

Reaching for duration and leverage in the Treasury market

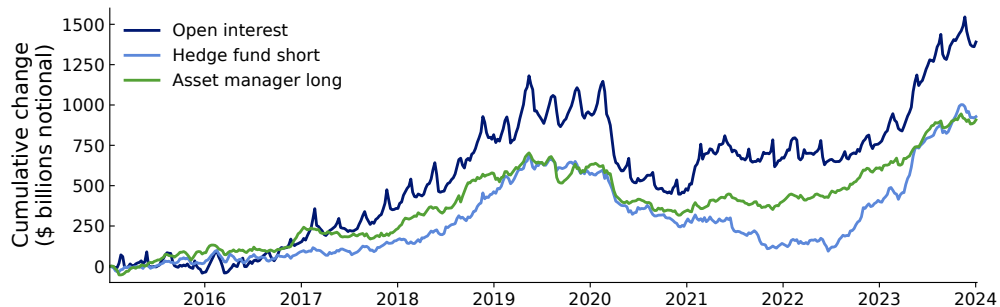
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Board of Governors of the Federal Reserve System

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Who holds long Treasury futures positions?

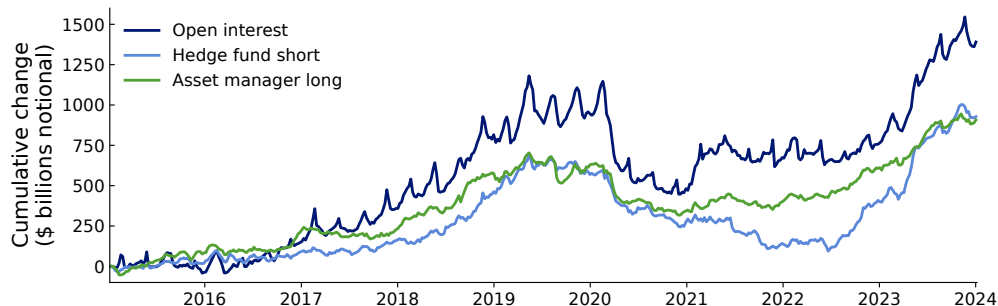


► **Open interest in futures contracts:** 2015: \$735B $\Rightarrow$ 2023: \$2.2T.

► Short side largely highly-levered arbitrage by hedge funds: **cash-futures basis trade**.

Schrimpf et al (2020), Barth and Kahn (2021), Banegas et al. (2021)...

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- ▶ **We show that much of the long side of trades is mutual funds.**

- ▶ **Q2 2023:** mutual funds were 31% of Treasury futures and >50% of AM positions.
 - ▶ >60% of change in total positions since 2021.

This paper: Mutual funds held nearly \$600B in long Treasury futures in 2023.

Employ regulatory filings covering details on fund positions including detailed data on derivatives.

Show substantial time-series and cross-sectional variation in Treasury futures holdings.

Understanding why mutual funds hold this synthetic Treasury leverage is important because:

1. Helps to explain variation in cash-futures basis trade volumes.
 - ▶ The cash-futures basis trade is a highly levered arbitrage trade funded in the repo market.
 - ▶ Important impact on aggregate dealer repo lending, hedge fund leverage, and Treasury market stress.
 - ▶ See Schrimpf et al. (2020), Barth and Kahn (2021), Kruttli et al. (2023)
2. Provides unique window into incentives to take on non-bank leverage in the Treasury market.
 - ▶ Risks of this leverage has been illustrated by March 2020 dash-for-cash, September 2022 gilt crisis.
 - ▶ Data on other non-banks in U.S. Treasury market (hedge funds, LDI funds, sovereign funds) is scarce.

This paper:

Mutual funds use Treasury futures to match target duration while “reaching for yield.”

