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Treasury Market Dysfunction and the Role of the Central Bank

ABSTRACT We build a simple model that shows how the incentives and constraints facing three key types of market players—broker-dealers, hedge funds, and asset managers—interact to create a heightened level of fragility in the Treasury market, and how this fragility can become more pronounced as the supply of Treasury securities increases. After validating a number of the model's empirical premises and implications, we ask what it can tell us about how the Federal Reserve might best address future episodes of market dysfunction. In so doing, we take as given that an important priority for any Fed response to Treasury market dysfunction is that it be clearly separated from anything having to do with monetary policy.

The market for US Treasury securities is enormous: As of 2024:Q3, federal debt held by the public of $28.3 trillion represented 96 percent of GDP, close to an all-time high. And the Congressional Budget Office

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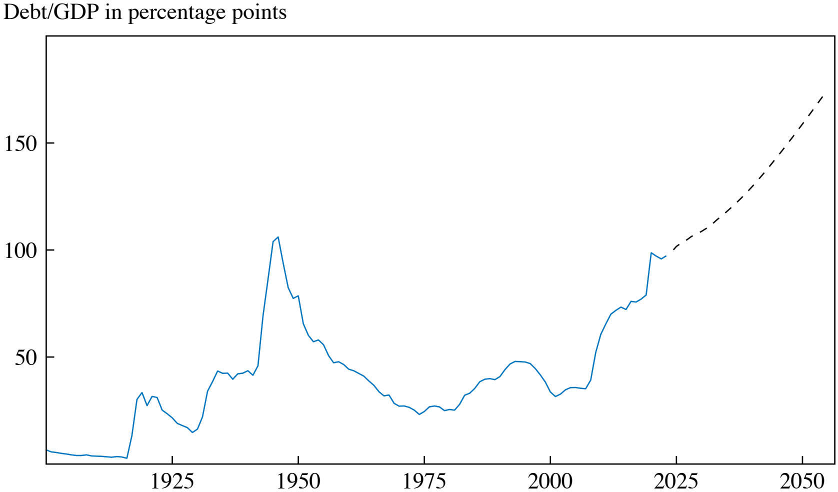
Figure 1. Federal Debt Held by the Public



Source: OMB and St. Louis Fed (2025) and CBO (2024).
Note: This figure shows the federal debt held by the public as a percentage of GDP from 1900 to 2023 (solid line) and the Congressional Budget Office projections of this ratio from 2024 to 2054 (dashed line).

projections show the debt-to-GDP ratio continuing to climb rapidly in the coming years, as shown in figure 1. These facts raise two principal concerns. First, there are questions regarding debt dynamics and fiscal sustainability. As the debt burden grows and interest costs become a larger share of GDP, will the United States at some point be forced by the bond market to make an undesirably sharp adjustment in fiscal policy?

Second, there are risks of market dysfunction and financial instability. The COVID-19-triggered turmoil in the Treasury market in March 2020 highlighted the nature of these risks. Dealers were overwhelmed with selling pressure, measures of trading costs spiked, and dealer-provided intermediation contracted. These problems threatened to spill over into other markets as well, potentially interrupting the smooth flow of credit and impairing the implementation of monetary policy. It is natural to wonder whether such episodes of fragility will become more frequent, more severe, or both as the Treasury market continues to grow.

This paper focuses on these market functioning issues and seeks to make three contributions. We begin by developing a simple model that highlights the incentives and constraints facing three types of market players: broker-dealers, hedge funds, and asset managers. These incentives and constraints can interact to create fragility in the Treasury market, fragility that can become more pronounced as the stock of Treasury securities increases. The model's mechanism is not the only potential driver of dysfunction, but changes in market structure and regulation in recent years have arguably increased its importance and impact.

Next, we explore a number of the model's premises and implications, including several that can help us understand the events of March 2020 (Duffie 2020; Liang and Parkinson 2020; Schrimpf, Shin, and Sushko 2020; Vissing-Jorgensen 2021; Barone and others 2023; Menand and Younger 2023; d'Avernas, Petersen, and Vandeweyer 2024). And finally, we ask how the Federal Reserve might best address future episodes of Treasury market dysfunction. Crucially, we take as given that an important priority for any Fed response is that it clearly separates monetary policy from financial stability operations. That was arguably not the case with the Fed's massive bond purchase response to the market turmoil of March 2020 (Fleming and others 2021; Duffie and Keane 2023), which over the following months morphed into a longer period of more traditional monetary policy–motivated quantitative easing (Kashyap 2024; Menand and Younger 2025).

The basic logic behind our model can be described as follows. Asset managers—who we think of as an aggregate of institutions such as bond mutual funds, pension funds, and insurance companies—are the only agents in the model who take on unhedged interest rate (or "duration") risk. Their preferences therefore determine the term premium on long-term Treasury bonds. Importantly, consistent with the empirical work of Barth and others (2024), asset managers choose to take this duration risk both by investing in cash Treasury bonds and by taking long positions in Treasury derivatives such as futures and swaps. This allows them to meet their benchmark duration targets while conserving some balance sheet space to invest in higher-yielding corporate bonds.[1]

Hedge funds and dealers cater to the asset managers by taking short positions in Treasury derivatives. They then hedge these short positions with offsetting purchases of cash Treasury securities. This is the basis trade and it means that these two agents are essentially providing inventorying services to asset managers, taking onto their balance sheets some of the Treasury securities that the asset managers prefer to hold synthetically, that is, off of their own balance sheets. In equilibrium, hedge funds and dealers are compensated for these services via a positive spread between the return on cash

1. For example, an insurance company or pension fund will typically want to have a long-duration asset portfolio to match the interest rate exposure of its liabilities.

Treasuries and the implied return on Treasury derivatives.[2] In this regard, it should be emphasized that the presence of hedge funds in the Treasury market is not an exogenous cause of fragility. If they were somehow prevented from participating in the market, the demand for long derivatives positions on the part of asset managers would inevitably draw forth another type of counterparty, which would potentially introduce a different set of vulnerabilities.

A crucial feature of both our model and reality is that when hedge funds engage in the basis trade, their long positions in cash Treasuries are financed almost entirely by borrowing, using them as collateral in the market for repurchase agreements, or repos—they are, in other words, highly levered.[3] This arrangement is inherently fragile. Any exogenous shock that reduces the wealth of the hedge funds or impairs their access to funding can lead to sharp unwinds. For example, Lu and Wallen (2025) find that dealers increased haircuts in the bilateral Treasury repo market by 1.5 percentage points in March 2020. This kind of forced deleveraging can cause hedge funds to simultaneously sell cash Treasuries and reduce their short positions in Treasury derivatives, leading to a spike in the price differential between these two markets.

