Observations on the Treasury Cash-Futures Basis Trade

by

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**Office of the Chief Economist
Commodity Futures Trading Commission**

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- **Key basis traders:** We examine the aggregate portfolio of 20 large Commodity Pools ("Select Funds") likely to account for much of the "long cash-short futures" activity in recent years.

- **Treasury futures:** Our Select Funds were predominantly short futures, with a notional market value of $1.1 trillion at the end of December 2023. They comprised the bulk of the $1.4 trillion short positions held by the leveraged funds in the sample.

- **Treasury securities:** The aggregate portfolio is long Treasury securities around $1 trillion, but also short about $200 billion; the net position totals $800 billion at the end of 2023. Net Treasury cash positions are at the high end or above several prior estimates of likely basis trader positions.

- **How we got here:** We confirm and quantify suspected peaks and valleys of the activity. Net Treasury cash positions increased $400 billion in the two years prior to December 2019, fell off sharply through 2021, and then ramped up $700 billion through 2022 and 2023.

- **More than just Treasury traders:** We also observe significant non-U.S. G-10 sovereign bond positions with a gross value of $1 trillion; the net short position was just over $100 billion at the end of 2023.

1 Introduction

A number of researchers have recently examined various aspects of Treasury cash-futures trading activity. Given the state of knowledge, a key exercise has simply been to estimate

the size and variation of the Treasury cash-futures basis trade. No single data set captures every variable of interest, but several are useful, especially in combination. Prior research in this space includes Barth and Kahn (2021), Barth, Kahn and Mann (2023), and Kruttli et al. (2024). Banegas, Monin and Petrasek (2021) and Glicoes et al. (2024) provide explicit comparisons of different indicia of basis trades.

A key improvement of our analysis is that we observe the market value of Treasury cash positions and, separately, the notional value of the futures positions for the funds of interest. The Form PF data, a standard source for researchers, provides Treasury positions for a wide cross section of funds, but the raw data represents the total Treasury instrument exposure (aggregating both cash positions and derivatives positions). Researchers have been forced to estimate the actual cash positions, which we observe directly. Our analysis is complementary to prior research, as it includes improvements compared to prior estimates, but we do face trade-offs in the work. Due to data limitations, our present analysis focuses on a small group of the largest funds that also file Form CPO-PQR with the Commodity Futures Trading Commission (CFTC).

Our empirical strategy is straightforward, and the analysis is mostly descriptive in nature. We fix a sample of 20 major Commodity Pools. We use large position reporting on futures to compute one leg, and we use Form CPO-PQR reporting to compute the cash market leg. A key component, which we emphasize, is that we have the ability and take the effort to match the contributors to the samples from different sources as closely as possible. In a final step, we combine the information across the two legs.

As emphasized in Banegas, Monin and Petrasek (2021), for example, analyses combining information from different sources can potentially induce significant and unknown effects on the comparisons and conclusions. While our sample of 20 Commodity Pools might seem modest compared to the thousands used in other work, these 20 are chosen judiciously and are painstakingly matched across our futures and cash market samples. Their short futures positions account for 75% of all short positions held by leveraged funds and were chosen because we believe them to be highly active in the Treasury cash-futures basis trade. When we make comparisons across cash and futures positions, or across futures positioning in different contracts, we do not have to worry about the composition of the funds underlying each sample. By construction, the funds making up the samples are as identical as possible.

Our methodological improvement is straightforward in concept, but it relies on some technical details that we elaborate on, up front. In the text, we often refer to the relevant group of entities as the "Select Funds". We emphasize that this term is for convenience of exposition. The use of the term "fund" or "hedge fund" in this note should be taken as shorthand for the entities of interest in a given analysis. We combine different data sets for our analysis, and the precise characterization of each data set requires more detail, unique to each data set.[1] Nonetheless, our analytical goal is to make the most apples-to-apples

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[1]Neither the futures data nor the Form CPO-PQR data are collected in the same fashion as the data collected for "Qualifying Hedge Funds" referenced in Form PF. The futures data are for controlling traders for a "special account", and the Form CPO-PQR data we examine are generally for a single Commodity Pool representing a Master Fund of a Commodity Pool Operator. We manually match entities across these data sets, to the extent possible.

comparison across the data sets and present the results in a readily accessible manner. We provide more technical details in the relevant sections of the note.

2   Treasury Futures Positioning

Figures 1 and 2 present long and short Treasury futures positions held by our Select Group of funds (depicted in orange), as well as futures held by Leveraged Funds not in this group (in blue). Data are quarterly and end in March 2024. While the interested public is likely familiar with the pattern of the aggregate of these two groups, we break them out for the first time. Throughout this note, we present futures positions in terms of notional market values in order to maintain comparability with the cash market positions, which are reported in terms of market values. To compute market values for futures, we multiply the notional value of contracts held by the settlement price of the nearby futures contract.