- a. Tilting portfolio towards higher yielding assets.
 - b. While maintaining target index duration.
1. Higher holdings for core bond funds associated with switch from Treasuries to MBS/ABS.
 - ▶ Little evidence of taking on credit risk, but see a shift from fixed to floating rate.
 - ▶ For funds with broader focus, also see a shift to equities.
 2. As futures holdings rise, the duration of the cash portfolio falls relative to benchmark
 - ▶ Driven by the difference in allocation to MBS/ABS and Treasuries.
 - ▶ Futures fill the resulting gap to the index.
 3. Increase in futures use coincides with higher yields on MBS relative to Treasuries.

Futures use is concentrated among a persistent set of funds even within strategy

- ▶ Higher benchmark Treasury share, mention MBS and duration in their prospectuses.
- ▶ High futures holders show signs of focusing on trading profits rather than buy-and-hold, flows less sensitive to performance.

Discuss alternative means of leverage and implications for Treasury issuance.

Data on mutual fund holdings is from SEC Form N-PORT

Quarterly filing for registered investment companies, required for funds with assets $\geq$ \$1B.

- ▶ Reporting for all funds began in June 2019, but coverage is poor before Q4 2019.
- ▶ **We scrape 208,569 filings for over 14,600 funds from the SEC's EDGAR database.**

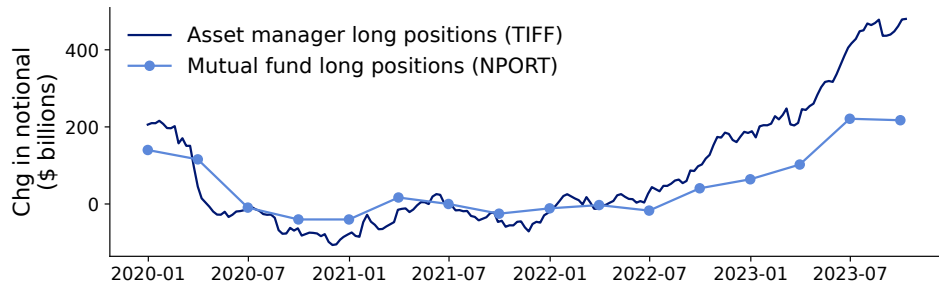
Includes notional value of derivatives contracts, direction of trade, and underlying security.

- ▶ Identify 96,227 Treasury futures positions from 396,991 total futures positions.

Merge in additional data from other sources:

- ▶ CRSP data for mutual fund attributes, returns and flows.
- ▶ Data from mutual fund prospectuses to identify benchmark indices.
- ▶ Data from ICE and JP Morgan for durations and ratings of cash securities.

Mutual funds' aggregate Treasury futures positions



Notional \$B	Q4 2019	Q2 2021	Q2 2023
Asset manager	888	682	1,087
Mutual fund	503	362	583
2-year only			
Asset manager	347	166	346
Mutual fund	190	122	259

► Mutual funds roughly 52% of AM futures

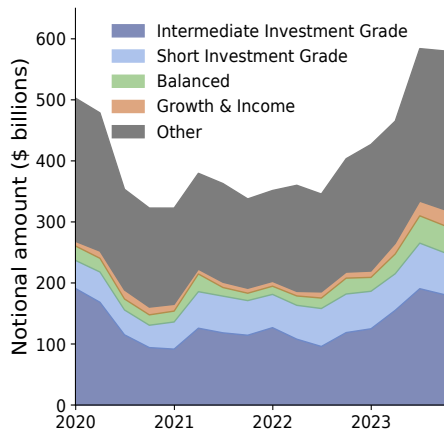
- Recently, larger share of 2-year and 5-year.
- (Contracts where basis trade is popular)

► Dynamics match overall change in AM Treasury futures.

- High in 2019, low in 2021, high again in 2023.

(anecdotal: remainder likely sep. accounts)

Heterogeneity in Treasury futures positions



Intermediate investment grade (IID) funds 32% of total.

- ▶ Benchmarked to Bloomberg Aggregate Index
- ▶ Mix of UST, MBS, investment-grade corporate debt.