In the short run, unwinds by hedge funds are absorbed by the broker-dealers. However, the balance sheet capacity of the dealers is limited by a variety of regulatory and other factors. This suggests that fire sales of basis positions not only generate a significant dislocation between cash and derivatives prices, but also cause the dealers to rearrange the rest of their balance sheets so as to pull back on their other key market functions, namely, providing liquidity to traders in the Treasury market and intermediating the repo market. Consequently, unwinds by hedge funds lead not only to a widening of the basis between cash Treasuries and derivatives, but also to increases in measures of secondary market trading costs, as well as in repo intermediation spreads.[4]

How might the Federal Reserve best address such a market stress scenario? In recent years, proposals have been put forward on a number of fronts, including: (1) adjusting regulations thought to restrict dealer capacity,

2. Barth and Kahn (2024) build a closely related model that also endogenizes the basis between cash Treasuries and Treasury derivatives, though unlike us, they do not focus on policy implications. See also Pirrong (2020).

3. Repos refer to the purchase of securities in exchange for cash (the opening leg) by a lender along with an agreement to sell those securities back to the borrower at a slightly higher price on a future date (the closing leg). Repos are thus similar to secured loans with the securities functioning as collateral.

4. Schrimpf, Shin, and Sushko (2020) and Kruttli and others (2021) describe a similar hedge fund unwind mechanism.

including the supplementary leverage ratio (SLR); (2) the creation of a broad-based standing Fed repo facility, by which the Fed could lend directly to hedge funds;[5] (3) the imposition of minimum margin requirements on repo-financed Treasury purchases; and (4) a mandate for clearing trades through a centralized counterparty.[6] As we discuss below, while these proposals could be helpful, they are unlikely to be a panacea in cases where the unwind is powerful enough. Indeed, in March 2020 the Fed did temporarily exclude Treasuries and reserves from the computation of the leverage ratio, as well as lend against Treasuries in the repo market. Yet quelling the market dislocations ultimately required the Fed to buy massive quantities of cash Treasuries to ease the pressure on dealer balance sheets and restore some semblance of market function.[7]

While these purchases were ultimately successful in the goal of reducing market disorder (Logan 2020), they arguably had a significant unintended cost. Without a clear upfront distinction between bond buying for market function purposes versus for monetary policy purposes, the initial round of Treasury purchases in the spring of 2020 morphed into a broader monetary policy effort that eventually saw the Fed add over $4 trillion to its combined holdings of Treasuries and agency mortgage-backed securities by mid-2022.[8] And, as documented by Levin, Lu, and Nelson (2022), given the subsequent surge in inflation and the accompanying series of hikes in

5. See, for example, Group of Thirty (2021) and Logan (2020).

6. See, for example, Duffie (2020), IAWG (2021), and Yadav and Younger (2025).

7. In the short period between the beginning of March 2020 and the end of May, the Fed bought approximately $1.6 trillion of Treasury bonds; $362 billion of these purchases were done in a *single week*, from March 25 to April 1. Federal Reserve Board, "Assets: Securities Held Outright: U.S. Treasury Securities," retrieved from FRED, https://fred.stlouisfed.org/series/TREAST.

8. By "morphing," we mean that the stated rationale for asset purchases evolved over the course of 2020, even as the purchases themselves continued at a high level. The initial March 15 Federal Open Market Committee (FOMC) announcement stated that purchases of at least $500 billion of Treasuries and $200 billion of mortgage-backed securities were intended to "support the smooth functioning of markets" (Federal Reserve Board 2020a, p. 2). One week later the Fed uncapped the size of the purchases, saying that it would continue purchases "in the amounts needed to support smooth market functioning and *effective transmission of monetary policy to broader financial conditions*" (Federal Reserve Board 2020b, p. 1, emphasis added). So almost from the outset market stability and monetary policy objectives were conflated. By September, market conditions had normalized, yet the intent to expand holdings at the current pace was reconfirmed. The rationale then given was that purchases were needed "to sustain smooth market functioning and help foster accommodative financial conditions, thereby supporting the flow of credit to households and businesses" (Federal Reserve Board 2020c, p. 2), with the latter being an overt monetary policy objective. And the $80 billion monthly pace of Treasury purchases remained in place for another year after that (Federal Reserve Board 2022).

policy rates, this volume of asset purchases ended up reducing the present value of Fed remittances to the Treasury by roughly $800 billion, potentially representing a substantial hit to taxpayers.

Our diagnosis of the root causes of Treasury market fragility suggests a novel approach that the Fed could take if faced again with a similar situation. The key observation is that the fire sale by hedge funds, which in turn creates the severe strain on dealer balance sheets, is not just an outright liquidation of Treasury securities. Rather, it is an unwinding of a *hedged* long cash Treasuries/short derivatives position. Thus, to relieve the stress on dealers, it would be sufficient for the Fed to take the other side of this unwind, purchasing Treasury securities and fully hedging this purchase with an offsetting sale of futures; this is, in effect, a more surgical approach to bond buying. The blunter policy of simply buying unhedged cash bonds from the dealers—that is, taking duration risk off their hands—does not provide them with any extra relief relative to this hedged approach, as they tend not to have any duration exposure in the first place (Lu and Wallen 2024).

A primary advantage of the Fed taking this hedged approach to bond buying is that it avoids the need to prespecify an unwind date for the policy. It has been argued by, for example, English and Sack (2024) that an important imperative for market function bond purchases is that they be clearly distinguished from monetary policy–motivated purchases. Duffie and Keane (2023) suggest that one way to do so is to require the central bank to commit in advance to liquidating securities when market functionality is sufficiently restored. However, it can be challenging for the central bank to commit in advance to a fixed schedule for liquidating bonds, to the extent that it does not know how long a period of market stress will last. Our hedged-purchase approach effectively finesses this problem by embedding the duration neutrality, and hence the crucial distinction from monetary policy, in the short derivatives position. This eliminates the need for the Fed to specify when it will begin selling bonds and allows it to keep helping with market function for as long as needed, without inadvertently generating any signal about the stance of monetary policy.[9]

Shorting futures alongside purchases of bonds is also consistent with the Fed's current playbook. The Fed regularly engages in repo transactions, either through standing facilities or temporary open market operations. Like

9. Another point is that if term premia are not entirely forward-looking and are determined not only by the expected future amount of duration removed, but by current flows, then preannouncing the future reversal of an unhedged bond buying policy will not neutralize the immediate impact of current purchases on the term premium. And this term premium impact will again raise the specter of monetary policy. Hedged purchases get around this problem as well.

the closing leg of a repo, futures represent a contractual agreement to sell securities on a future date at a price agreed to at the time of trade. Basis trades of the sort we have in mind involve a spot purchase and future sale. This makes them conceptually very similar to repo transactions, with the key difference between the two being different counterparties for the purchase and sale. To be clear, the specific legality of our proposal in the context of the Fed's current understanding of its own statutory constraints is an important question, but it is beyond the scope of this discussion.[10] We focus on the economic rationale for such actions.