Our select sample of funds likely includes key basis traders from among the relative value, fixed income arbitrage funds and multi-strategy funds that the CFTC staff classifies into the "Leveraged Funds" category in the weekly Commitments of Traders (CoT) reports. Our Select Funds include some entities that are categorized as "Asset Managers" in CoT reports. It is well known that, for the CoT, CFTC staff classify traders based on their predominant activity. For the purposes of this note, our grouping is almost, but not quite, identical to that of the CoT. We have tailored our categorization slightly, based on the precise issues we are addressing. None of our qualitative results differ from those obtained from the CoT data, but our goal of apples-to-apples comparisons yields slightly different numerical results.

Figure 1: Long Treasury Futures Positions, Select Funds vs. Other Leveraged Funds
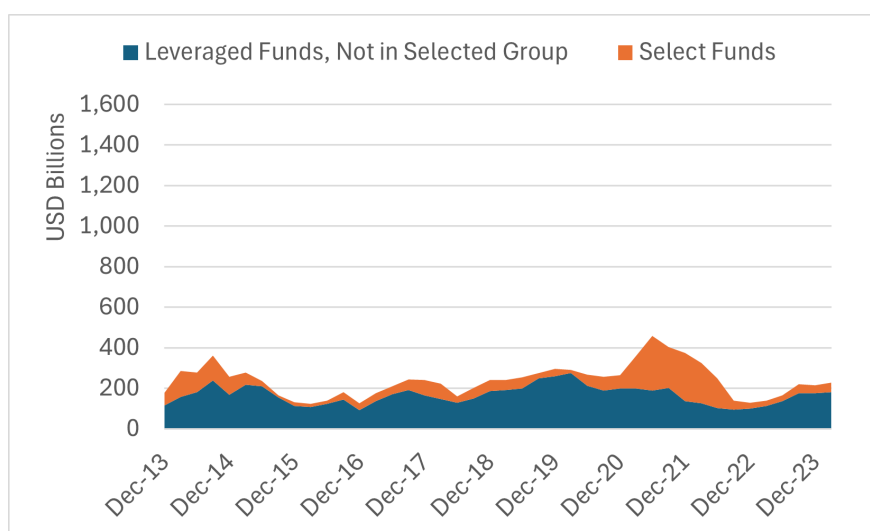
Sources: CFTC data and authors' calculations.

Figure 2: Short Treasury Futures Positions, Select Funds vs. Other Leveraged Funds
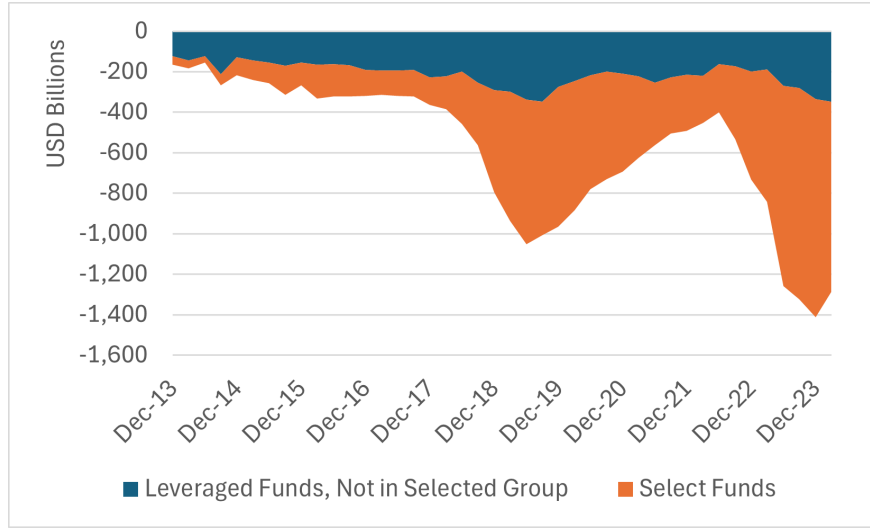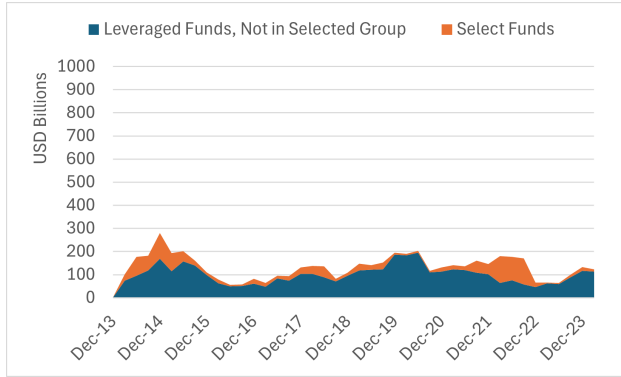

Sources: CFTC data and authors' calculations.