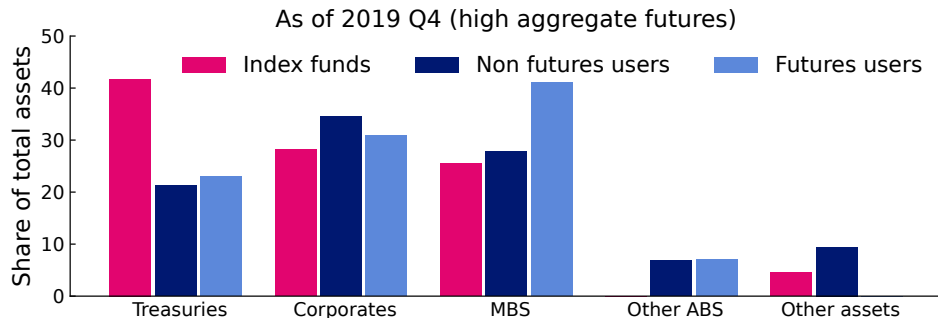
Even within class there is a great deal of heterogeneity.

- ▶ Futures holdings are persistent: 97% of funds that did not have long futures in 2023 did not in 2019.

Lipper Class	Share >0	Percentiles			
		50%	75%	90%	99%
Total	10	0	0	0.002	0.81
IID	53	0.003	0.14	0.59	15.09
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

Compare futures holders to both index funds and non-futures holders in same quarter.

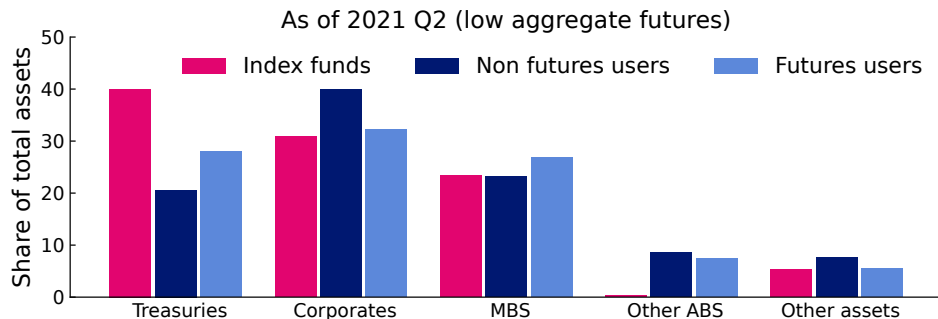
Sort funds into index funds, futures users, and non-futures users as of June 2023.



- ▶ **Holdings of cash Treasuries differ substantially from index funds.**
 - ▶ Index funds have $\approx 40\%$ in cash Treasuries, whereas futures users and non-users $\approx 20\%$.
- ▶ **Futures funds tilt towards MBS and ABS, non-futures users towards corporate debt.**
 - ▶ Size of tilt varies with aggregate level of futures use.

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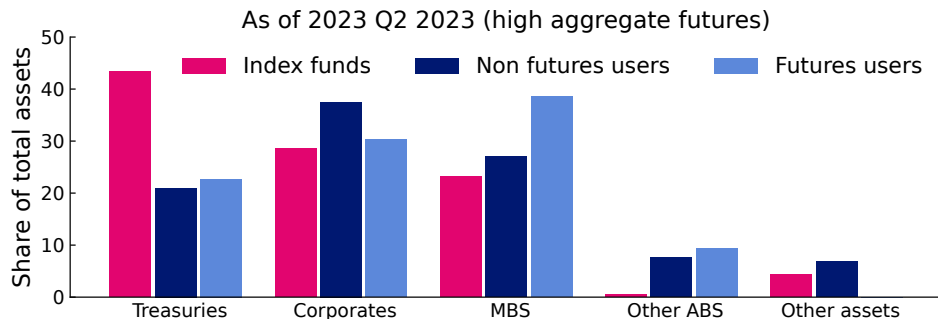
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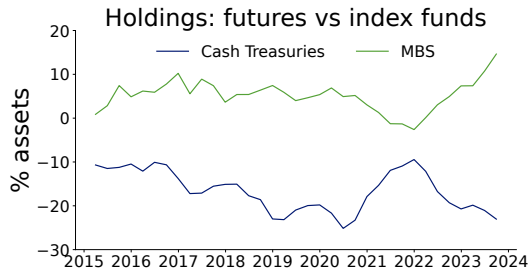
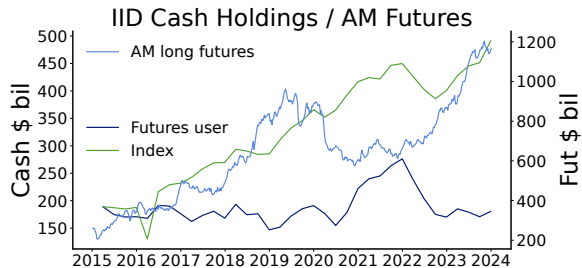
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Further evidence of association with MBS investments