Moral hazard is a natural concern for a policy that removes the main risk hedge funds face when taking leveraged positions in cash futures basis. We discuss this issue in detail below, but two points are worth flagging up front. First, in contrast to unhedged bond purchases (i.e., quantitative easing), the prospect of hedged purchases does not have the same potential to create a "Fed put" with respect to interest rate risk (Haddad, Moreira, and Muir 2024) and so is less distortive in this sense. Second, any remaining moral hazard issues can be partially mitigated with a Bagehot (1873)-like design whereby the Fed stops short of fully insulating the hedge funds from losses while still limiting broader spillovers to the rest of the system.

In section I we develop our model and flesh out its empirical content. In section II we present a range of evidence that bears on the model's main premises and predictions. Section III discusses the policy implications of our framework, and section IV concludes.

I. A Model of Treasury Market Fragility

I.A. Demand Curves for Cash Treasuries and Treasury Derivatives

We develop a simple static model of the Treasury market with two traded securities: long-term zero-coupon cash Treasury bonds, which are available

10. The FOMC has repeatedly authorized the Federal Reserve Bank of New York to transact in foreign exchange derivatives, such as forward contracts (e.g., FOMC 2022). Also, in one instance in 1974, the Federal Reserve Bank of New York assumed a large portfolio of foreign exchange derivatives from Franklin National Bank to avoid exacerbating stress in the market at the time (Brimmer 1976). Notably, it did so prior to Franklin's failure in October of that year. It is also worth noting that section 4 of the Federal Reserve Act empowers the Federal Reserve Banks to "make contracts" and grants "such incidental powers as shall be necessary to carry on the business of banking within the limitations prescribed by this Act" (Federal Reserve Act of 1913, Pub. L. 63–43, 38 Stat. 251). Both have been used at times to justify actions similar to those considered here, including repo (Menand and Younger 2023) and derivative exposures taken on during the Fed response to the 2008 global financial crisis (Alvarez and others 2008).

in supply S_T, and derivatives on these same bonds, which are in zero net supply. These derivatives can be thought of as representing either Treasury futures or interest rate swaps; given that our model lacks multiple trading periods, it does not allow for a clear distinction between the two.[11] To keep things simple, we label these derivatives "futures" throughout what follows. The futures and cash bonds in our model always have the same dollar duration, and therefore perfectly hedge each other. There is also a short-term riskless asset available in perfectly elastic supply. This riskless asset has a return of r_{short}, which is exogenous and can be thought of as determined by monetary policy.

Denote the price of the zero-coupon Treasury bond as P_T, and the price of the one-period-ahead futures contract as P_F. In the absence of arbitrage, spot futures parity would imply that:

$$P_F = P_T\left(1 + r_{short}\right). \tag{1}$$

We are going to consider scenarios where this parity condition is violated. In such scenarios, we define a Treasury cash futures basis, denoted x, by:

$$P_F = P_T\left(1 + r_{short} + x\right). \tag{2}$$

Thus, the return from the arbitrage trade of buying cash Treasuries and selling futures is: $\frac{P_F}{P_T} - 1 = r_{short} + x$, which is the risk-free rate plus the Treasury cash futures basis. Our analysis below solves for the endogenous value of x.

There are three types of market participants, all of whom are active in both securities: dealers D, hedge funds H, and asset managers A. We describe each of them in turn.

Dealers are atomistic, perfectly competitive, and present in unit measure. They fully hedge interest rate risk, so their long demand for cash Treasuries is equal to their short position in futures: $D_{DT} = -D_{DF}$ where D refers to demand, the first subscript denotes identity of the owner—dealers D, hedge funds H, or asset managers A, and the second subscript denotes the

11. Both futures and swaps are derivatives that provide exposure to interest rate risk. A futures contract provides an investor with a claim to a Treasury to be delivered at a future date. A swap contract pays an investor (the "fixed receiver") a series of fixed interest rate payments in exchange for a series of floating interest rate payments tied to a rate like the secured overnight financing rate (SOFR), an index that tracks Treasury repo rates. Swaps tend to be longer maturity contracts than futures so that investors in futures face greater rollover risk if they opt to maintain their positions over longer horizons. Our static model does not speak to these multiperiod issues.

security—treasuries T or futures F; we confirm this full-hedging assumption empirically below. Dealers perform two basic functions: They engage in *intraday* market making, and they may also take a position in the Treasury futures basis, that is, they may arbitrage differences in the returns on cash Treasuries and futures. Such arbitrage positions are held *overnight.*

Intraday market making works as follows: At the beginning of each day, each dealer sets aside an amount of balance sheet space M for that day's market-making activity. Per unit of capital, they earn an expected return above the risk-free rate of $\phi s(M)$, where ϕ is a productivity parameter, and $s(M)$ is the bid-ask spread in the cash Treasury market. Competition among dealers implies that $s(M)$ is declining in the *aggregate* market-making capital M of the entire dealer sector, although each individual dealer takes s as exogenously given—that is, they are price takers. To keep things simple, we assume that at the aggregate dealer sector level, $s(M) = a - bM$: Bid-ask spreads are linearly declining in the total capital devoted to market making.

Dealers may also arbitrage the Treasury cash futures basis by buying cash Treasuries and shorting futures. In undertaking these two activities, dealers face a balance sheet constraint, which implies that their long demand for Treasuries (those which they hold overnight to engage in the Treasury futures basis trade), plus their capital devoted to intraday market making, cannot exceed some fixed capacity constraint K_D. Thus, we have: $D_{DT} + \mathrm{M} \leq K_D$.

The optimization problem of the dealers is therefore to maximize $D_{DT}(r_{short} + x) + M(r_{short} + \phi s(M))$, subject to $D_{DT} + M \leq K_D$. It follows from the dealers' first-order condition that if the balance sheet constraint binds, then $x = \phi s(M)$. Simply put, when balance sheet capacity is scarce, dealers equalize the excess returns from allocating this capacity to the two activities. This suggests an immediate empirical implication: In times of stress, when the balance sheet constraint is most likely to be binding, we should expect the Treasury futures basis, and measures of Treasury market liquidity, to comove closely together.

Given that $s(M) = a - bM$, we can substitute this into the first-order condition to get $M = \frac{a}{b} - \frac{x}{b\phi}$. Intuitively, a bigger Treasury futures basis means less capital devoted by dealers to market making. We then have the following expression for dealer Treasury demand:

$$D_{DT} = K_D - \frac{a}{b} + \frac{x}{b\phi}. \tag{3}$$

For dealers to choose to allocate some of their scarce capacity to both market making and cash futures arbitrage, we require $0 < D_{DT} < K_D$, which in turn requires $bK_D + \frac{x}{\phi} > a > \frac{x}{\phi}$. Intuitively, if the first unit of market making is too profitable, dealers would be at a corner doing only market making; if it is too unprofitable, dealers would be at a corner doing no market making.