The Select Funds have been predominantly, although not exclusively, short during recent years. They account for the majority of the variation in short futures over the past decade, and they account for roughly 75% of the short futures notional at the peaks in 2019 and 2023. We provide some specific comparisons for December 2023. In aggregate, Select Funds held short positions with a notional market value of $1.08 trillion and a long position of $41 billion, resulting in a net position of $1.04 trillion. Funds in the Leveraged Funds category that are not in the Select Funds group have aggregate positions totaling $335 billion on the short side and $174 billion on the long side, with an aggregate net short position of $160 billion.

Figures 3 through 6 further delineate long and short futures positions of select funds vis-à-vis other funds by splitting the positions according to maturity: (i) between two and five years, and (ii) ten years or more. Figure 5 lends further credence to our select sample of hedge funds as we observe large positions in 2-year and 5-year Treasury futures—the main instruments often discussed with respect to the basis trade. Further, Figure 6 reveals that the same group of funds is not confined to shorter maturities but also takes on meaningful positions in longer-maturity instruments.[2]
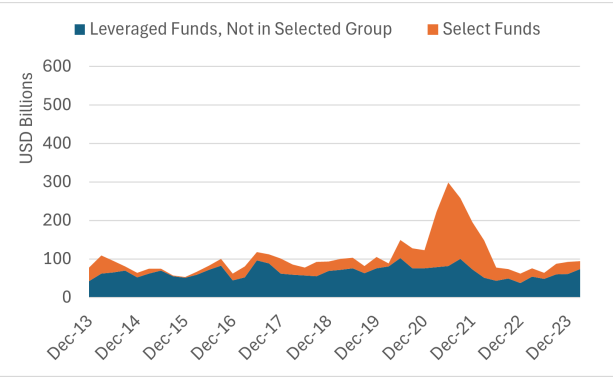
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[2]Note that vertical scales for longs and shorts are identical for a given maturity group, but vertical scales differ across the two sets of contracts.
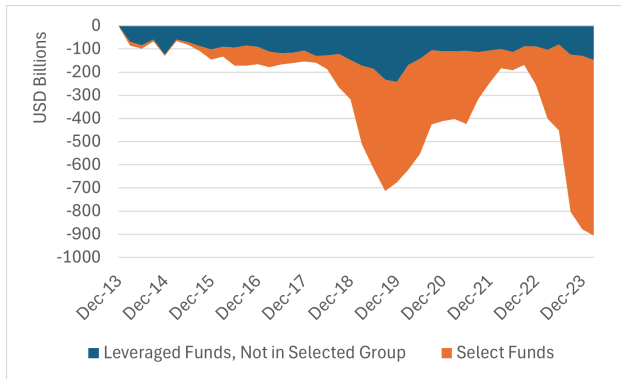
Figure 3: Long Futures, 2 year to 5 year

Figure 4: Long Futures, 10 year +

Figure 5: Short Futures, 2 year to 5 year

Figure 6: Short Futures, 10 year +
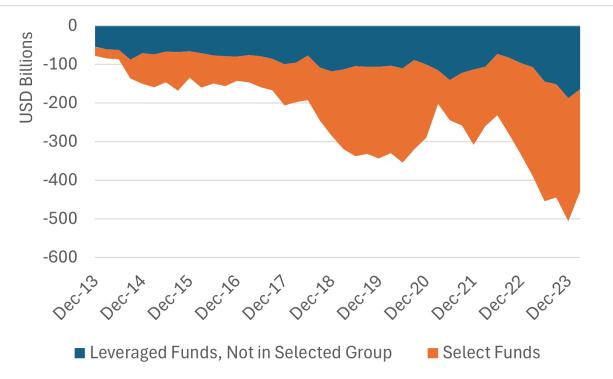
3 Cash Market Positioning

Data reported to the CFTC through Form CPO-PQR provides some information on the market value of positions, both in Treasury bonds and in non-U.S. sovereign bonds. As noted previously, several researchers have focused on Treasury exposures to hedge funds, as reported in Form PF. Those data reflect long and short notional exposures, whether obtained through cash market positions or derivatives, and researchers have made estimates of the actual cash market exposure embedded in the answers. In that sense, the Form CPO-PQR data is an improvement on the data used in prior work.

On the other hand, Form CPO-PQR data comes with other trade-offs that we acknowledge. Due to data limitations, we are able to examine the cash market positions over a meaningful period of time for a relatively small number of funds. This factor is a significant driver in our strategy of constructing a group of Select Funds, on which we do a deep-dive analysis. A drawback is that we cannot readily contrast the activity of our Select Funds group with the activity of other funds in our sample.