- ▶ **Pattern still holds in longer time series available through CRSP.**
 - ▶ As AM futures holdings rise, index fund holdings of cash Treasuries rise, futures holders do not.
 - ▶ Decreases in futures holding fund Treasuries relative to index coincide with increases in MBS.
- ▶ *Confirmed by panel regression analysis in full paper.*
 - ▶ Meanwhile, no association with corporate debt holdings, and if anything a decrease in speculative-grade debt.

Why should Treasury futures holdings be complements to MBS holdings?

Fixed rate MBS and ABS are generally within investment scope.

- ▶ However, we will show they have **very different duration**.
 - ▶ **This matters because IID funds tend to target duration.**
 - ▶ About 35% of 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."

- ▶ Other funds will state ranges on duration:

Janus Henderson Flexible Bond

...average portfolio duration typically ranges between 3 and 7 years

- ▶ **In this section we show that futures holders tend to track their portfolio index closer overall...**

... but their cash duration falls relative to the benchmark.

- ▶ Driven by differences in MBS/ABS and Treasury holdings.
- ▶ Suggests that IID funds are using futures to manage duration.

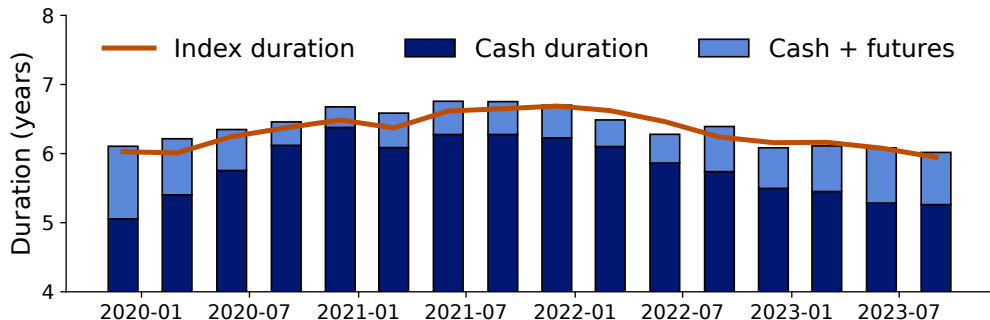
Gap between cash portfolio duration and index duration grows when futures popular.

Using ICE data, calculate weighted average cash duration for portfolio, asset categories.

- ▶ **Tilting from UST to MBS opens a gap between cash portfolio duration and benchmark.**
 - ▶ Driven by allocations rather than changes in duration of individual securities.
- ▶ If futures are for duration matching, expect *cash* portfolio duration to *fall* relative to bechmark.
⇒ **Futures help to fill the gap.**

	Dec 2019		Jun 2021		Jun 2023	
	Share	Duration	Share	Duration	Share	Duration
U.S. Treasuries	21.62	9.30	29.71	9.41	21.52	9.30
MBS	30.93	3.53	19.70	4.25	33.12	3.78
Corporate debt	21.76	5.56	25.24	7.38	22.81	5.95
ABS	2.28	1.70	2.83	2.04	3.24	1.86
Other	13.05	4.77	13.93	5.66	11.00	4.73
Futures holder duration		5.06		6.28		5.28
Index fund duration		6.04		6.62		6.08

Futures fill the resulting gap, both in the aggregate and in panel regressions



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

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?