In the context of our model, hedge funds should be thought of as representing the subset of these funds that focus on relative value strategies.[12] Relative value strategies seek to profit from small price discrepancies between similar securities rather than from outright directional bets. Therefore, the hedge funds in our model are like the dealers in that they too fully hedge against interest rate risk, and they too face a capacity constraint, which in this case can be thought of as determined by how much equity they have raised from their investors. The one key difference is that hedge funds lever their Treasury positions by borrowing against these Treasuries in the repo market at the short-term rate of r_{short}, so they only need to put up a small fraction $\gamma << 1$ of their equity for each unit of a long Treasury position.[13] Hence their balance sheet constraint is $\gamma D_{HT} + X_H \leq E_H$, where X_H represents other (proprietary) equity-financed hedge fund investments, and E_H is hedge fund equity capital. In this case, we assume that these other investments are not perfectly scalable at the individual hedge fund level, and that each fund is aware of the fact that taking on more of these investments lowers their excess returns relative to the short rate. In particular, each hedge fund understands that $r_H(X_H) = r_{short} + c - \beta X_H/2$, where c is a proxy for the quality of the hedge fund opportunity set.

Given our assumptions, each hedge fund earns a net dollar return given by:

$$D_{HT}\left(\left(1-\gamma\right)x + \gamma\left(x + r_{short}\right)\right) + X_H r_H\left(X_H\right). \tag{4}$$

Equation (4) reflects the fact that hedge funds use a mix of repo borrowing and their own equity to fund their basis trading positions. For the

12. This is a significant subset of hedge funds. Statistics published by the Securities and Exchange Commission (SEC 2024) showed \$1.3 trillion in net assets at relative value funds as of 2024:Q2, including \$900 billion focused specifically on sovereign bond arbitrage. That is comparable to other categories of hedge fund strategies such as long/short equity funds (\$1.2 trillion) and global macro funds (\$1.2 trillion).

13. More broadly, γ should be interpreted as the total capital required to maintain the relative value trade by the hedge fund, inclusive of repo haircuts, futures initial margin, and firm-specific risk limits.

fraction $(1 - \gamma)$ funded at the repo rate r_{short}, the hedge fund earns the cash futures basis x. For the fraction γ funded with equity, they earn the cash futures basis plus the risk-free rate $(x + r_{short})$, since they do not have to repay any borrowing.

Each hedge fund seeks to maximize its net return in equation (4) subject to the constraint that $\gamma D_{HT} + X_H = E_H$, taking into account that $r_H(X_H) = r_{short} + c - \beta X_H/2$. This yields the following expression for hedge fund Treasury demand:

$$D_{HT} = \frac{E_H}{\gamma} - \frac{c}{\beta\gamma} + \frac{x}{\beta\gamma^2}. \quad (5)$$

We require $\beta E_H + \frac{x}{\gamma} > c > \frac{x}{\gamma}$ to ensure that hedge funds allocate some of their portfolios to both activities. In words, the return on the first unit of the alternative investment has to exceed the levered return on the Treasury futures basis (so that hedge funds do some of the alternative investment), but it cannot be too high (or hedge funds will not do any basis trading).

Asset managers can be thought of as representing "real money" investors such as bond mutual funds, pension funds, and insurance companies. They are the only agents in our model who bear interest rate risk. We assume that they do so by taking long positions in both Treasury securities and Treasury futures. For simplicity, we assume a fraction θ of that total position is in futures, that is, their allocation across futures and securities is invariant to the basis. But their activity will affect the pricing of the basis, with increased demand for futures increasing the basis x.

These assumptions are intended to capture key aspects of the incentives and constraints facing two different subgroups of asset managers. The first subgroup are liability-driven investors (LDIs), primarily insurance companies and pension funds. These institutions typically have very long-dated liabilities: roughly fifteen years for pensions and often longer for life insurance companies. This gives them a risk management motive to hold long-duration assets. But they also want sufficient exposure to corporate credit risk to generate high enough yields to cover their costs. Thus, the ideal asset for them would, in principle, be a very long-dated corporate bond.

The market, however, produces far less long-maturity high-grade corporate credit than needed to meet potential LDI demand. As of 2024:Q3, the Fed Flow of Funds data show approximately \$16.2 trillion of defined-benefit pension fund liabilities (\$3.2 trillion for private plans and \$13 trillion for public plans) and \$9.9 trillion of life insurance liabilities.[14] By contrast, of the more than \$8.6 trillion of investment-grade corporate debt outstanding at that time, only \$2.8 trillion had a remaining maturity greater than ten years.[15] LDIs therefore have an incentive to hold some of their cash portfolio in shorter-maturity corporate bonds and to use interest rate derivatives to synthetically extend their overall asset-side duration so as to better match the duration of their liabilities. Given extensive disclosure of their exposures, life insurance companies provide a good test of this hypothesis: As of the end of 2023, roughly half of the \$3.1 trillion notional of over-the-counter derivatives in their portfolio were interest rate positions (Raimondi and Piccin 2024).

Bond funds are the other important subgroup of asset managers. Mutual funds own roughly \$5.5 trillion of debt securities and exchange-traded funds own \$1.7 trillion.[16] Approximately \$900 billion of that is actively managed (TBAC 2024). Much like life insurers and pension funds, actively managed bond funds often seek higher returns by overweighting short-term credit and using derivatives to extend the maturity of these positions so that their interest rate risk is not too far off from benchmarks such as the Bloomberg US Aggregate Index. However, it is worth noting that, unlike LDIs, bond funds predominantly use exchange-traded futures, rather than over-the-counter swaps, for this purpose. Barth and others (2024) document that mutual funds made up 53 percent of all asset manager long Treasury futures positions in June 2023, and that between 2021 and 2023, they accounted for 62 percent of the increase in total open interest in long Treasury futures.

Although these are the specific stories we have in mind, for simplicity we take a shortcut and do not explicitly incorporate the credit risk aspect of asset managers' decision. Instead, we just assume that asset managers as a broad group have an aggregate demand for duration risk that depends on the excess return to bearing this risk. A simple mean-variance formulation yields:

$$D_{AT} + D_{AF} = A\left(\theta r_F + \left(1-\theta\right) r_T - r_{short}\right), \tag{6}$$

where we have normalized the variance of interest rate risk to unity, and A is the risk tolerance–adjusted scale of the asset management industry.

14. Federal Reserve Board, "Financial Accounts of the United States - Z.1," FRB Z.1 FL574190043 and FRB Z.1 FL544190005, respectively, https://www.federalreserve.gov/releases/z1/.