Further, Form CPO-PQR data are reported at the Commodity Pool level, whereas Form PF data have historically been available at the consolidated fund level. Hedge funds are often

Figure 7: Cash Market Position, U.S. Treasury securities (Select Funds)
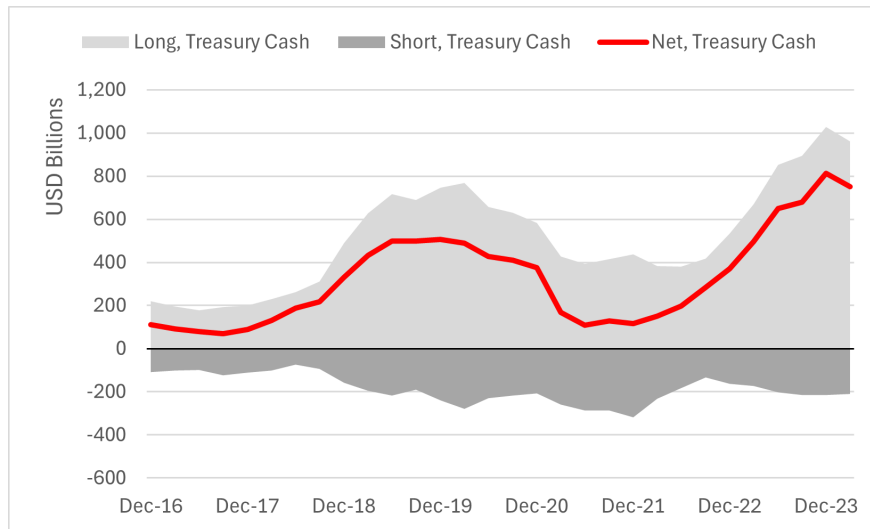
Sources: Form CPO-PQR and authors' calculations.

structured in master-feeder arrangements and feature transactions and positions that interact in ways that a naive pool-by-pool analysis will inadequately capture. For the purposes of this note, we have elected to examine the Commodity Pool that, in our judgment, most closely corresponds to the core fixed income trading portfolio of the Commodity Pool Operator (CPO). With these limitations noted, we proceed to Figure 7, which depicts the market value of our Select Funds' Treasury cash positions—long, short, and net. Data are quarterly and extend through March 2024.

The gross positions in the chart (i.e., the union of shaded components in the figure) highlight that these funds, in aggregate, are active on both sides, but the magnitude of the short side has been more stable than that of the long side. Increases in the gross positioning have been more strongly associated with variations in the long side of the positions, which peaked in 2019 and at the end of 2023. The resulting pattern in net positions is broadly consistent with the net Treasury futures positions that one can infer from the estimates found by prior researchers and attributed to the basis trade. In the very recent past, our figures exceed the estimates presented by Glicoes et al. (2024). They estimate that the true September 2023 net Treasury figure for the market might range between $260 and $574 billion, whereas our figure for that date is a net portfolio valued at $680 billion.

As with Treasury securities, the pools filing Form CPO-PQR are asked to provide the long and short market values (in USD) of non-U.S. G-10 sovereign bonds. Figure 8 presents the aggregated long, short, and net positions for our core group of hedge funds. The scale of the chart is the same as the one in Figure 7 to facilitate comparison. Throughout the sample, we observe that gross cash positions trend upward from $300 billion at the end of 2016 to $1 trillion at the end of 2023. Net positions fluctuated but remained reliably below zero for most of the sample (although a few quarters hovered near zero in mid-2020). In December 2023, the reported net position stood at −$125 billion.

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Figure 8: Cash Market Position, non-U.S. G-10 Sovereign bonds (Select Funds)
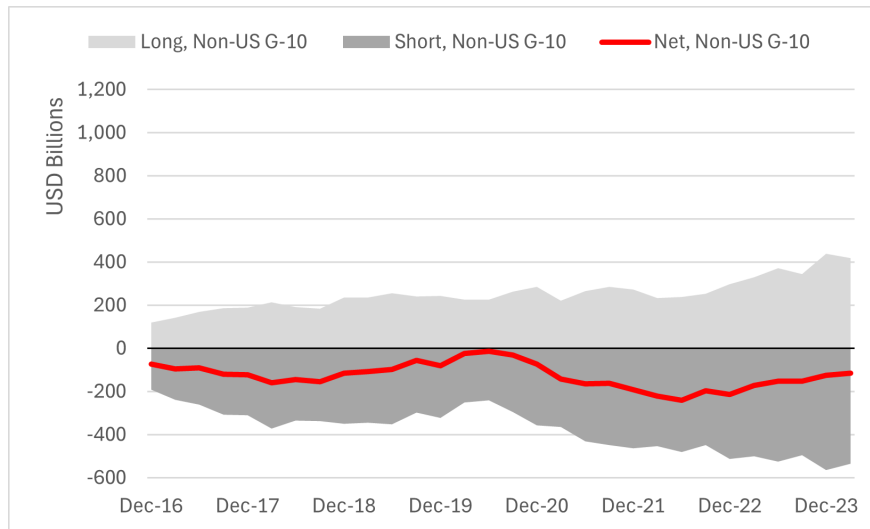
Sources: Form CPO-PQR and authors' calculations.