Futures and derivatives use is often mentioned explicitly in prospectuses:

- ▶ 95% of high-futures-use IID funds mention derivatives under principal risks.
versus 66% of IID funds that do not use futures.

Suggests futures users are differentiated from other funds.

- ▶ But doesn't explain what they provide to investors.

Assemble some key variables from the prospectus text:

- ▶ Share of Treasuries in benchmark index.
- ▶ Whether objectives mention total returns (focus on trading) vs. income (focus on holding).
 - ▶ Also include turnover ratio.
- ▶ Whether risks mention leverage.
- ▶ Whether strategies mention duration or mortgages.

Why do some fund use futures and not others?

	Has long IID funds	Treas futures All funds
UST share		8.099***
Turnover	0.016**	0.003***
Leverage	0.043	0.013***
Duration	-0.058	0.016***
Tot. return	-0.025	0.010***
Income	-0.079**	-0.007**
Log assets	0.05***	0.02***
Mortgage	0.029***	0.003***
Index fund		-0.018***
R-squared	0.232	0.254

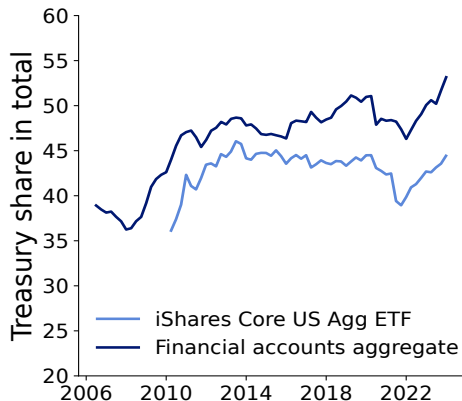
No significant difference in performance for futures-users.

- ▶ Both outperform the Aggregate Index on average.
- ▶ However, some evidence that funds that use futures are less sensitive to performance.

Regress dummy for futures use in 2023 on fund characteristics.

- ▶ Funds likely to reach for duration:
 - ▶ Benchmarked to indices with higher Treasury weights.
 - ▶ Mention “duration” or “mortgage” in principal strategies.
- ▶ Funds that take advantage of temporary returns.
 - ▶ Higher turnover, total return objective instead of income.

Costs of holding Treasuries for mutual funds



Funds appear to use futures to avoid holding the cash Treasuries in their benchmark index.

In turn, the Aggregate Index weight on Treasuries depends on total outstanding.

- Compare ETF indexed to the Aggregate and a financial accounts aggregate:

$$\frac{\text{Federal debt held by public} - \text{Fed holdings}}{\text{Estimated intermediate grade debt}}$$

As issuance increases, burden of matching Treasury share in the index may also rise.

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 reach for duration.

- ▶ Fund commonly employ futures when they move from Treasuries to MBS.
- ▶ These moves appear to be to take advantage of spreads of MBS relative to Treasuries.
- ▶ Futures offset the duration mismatch that results.

Funds that use futures appear to be differentiated.

- ▶ Likely to mention derivatives explicitly in their prospectuses and less sensitive to performance.
- ▶ Also indicate that they are more focused on duration and temporary gains from trading.

Why not use repo for leverage?

Funds can achieve the same reach for duration using repo.

- ▶ Buy Treasury and borrow against it in the repo market.
- ▶ Since 2021, repo and futures are subject to same portfolio-level VaR limits.
⇒ No real difference in regulatory treatment.
- ▶ Barth and Kahn (2021) show that cash-futures basis is high when Treasury futures are popular.
⇒ Mutual funds are using the more expensive means of gaining leverage.

Only 1% of IID funds, 0.4% of all funds use repo. (52% of IID use futures, 9% of all funds.)

- ▶ **May be some stigma attached:**
 - ▶ 97% of funds with repo mention leverage as a risk, 80% mention repo specifically.
- ▶ **Repo may be more difficult for customers to transact in.**
 - ▶ For customer, lacks transparent pricing and electronic trading (Clark et al. (2021), Kahn et al. (2023)).
 - ▶ Pricing depends on relationships (Han et al. (2022), Huber (2023)).