15. Taken from the J.P. Morgan Global Aggregate Bond Index as of September 2024 month-end.

16. FRB Z.1 LM654022005; see link to data in footnote 14.

Here r_T is the yield on the cash Treasury bond, and r_F is defined by $r_F = r_T - x$, which is the Treasury yield less the cash futures basis. In our model, asset managers pay the Treasury cash futures basis for the convenience of holding Treasuries off balance sheet—that is, in futures rather than securities. Thus r_F is the implied rate of return on their long futures position, which is less than that on the cash Treasury security.

I.B. Market Clearing

Given equations (3), (5), and (6), we can now equate supply and demand in the two markets. The cash Treasury market clears when $D_{DT} + D_{HT} + D_{AT} = S_T$. This implies:

(7)
$$K_D - \frac{a}{b} + \frac{x}{b\phi} + \frac{E_H}{\gamma} - \frac{c}{\beta\gamma} + \frac{x}{\beta\gamma^2} + \left(1-\theta\right) A\left(\theta r_F + \left(1-\theta\right) r_T - r_{short}\right) = S_T.$$

The futures market clears when $D_{DT} + D_{HT} = D_{AF}$, so that the short futures positions of the dealers and the hedge funds equal the long positions of the asset managers. This implies:

(8)
$$K_D - \frac{a}{b} + \frac{x}{b\phi} + \frac{E_H}{\gamma} - \frac{c}{\beta\gamma} + \frac{x}{\beta\gamma^2} = \theta A\left(\theta r_F + \left(1-\theta\right) r_T - r_{short}\right).$$

Solving, we have:

(9)
$$\left(\theta r_F + \left(1-\theta\right) r_T\right) - r_{short} = \frac{S_T}{A}.$$

In other words, the term premium—expressed as a weighted average of long-term Treasury and implied futures rates less the short rate—is pinned down by the supply of Treasuries S_T relative to the aggregate risk tolerance A of the asset management sector. This makes intuitive sense, as the asset management sector is the only one that absorbs duration risk, and hence it is the only one whose preferences should matter for the term premium.

With the term premium thus pinned down as in equation (9), the dealers and the hedge funds determine the size of the basis x to be:

(10)
$$x = \left[\frac{b\phi\beta\gamma^2}{b\phi + \beta\gamma^2}\right]\left(\theta S_T - K_D - \frac{E_H}{\gamma} + \frac{a}{b} + \frac{c}{\beta\gamma}\right).$$

Unpacking equation (10) helps us understand the economic determinants of the basis. First, the basis is increasing in Treasury supply S_T. As S_T rises, asset manager demand for futures goes up. This demand must be accommodated by the dealers and the hedge funds, who sell them the futures and take offsetting positions in cash Treasuries. Effectively, the dealers and the hedge funds must in equilibrium be compensated for using their scarce balance sheet capacity to hold the cash Treasuries that the asset managers are themselves unwilling to hold.[17] It therefore makes sense that this compensation, that is, the basis, is reduced when either dealer balance sheet capacity K_D or hedge fund equity E_H is larger, or when the alternative investment opportunities for these two players, as indexed by a and c respectively, are less attractive.

Note too that as Treasury supply S_T goes up, and the basis x widens, the scale of hedge funds' positions in the Treasury futures arbitrage trade increases. This is apparent from equation (5). And it is a key reason why an expanded supply of Treasuries can make the market more fragile.

I.C. Is the Basis Always Positive?

In our model, the Treasury futures basis x is always positive. This is because the asset manager sector is assumed to have a structural demand to be long Treasury futures, which pushes the price of these futures up, and the rate down, relative to that on cash Treasuries. As we document below, the basis has indeed been largely positive since the global financial crisis (GFC). Prior to that time, however, it was often negative, sometimes significantly so. This is seen most clearly in the matched-maturity swap spread, or the differential between the yield to maturity on a recently issued Treasury bond and the fixed rate on a swap with the same maturity date. These swap rates were higher than Treasury yields in the period prior to the GFC, in contrast to the current configuration (He, Nagel, and Song 2022; Du, Hébert, and Li 2023). Indeed, the hedge fund Long-Term Capital Management famously had a huge position in the reverse of the basis trade in the late 1990s, being short cash Treasuries and long Treasury derivatives—a trade that helped to precipitate its downfall in 1998 when, in the wake of a

17. Again, in the more elaborate story that we have in mind, asset managers would prefer not to take all of their duration risk in the form of cash holdings of Treasuries, because they want to also save space in the cash portion of their portfolios for credit-risky corporate bonds. Being on the wrong side of the Treasury futures basis is the price they pay to dealers and hedge funds for allowing them to expand their risk taking beyond what their balance sheets alone allow.

Russian sovereign bond default, there was a flight to cash Treasuries, which pushed down their yields sharply relative to the rates on the corresponding derivatives.[18]

What explains the difference in the sign of the basis pre-GFC and post-GFC? Although it is hard to provide a completely definitive explanation, Hanson, Malkhozov, and Venter (2024) suggest that the role of government-sponsored enterprises is an important part of the story. In particular, prior to the GFC, government-sponsored enterprises had large portfolios of mortgage-backed securities, whose interest rate risk they sought to hedge by taking short positions in derivatives, that is, the reverse of what we see today from asset managers.[19] Another possible factor pre-GFC was structural demand for long positions in cash Treasuries from foreign central banks, which at the time were rapidly accumulating foreign exchange reserves that were predominantly invested in US dollars (see, e.g., Zhang and Martínez García 2024). Both of these forces have reversed since the GFC: Government-sponsored enterprises have unwound most of their retained portfolio of mortgage-backed securities, foreign exchange reserve accumulation has slowed, and foreign central banks have been diversifying the currency exposure of their reserves away from US dollar investments.

I.D. The Treasury Market Under Stress

To see how Treasury market fragility plays out in our model, consider an adverse shock that hits the hedge fund sector and forces them to unwind their highly leveraged positions. To keep the math as simple as possible, assume that this is an "MIT shock," meaning that it is unanticipated ex ante, so that the preceding expressions for prices prior to the realization of the shock are unchanged. One plausible shock could be an unexpected and large increase in the margins required for the hedge funds to maintain their futures positions.

Margin generally comes in two forms: initial and variation. Variation margin is driven by the *actual* mark-to-market gains or losses of any given position. Initial margin is required regardless of the mark-to-market of the position (e.g., at inception of a trade, when there are not yet any realized gains or losses) and ensures that counterparties are overcollateralized with

18. See President's Working Group on Financial Markets (1999).

19. More generally, Hanson, Malkhozov, and Venter (2024) and Du, Hébert, and Li (2023) show that prior to the GFC, dealers tended to be short cash Treasuries on net, rather than long, as they are in the current environment. This is what one would expect from their arbitrage role if the sign of the basis were reversed.

respect to any *potential* losses in the event of a failure. When volatility in markets increases, the dealers and centralized counterparties offering leverage through both cash lending (e.g., repo) and derivatives (e.g., futures and swaps) think of themselves as more exposed to such losses, and hence increase initial margin requirements (see, e.g., Heckinger, Cox, and Marshall 2016; BCBS, CPMI, and IOSCO 2022).