Our main takeaway from Figure 8 is the significant size of the gross positions. Portfolio managers in this group are trading a global portfolio consisting of hundreds or thousands of line items. As of December 2023, gross positions in non-U.S. sovereign bonds stand at 80% of the size of the gross Treasury positions and have the same order of magnitude as U.S. Treasury securities: trillions. Examining Treasury exposures in isolation from the non-U.S. bond exposures is bound to be incomplete, but if the Treasury position size dwarfed the non-U.S. position size, the issue might be immaterial for many questions. If there is significant carry trade activity impacting Treasury markets, for example, then a more complete analysis should reflect that fact.
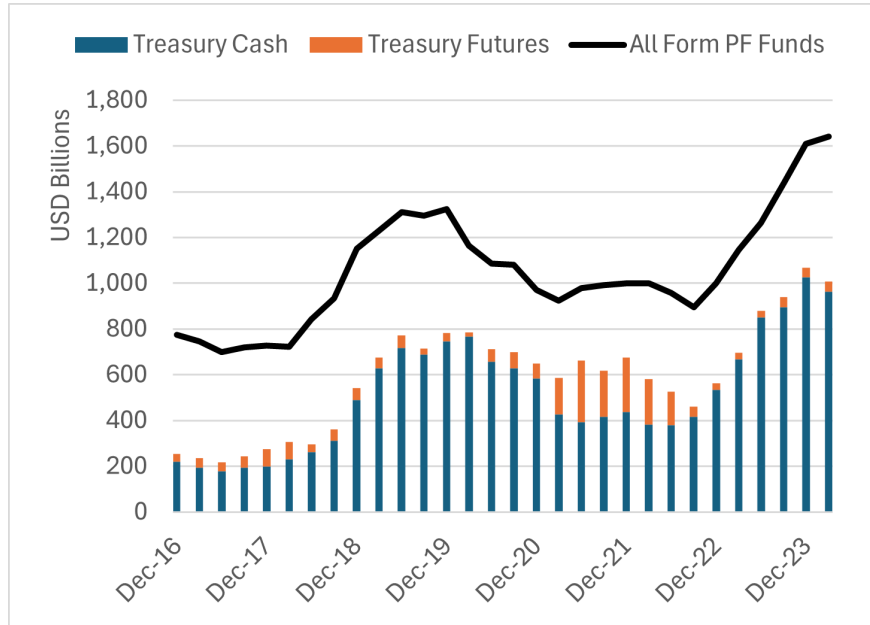
4 Putting the Pieces Together: Cash and Futures Positioning

Figures 9 and 10 explicitly compare Treasury positions in our sample vs. exposure reported on Form PF for the entire universe of Form PF reporters. The blue segment of each bar represents the cash market value for the Select Funds, and the orange segment represents the notional cash value of futures positions. The solid black line shows the Form PF aggregate. Data are quarterly though March 2024.

Our numbers follow the general pattern observed in Form PF data. The pattern has been described by various researchers: gross long and short exposures trending larger from the end of 2016 to a peak at the end of 2019, a decline until the end of 2020, a plateau lasting until the end of 2021, and a sharp increase over the two years prior to the end of 2023.

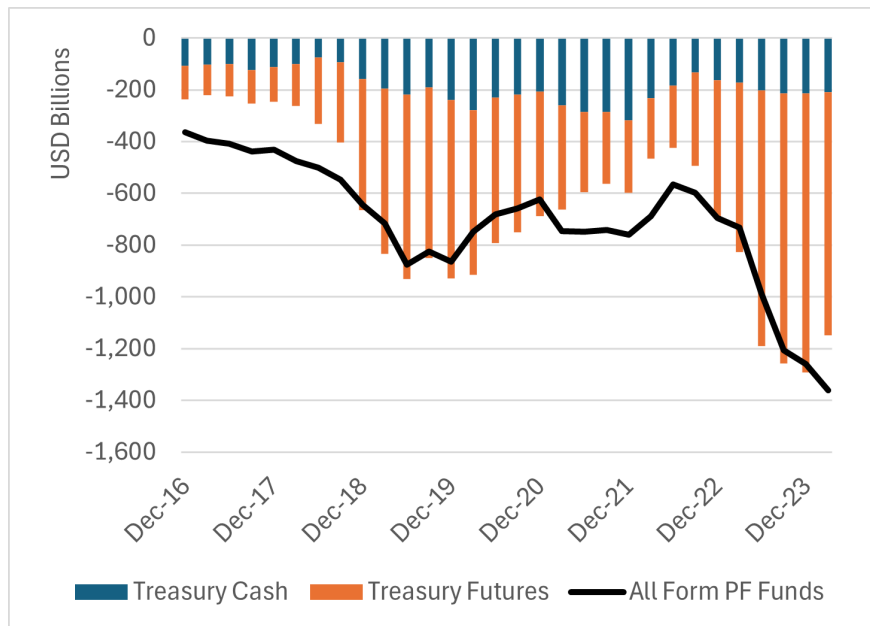Unlike the Form PF series, our sample aggregates across a small set of funds responsible for the majority of short positions and not across the remaining 1,500 to 2,000 smaller hedge funds that are not the focus of this note; the results readily corroborate this idea. While the

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Figure 9: Long Cash and Futures Positions, Select Funds

Figure 10: Short Cash and Futures Positions, Select Funds

long exposures in our sample account for roughly two thirds of the long positions reported by all qualifying hedge funds described on Form PF, the fraction is much higher for the short side. For December 2023, we estimate the short exposures from our sample to be approximately equal to that of the entire universe of Form PF filers.

