0.012** (0.006)		0.023** (0.009)	
Δ Mortgage spread		0.057*** (0.020)		0.051*** (0.016)		0.026*** (0.006)		0.076*** (0.015)
ZLB	-0.016** (0.006)	-0.001 (0.005)	-0.031*** (0.006)	-0.018* (0.009)	-0.027*** (0.003)	-0.014*** (0.003)	-0.039*** (0.009)	-0.010 (0.011)
Δ Fed funds rate	0.000 (0.003)	0.013** (0.005)	-0.010*** (0.002)	-0.003 (0.009)	0.000 (0.002)	0.001 (0.003)	-0.002 (0.004)	0.024* (0.012)
Δ GDP gap	0.005** (0.002)	-0.003 (0.004)	-0.003** (0.001)	0.001 (0.004)	0.002 (0.001)	0.004** (0.002)	-0.007** (0.003)	-0.007 (0.008)
Δ Inflation gap	-0.010 (0.007)	-0.016** (0.006)	-0.003 (0.005)	-0.002 (0.004)	0.006* (0.003)	-0.004 (0.003)	-0.009 (0.009)	-0.026*** (0.006)
Constant	0.011*** (0.004)	0.003 (0.004)	0.025*** (0.003)	0.011* (0.007)	0.017*** (0.003)	0.005** (0.003)	0.022*** (0.006)	-0.004 (0.010)
Obs.	120	40	120	40	120	40	120	40
R^2	0.318	0.458	0.666	0.571	0.548	0.771	0.428	0.630

- ▶ Many investors buy MBS when banks/Fed sell
- ▶ So why are asset managers responsible for so much Treasury futures variation? *They track a benchmark.*

Cross-sectional variation

Cross-sectional heterogeneity

	Share	Percentiles			
	> 0	50%	75%	90%	99%
Total	10	0	0	0.002	0.81
IID	53	0.003	0.14	0.59	15.18
SID	50	0.002	0.14	0.50	3.13
B	24	0	0	0.06	1.98
SII	39	0	0.07	0.36	7.28
GI	6	0	0	0	0.14

There is a great deal of heterogeneity in Treasury futures positions, even within styles.

Why do some funds hold more Treasury futures than others?

If holding futures allows funds to reach for yield, why is their use not more widespread?

Results suggest that funds that use futures are differentiated.

1. *Larger* emphasis on tracking benchmark duration;
2. *Less* sensitive flow-performance relationship.

Fund performance

	Return relative to Aggregate Index			Std. Dev	Duration component
	Average excess	Beta	Alpha		
No futures	0.28	0.88	0.32	0.45	0.37
Low futures	0.34	0.93	0.38	0.45	0.39
Medium futures	0.46	0.94	0.49	0.47	0.39
High futures	0.34	0.96	0.36	0.47	0.40

- ▶ High futures users have higher index betas; no clear pattern in excess returns or alpha

Flow-performance relationship

	<i>Dependent variable: Percent flows</i>		
	(1)	(2)	(3)
Log of total net assets	0.002*** (3.592)	0.003 (1.23)	0.003 (1.231)
Quarterly return	0.528*** (3.453)	0.454*** (2.949)	0.571*** (2.979)
Quarterly return \times Low futures	-0.007 (-0.105)	-0.012 (-0.178)	-0.006 (-0.083)
Quarterly return \times Medium futures	-0.105 (-1.586)	-0.107 (-1.606)	-0.107 (-1.607)
Quarterly return \times High futures	-0.093* (-1.891)	-0.091* (-1.825)	-0.099* (-1.944)
Time fixed effects	X	X	X
Entity fixed effects		X	X
Other controls			X
Observations	8,288	8,288	8,288
R-squared	0.019	0.019	0.019

Conclusion

We show that mutual funds are large users of Treasury futures.

- ▶ Their holdings drives a substantial share of aggregate movements in open interest.

Mutual funds use futures to manage duration when they reach for yield.

- ▶ Fund commonly employ futures when they move from Treasuries to MBS.
- ▶ Appears associated with spreads of MBS relative to Treasuries.
- ▶ Futures offsets the duration mismatch that results.

Leads to increased leverage in Treasury markets

- ▶ Directly through mutual funds' long futures positions
- ▶ Indirectly through hedge funds' basis trade positions

NPORT Data

Cleaned and processed data from NPORT is available at Jay's website:

<https://j-kahn.com/nport/>