Although margin calls are a danger in any highly levered position, the risk of this form of forced delevering is particularly acute in basis trades (Younger 2021). This is because the two legs of the trade are separately margined. A basis position that is fully hedged against interest rates when viewed as a whole will have gains on one leg vis-à-vis one counterparty offset by losses with another counterparty. In the event the hedge fund defaults, the counterparty with unrealized losses has no claim on the counterparty with unrealized gains and is thus exposed to the risk of loss on only the leg of the trade in which they directly participate. This segmentation of collateral means that, as interest rate volatility rises, hedge funds find themselves the subject of margin calls on both legs of the trade, despite having no overall interest rate risk or any unrealized gains or losses.

This is precisely what happened in March 2020. Rising volatility led clearinghouses to rapidly increase initial margin requirements on futures contracts, particularly on those on longer-maturity Treasuries.[20] While prudent from the perspective of their own risk management, this decision amplified volatility. Margin calls act as a negative wealth shock, forcing hedge funds to raise cash by either unwinding positions or selling other assets (Aramonte, Schrimpf, and Shin 2023).

Apart from this margins-based dynamic, one can also imagine various other mechanisms that lead to unwinds of hedge fund basis trades. For example, diversified hedge funds might experience negative returns on their other, non-Treasury trades, and be forced to cut back their positions across the board, either as a means of risk management or because of withdrawals of investor capital (Shleifer and Vishny 1997). Alternatively, an initial exogenous increase in the demand for dealer market-making services, as parametrized by a in the model, could lead dealers to shift capacity away from

20. Initial margin requirements for some Treasury futures contracts more than tripled in a few days (Younger 2021). Cunliffe (2022, para. 37) reports that, across all central counterparties, "initial and variation margin increased significantly, with the increase in IM totalling around $300bn in March 2020 and the increase in VM flows peaking at $140bn during the height of the stress in mid-March."

arbitraging the basis, thereby causing an initial widening of the basis that, given their leverage, could have a powerful impact on hedge fund capital.

For starkness, let us consider the extreme case where the hedge fund sector is forced to exit the basis trade entirely. This leaves broker-dealers as the only remaining agents available to arbitrage the basis, which widens sharply as a result of this fire sale. Specifically, the post-stress level of the basis is now given by:

$$x = b\phi\left(\theta S_T - K_D + \frac{a}{b}\right). \tag{11}$$

Comparing equations (10) and (11), the widening of the basis will be most pronounced when γ is small, that is, when hedge funds use more leverage in the preshock period; high preshock leverage makes the post-shock deleveraging effect particularly powerful. Moreover, because the dealers' first-order condition $x = \phi s(M)$ continues to hold, the widening of the basis is accompanied by a commensurately large erosion in the secondary market trading liquidity of Treasury securities.

It should be emphasized that these deleveraging effects occur even when we assume—as we have thus far—that the repo market continues to function frictionlessly in the stress scenario. That is, we have so far maintained the premise that hedge funds are able to borrow in the repo market at the short-term riskless rate r_{short} even under stress; their unwinding of their positions is due only to a shock to their capital, not to any contraction in their access to funding. Of course, any deterioration in repo market access for hedge funds will only increase the pressure on them to unwind their basis trades. We turn to this possibility next.

I.E. Endogenizing Repo Market Conditions

Rather than assuming that hedge funds can always borrow in the repo market at the riskless short-term rate r_{short}, we can add a bit of realism by having broker-dealers intermediate any repo market lending to hedge funds. Concretely, assume that dealers have a unique advantage in that they alone can borrow on a collateralized basis against cash Treasury securities at r_{short}—one can think of them as borrowing from a set of unmodeled money market funds with whom they have well-developed relationships. The dealers then turn around and lend on a collateralized basis to the hedge funds at a higher rate r_{repo}, which is endogenously determined; the premise here is that the hedge funds, lacking the same relationships, are unable to borrow directly from the money funds and hence require the dealers to intermediate the repo lending for them.

Denote the amount of capital allocated to repo market intermediation by R, where each unit of capital earns ψ units of the repo intermediation spread $(r_{repo} - r_{short})$ on top of the short rate. The dealers' revised optimization problem therefore is to maximize:

$$(12) \quad D_{DT}\left(r_{short} + x\right) + M\left(r_{short} + \phi s\left(M\right)\right) + R\left(r_{short} + \psi\left(r_{repo} - r_{short}\right)\right),$$

subject to $D_{DT} + M + R \leq K_D$. From this new first-order condition, we have that when the balance sheet constraint binds, then $\psi(r_{repo} - r_{short}) = x = \phi s(M)$. When balance sheet capacity is scarce, dealers equalize the excess returns from allocating this capacity across all three activities: market making, the Treasury futures basis trade, and repo lending to hedge funds. This suggests in times of stress, when the balance sheet constraint is most likely to be binding, we should expect all three of the Treasury futures basis x, the repo intermediation spread $(r_{repo} - r_{short})$, and measures of market liquidity $s(M)$ to comove closely together.

This endogenous behavior of the repo spread adds another amplification mechanism to the fire sale spiral that hits the Treasury futures basis when an adverse shock hits. As the basis initially widens and hedge funds begin to liquidate their positions, broker-dealers withdraw from intermediating the repo market, putting another source of pressure on the hedge funds to unwind.

On the one hand, this logic makes clear why there have been calls to have the Federal Reserve lend against Treasury securities directly to entities like hedge funds at times of market stress, thus bypassing the need to have broker-dealers, with their limited balance sheet capacity, intermediate this lending.[21] On the other hand, while helpful, such direct Fed repo lending is unlikely to be a panacea. We have argued that sharp unwinds by hedge funds of their highly leveraged Treasury futures basis trades can occur even in a frictionless repo market that offers unchanging rates and access in a stress scenario; the root source of these unwinds can be various shocks to hedge fund capital, not limitations on their ability to borrow against Treasury collateral.

21. See, for example, Group of Thirty (2021) and Logan (2020).

I.F. Summary of Model Implications

To briefly summarize the model's key premises and predictions, we have five maintained assumptions that form the starting point for our analysis and four testable hypotheses that emerge from it. The maintained assumptions are:

A1: Broker-dealers may have large inventories of cash Treasuries but will be largely hedged in the derivatives market, so that their net exposure to interest rate risk is relatively small.

A2: In the post-GFC period, hedge funds will generally be long cash Treasuries—with these positions largely funded by highly leveraged repo borrowing—and short Treasuries futures.