Further, by separately computing the relevant cash and futures positions, we are able to present tabulations of the cash and futures positions for our core sample of funds. Consistent with these traders engaging in basis trading, cash exposure predominates on the long side and futures exposure predominates on the short side. For the year 2023, we estimate that our sample is 95% cash on the long side and 80% futures on the short side. At the end of 2023, exposures are $1.1 trillion on the long side of our sample ($1.03 trillion cash and $40 billion futures) and $1.3 trillion on the short side ($215 billion cash and $1.1 trillion futures).

Figure 11 distills many of the facts presented above into a few plausible summary statistics: one showing the short futures position and a couple describing the Treasury security portfolio. Computing the largest possible basis trade position from this group would utilize the two solid lines in the chart: the long cash position and the short futures position. One might expect the smaller of the two, at any given point in time, to represent the maximum possible size of a literal basis trade. The two have exhibited similar magnitudes, but the long cash position was larger (by about $100 billion) in the first few years of the sample and during the period from 2019 to 2022. By 2023, the futures position was larger by $100 billion.

We also display the net Treasury cash position as the dashed blue line in the figure. As previously seen regarding Figure 7, the long and net Treasury positions follow the same general path, with the net position generally $100 to $200 billion lower than the long position. Another natural estimate for the size of the basis trade is the directional, net Treasury security position. The implicit assumption is that the long and short cash positions reflect less directional activities confined to the Treasury space, such as on-the-run/off-the-run trades, and can be netted against each other to isolate the cash/futures activities. We recognize that the assumption might not fully capture the complexities of the portfolios, but it is a good reference point.

Put together, the cash positions and the futures positions display a striking mirror image of each other. Regardless of whether one focuses on the long or net cash position, the patterns are generally the same. The long cash/short futures positioning clearly expands quickly into a peak near the end of 2019, persistently declines for a few years, and then expands even more strongly throughout 2022 and 2023.

Figure 12 takes the same underlying data as Figure 11, but the quarterly changes in value are presented instead of levels. The blue bars represent the change in value for the net Treasury cash position; the orange shows the change in the short futures position. The strong negative correlation between the two is readily apparent, as is the strong trends as the position built up into 2019, declined, and then increased again into 2023. We recognize that some of the negative correlation is mechanical and likely due to valuation changes and not portfolio changes; if cash and futures prices move together, long cash and short futures notional market values would obviously covary negatively in absence of portfolio changes. We have not attempted to separate out valuation and quantity effects in this note.

Figure 11: Cash and Futures Portfolios, Select Funds
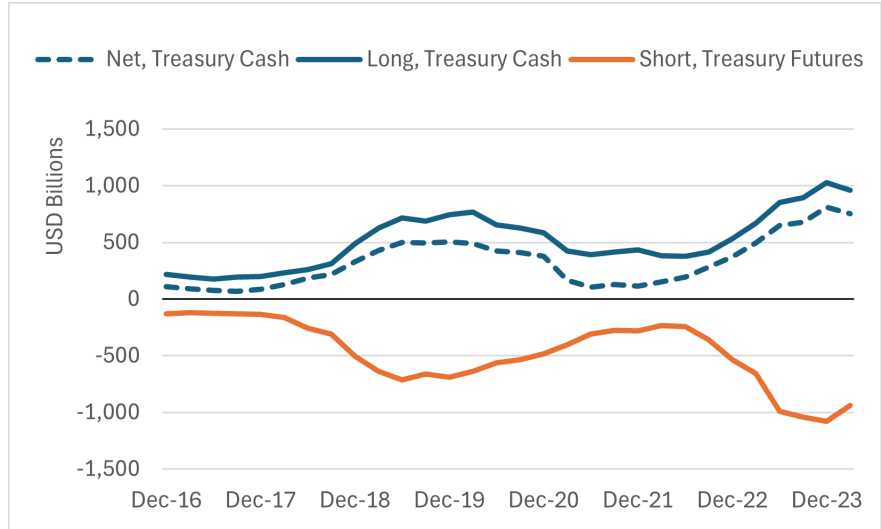
Sources: Form CPO-PQR data and authors' calculations.

Figure 12: Quarterly Change in Position Value, Cash and Futures
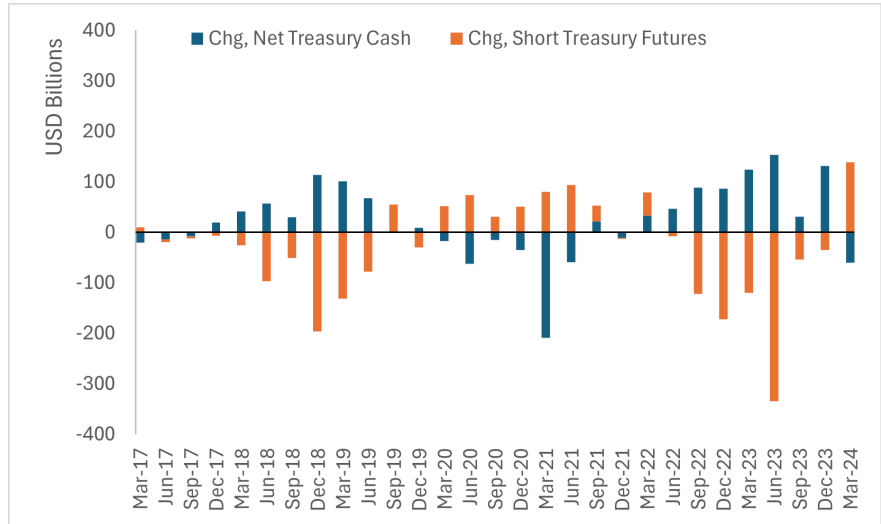
Sources: Form CPO-PQR data and authors' calculations.

Given the timeliness of the futures position data, it is natural to use it to infer changes in the unobserved cash positions. The chart illustrates that the quarter-on-quarter changes in the futures notional value is often of larger magnitude than that of the cash value. The standard deviation of the futures change is about \$100 billion, whereas the standard deviation for the cash value is just under \$75 billion. Regressing the net cash value changes on the futures value changes yields a coefficient of -0.6. This confirms the idea that changes in futures are strongly related to changes in cash values but tend to overstate the change in net cash values; the relationship is not one-to-one. The relation between long cash values and short futures values is a bit stronger but still not one to one: the regression coefficient is -0.7.

The Dash for Cash in Q1 2020

Finally, we provide more detail on the position changes at the beginning of 2020. Given the significant stress imposed by the large flows of Treasury securities around the time of the COVID shock, several researchers have attempted to evaluate how much different types of Treasury investors transacted at that time. Banegas, Monin and Petrasek (2021) estimate that qualifying hedge funds sold \$173 billion in Treasury securities during Q1 2020 (most of which was due to likely basis traders). The authors contrast this with estimates of \$266 billion in net sales by mutual funds, a decline in \$178 billion for the foreign official sector, and a decline in foreign private holdings of \$72 billion. Other estimates illustrate the uncertainty: the authors note that the Enhanced Financial Accounts show a decline of just \$19 billion in long Treasury securities held by domestic and foreign hedge funds.

For the Select Group of funds, we find that the net positions in Treasury securities declined by \$17 billion in Q1 2020, while gross positions increased by \$60 billion. This figure reflects an increase in the long positions of \$21 billion (increasing from \$746 to \$768 billion) and an increase in magnitude of short positions of \$38 billion (from \$240 billion to \$279 billion).[3] Open positions in futures declined \$72 billion for this group: long positions fell by \$20 billion (from \$37 billion to \$17 billion), while short futures declined in magnitude by \$52 billion (from $-\$689$ billion to $-\$637$ billion).

Our sample paints a different picture than the one that a reader might take away from the existing literature noted above. Kruttli et al. (2024) estimate over \$170 billion in sales of Treasury securities by hedge funds and conclude that "In March 2020, the average hedge fund with UST holdings significantly reduced its gross exposures and arbitrage activity in UST markets, decreasing both long and short exposures by around 25%." Yet, the large, likely basis traders we examine *increased* their gross cash market exposure during the quarter ended in March 2020, although futures positions contracted.

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[3]Banegas, Monin and Petrasek (2021) also suggest adjustments in the raw figures to adjust for valuation effects. Comparing end of period portfolio values with beginning of period values combines changes in quantities and changes in prices. They isolate quantity changes for hedge funds by noting a 45 basis point decrease in yields and an average hedge fund duration of 6.8, suggesting a 3% increase in position values for March 2020, solely due to valuation effects. We lack the relevant data to make these adjustments explicitly, but we note that the long positions for the Select Funds increased in value by 3%, whereas the short positions increased in magnitude by 16%.

Nonetheless, Kruttli et al. (2024) test various channels by which financial stress could be transmitted across the system and conclude that dealers favor clients with significant revenue generation, disproportionately giving those customers better access to credit during stress periods. Our group of Select Funds is likely to include funds with disproportionate access to funding, but testing that hypothesis is beyond the scope of this initial note. We expect to evaluate more of these cross-sectional questions as our work progresses from the initial issue of "How much?" to the more fundamental issue of "Why?".