A3: In the post-GFC period, broker-dealers will also be short Treasury futures, while asset managers will have long positions that roughly offset those of the dealers and the hedge funds.

A4: Asset manager long positions in Treasury derivatives are in part a reflection of the lack of availability of long-maturity corporate bonds, and their consequent desire to create a synthetic alternative by combining shorter-maturity corporate bonds with Treasury derivatives.

A5: In the post-GFC period, cash Treasuries will generally be cheap relative to Treasury derivatives—that is, cash Treasuries will have higher yields than those implicit in the corresponding derivatives contracts.

The testable hypotheses that emerge from the model are:

H1: Increases in the supply of Treasury bonds will induce hedge funds to take larger leveraged positions in the Treasury futures basis trade, thereby exacerbating market fragility.

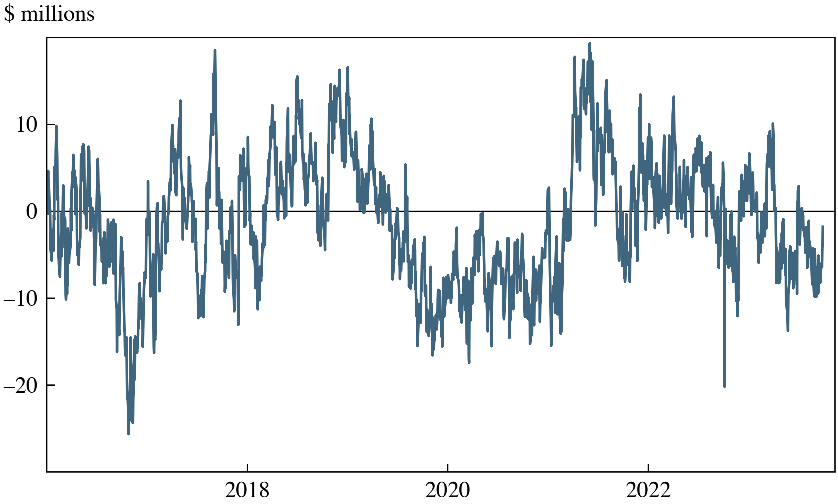
H2: In times of stress, hedge funds will unwind their arbitrage positions, so that their long positions in cash Treasuries and their short positions in Treasury futures are simultaneously reduced. In the short run, broker-dealers will take the other side of this unwind, so that their short positions in Treasury futures increase alongside their long positions in cash Treasuries.

H3: In times of market stress, this unwind by the hedge funds will lead the price of cash Treasuries to fall sharply relative to Treasury derivatives prices.

H4: In times of stress, measures of Treasury market illiquidity and the repo intermediation spread will comove closely with the Treasury futures basis and hence will also spike up.

In the next section, we try to shed empirical light on each of these propositions.

Figure 2. Large Dealer Bank Net Interest Rate Exposure



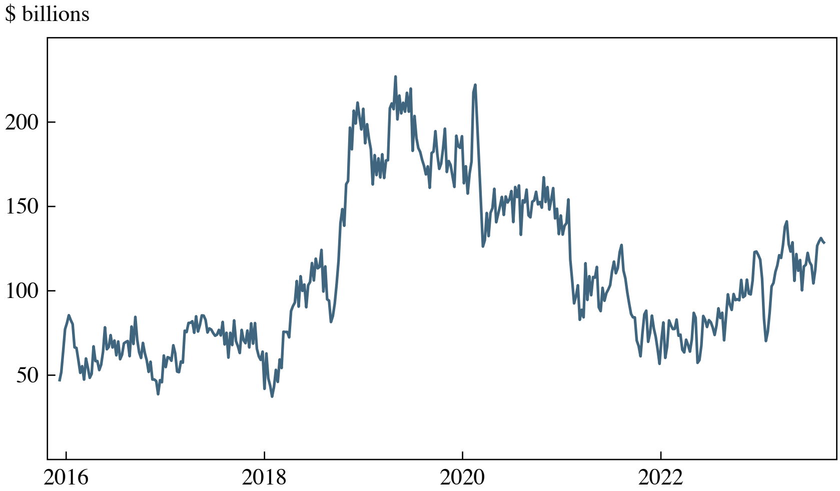
Source: Reproduced from Lu and Wallen (2024).

Note: This figure shows the DV01 of large US dealer banks. DV01 is the sensitivity of profits to a 1 basis point increase in the level of the yield curve at all points. The sample of large US dealer banks includes Bank of America, Citigroup, Goldman Sachs, JP Morgan Chase, and Morgan Stanley. The data are daily from January 2016 to September 2023. A –$20 million exposure is approximately equivalent to a long position of $20 billion of Treasury securities with a ten-year duration.

II. Evidence

Figures 2 and 3 speak to assumption 1. Figure 2 is taken from Lu and Wallen (2024), who use regulatory data from the Federal Reserve to obtain daily risk exposure measures at the individual trading desk level for the dealer arms of five largest US bank–affiliated dealers. The figure displays the time series of cumulative net interest rate risk exposure, over the period 2016–2023, across all desks at these five firms, where this exposure is measured by DV01, which is the profit sensitivity to a 1 basis point increase in interest rates. This DV01 value nets all long and short positions from both cash and derivatives positions (i.e., futures and swaps), and so gives a picture of the overall hedged interest rate risk of dealers' books. To interpret the magnitudes in the figure, note that a DV01 of $10 million is the exposure that one would get from an unhedged long position of $10 billion in bonds with duration of ten years. Thus, the figure implies that over the sample period, the largest single-day aggregate net interest rate risk of these five

Figure 3. Primary Dealer Net Holdings of Treasury Securities



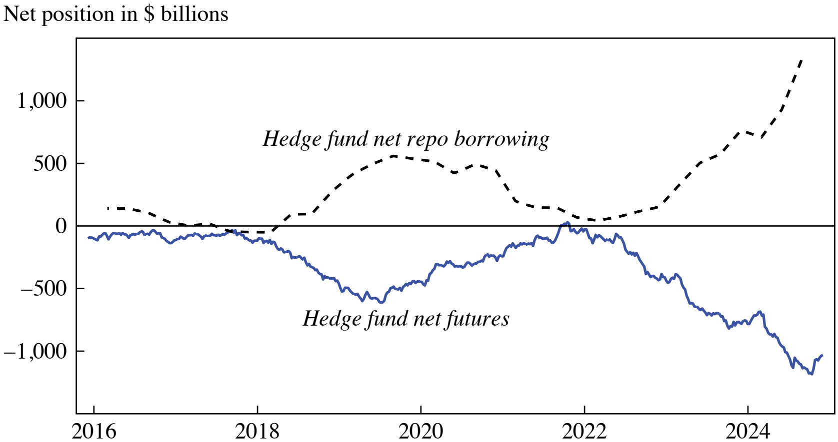
Source: Federal Reserve Bank of New York Primary Dealer Statistics.
Note: This figure shows primary dealer net holdings of Treasury coupon bonds. The data are weekly from January 2016 to September 2023.

firms was equivalent to an unhedged long position of $26 billion in ten-year duration bonds. And notably, this conclusion holds even during the market stress period of March 2020, when broker-dealers were subject to an enormous wave of selling of cash bonds; their DV01 exposure during this month was, if anything, just a tiny bit negative, but for all intents and purposes essentially zero.