5 Zooming In: Cash and Futures in the Cross Section

Form CPO-PQR also provides some insight into specific instruments held by Commodity Pools, if the positions are large enough. We utilize this information to provide visibility into the maturity structure of the portfolios held by these pools. Specifically, Tables 1 and 2 break out the long and short U.S. Treasury positions of our core group of funds for December 2023. The breakdown is by instrument type (bills, notes and bonds, and TIPS) and time-to-maturity buckets corresponding to futures contracts (up to and including 2 years, greater than 2 years but less than or equal to 5 years, greater than 5 years but less than 10 years, and greater than 10 years).

The percent of separately reported holdings of Treasury cash instruments—92% for long positions (Table 1) and 85% for short positions (Table 2)—attests to our substantial visibility into specific instruments and maturities.[4] Notably, our sample of hedge funds is a heterogeneous group that balances Treasury cash holdings across the maturity spectrum. This finding echoes our results for futures presented in Figures 3 through 6—namely, that hedge funds' cash holdings are not confined to 2-year and 5-year notes (which have been a major focus of the conversation on the basis trade).

Table 1: Long Positions: U.S. Treasury Securities, Select Funds (USD billions)

Time to maturity (years)	Bills	Notes and bonds	TIPS	Total	% of total
[0,2]	18	182	10	209	22%
(2,5]		365	6	372	38%
(5,10]		192	2	194	20%
(10,30]		117	*	119	12%
Subtotal	18	856	19	893	92%
Not separately reported				78	8%
Total reported holdings				971	100%

Sources: Form CPO-PQR data and authors' calculations. Data in some cells has been suppressed in order to enhance confidentiality and is denoted by "*".

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[4]The total long positions in Table 1 do not quite tie out to the long positions displayed in Figure 7. Due to data limitations, one sample pool is excluded from the analysis in this section. We continue to match cash and futures positions of different funds as closely as possible and exclude this pool from both cash and futures aggregates.

Table 2: Short Positions, U.S. Treasury Securities, Select Funds (USD billions)

Time to maturity (years)	Bills	Notes and bonds	TIPS	Total	% of total
[0,2]	*	49	*	53	25%
(2,5]		45	*	45	21%
(5,10]		58	1	59	28%
(10,30]		24	0	24	11%
Subtotal	*	176	*	182	85%
Not separately reported				33	15%
Total reported holdings				215	100%

Sources: Form CPO-PQR data and authors' calculations. Data in some cells has been suppressed in order to enhance confidentiality and is denoted by "*".

Table 3 summarizes long cash, short futures, long futures, and short cash positions for our group of hedge funds in various maturity buckets. While aggregated market values of positions is a crude measure, we are able to refine it somewhat by comparing instruments within a specific maturity bucket. We find that these pools are broadly offsetting cash and futures positions in Treasury instruments, but there does not appear to be a monolithic, one-for-one match at each futures contract tenor point. The buckets display varying levels of matching across the instrument types. Comparing the long cash and short futures results, the match is poor at the front end of the curve and is progressively better the further out the maturity structure one looks. For the bucket referencing instruments maturing in 2 years or less, the cash holdings are double the short futures market value of notional. For the bucket referencing instruments greater than 5 years to maturity, the match is surprisingly exact. The magnitudes in the long futures and short cash cells bear little resemblance to each other.

We conclude from Table 3 that the textbook cash-futures basis trade appears inadequate to describe the aggregate portfolio. Clearly, there are very large, long cash positions and very large, short futures positions which one might readily use the shorthand "the basis trade" to describe. Research to date suggests that a significant component of recent Treasury exposure by leveraged funds is, broadly speaking, the cash-futures basis trade. Nonetheless, the portfolios likely contain other risk exposures that should be evaluated; combining all of them together as the "basis trade" might obscure additional risks that should be evaluated.

Table 3: U.S. Treasury Cash and Futures, Select Funds (USD billions)

	Time to maturity (years)		
	[0,2]	(2,5]	(5,30]
Long cash	209	372	312
Short futures	−406	−298	−307
Long futures	2	7	31
Short cash	−53	−45	−83

Sources: Form CPO-PQR data and authors' calculations.

6   Conclusions

The goal of this note is to introduce novel data into the ongoing conversation regarding the Treasury cash-futures basis trade, and, more generally, the footprint of hedge funds in the U.S. Treasury market. We examine a group of 20 large Commodity Pools ("Select Funds") that account for a majority of short Treasury futures positions in recent years. The presentation has mostly been descriptive, and we recognize a number of avenues for further inquiry.

Our figures corroborate the broad outlines of prior research on the main driver of variation, and the overall increase, in gross hedge fund exposures to Treasury instruments in recent years. The net long Treasury cash position changes have been closely mirrored by short Treasury futures position changes. The net cash position for our group of Select Funds is at or above the basis trade estimates provided by others, but the patterns are similar.

We find that these funds increased their net Treasury cash positions by \$400 billion in the two years prior to the peak in December 2019. Net positions declined until the inflection point in mid-2021, bottoming out at \$100 billion. In 2022 and 2023, however, these funds persistently increased their net Treasury cash positions up to \$800 billion at the end of 2023. Positions declined somewhat in magnitude in early 2024 but remain at historically high levels.

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