By contrast, figure 3 shows the net holdings of cash Treasury bonds for primary dealers. Because this measure nets long and short positions in cash bonds, it still understates gross long positions in cash, but it excludes any hedging coming from derivatives. As can be seen, the magnitudes of these net cash positions are on the order of $150 billion to $200 billion, or nearly ten times larger than the largest observed post-derivatives hedging position.[22] Thus, consistent with our premise in assumption 1, it appears

22. Because of data limitations, figure 2 refers to the risk exposures of the five major US dealers in Lu and Wallen (2024), while figure 3 refers to the net Treasury holdings of *all* primary dealers, so the magnitudes are not directly comparable. However, Cochran and others (2024) report that as of June 2024, the five major US dealers had about 70 percent of the net Treasury holdings of the entire primary dealer sector.

Figure 4. Hedge Fund Treasury Futures Position and Repo Borrowing



Source: Office of Financial Research and CFTC.

Note: This figure shows hedge fund net repo borrowing and net Treasury futures positions. The hedge fund net repo borrowing is aggregated from the SEC Form PF data by the Office of Financial Research and is quarterly from January 2016 to September 2024. The net Treasury futures position data are weekly and are taken from the CFTC, where we take the reported data for "leveraged money positions" to be hedge funds. The data are from January 2016 to December 2024.

that broker-dealers use derivatives to hedge the vast majority of the interest rate risk associated with their net long positions in cash bonds.[23]

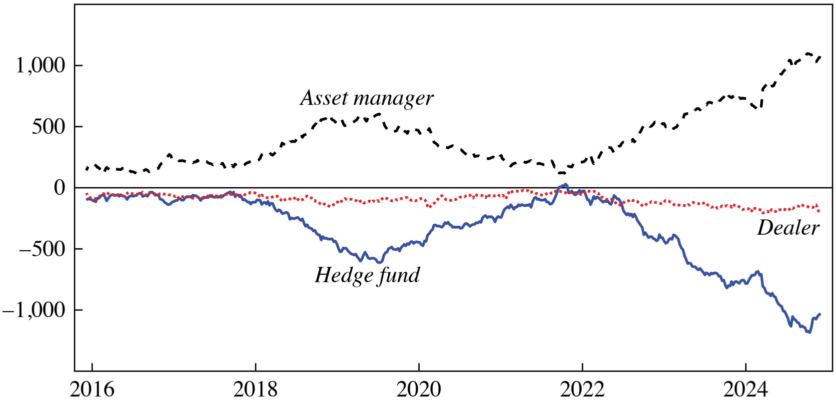
Figure 4 sheds light on assumption 2, using the Securities and Exchange Commission (SEC) data to plot hedge fund repo borrowing against cash bonds, along with the Commodity Futures Trading Commission (CFTC) data on their futures positions over the period 2016–2024. The repo borrowing and the short futures positions are virtual inverses of one another, suggesting that, consistent with assumption 2, essentially all repo-financed long positions in cash bonds are hedged with short positions in futures, and that most of the time variation in these series is variation in the magnitude of their leveraged bond futures arbitrage position. This is further corroborated by Glicoes and others (2024), who use regulatory data on Treasury transactions to show that hedge funds are engaging in bundled trades of long cash Treasuries and short futures.

Figure 5 shows futures net positioning among hedge funds, dealers, and asset managers. Hedge fund positioning in futures closely mirrors the inverse

23. This conclusion applies at the level of the *dealer subsidiary* of these bank holding companies. It does not apply to their commercial banking subsidiaries, which typically have large unhedged positions in Treasury bonds and mortgage-backed securities.

Figure 5. Dealer, Hedge Fund, and Asset Manager Positions in Treasury Futures

Net position in $ billions



Source: CFTC.

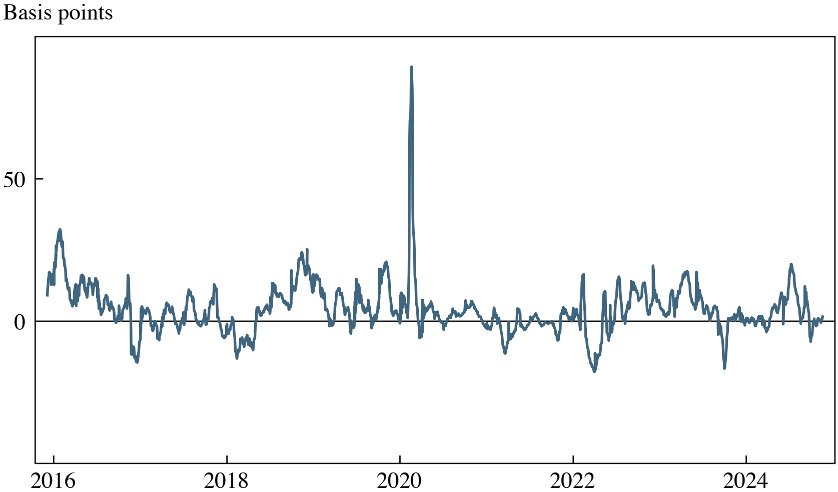
Note: This figure shows hedge fund, asset manager, and dealer net positions in Treasury futures. The data are weekly from January 2016 to December 2024. The hedge fund positions correspond to those labeled "leveraged money positions" in the CFTC data.

of asset managers, consistent with assumption 3. Strikingly, hedge funds at the end of 2024 were net short over $1 trillion in futures, or roughly double the position that they had leading up to the period of market turmoil in March 2020. Recall that this futures position is likely the other side of an equal-sized long position in cash Treasuries, one that is financed almost entirely with overnight repo borrowing, as suggested by figure 4.

Also consistent with assumption 3, broker-dealers are also consistently short futures, though their position is an order of magnitude smaller than that of the hedge funds. In other words, it appears that hedge funds are the frontline players in providing the service of inventorying cash bonds to the asset managers.[24] In this vein, a regression in weekly changes over the sample period January 2016 to December 2024 reveals that a $100 increase in long positions by asset managers is associated with a $78 increase in short positions by hedge funds, and just a $17 increase in short positions by broker-dealers. This suggests that if the dealers are forced to absorb a

24. It is interesting to ask how we arrived at this institutional arrangement—that is, one where hedge funds, not dealers, are the primary providers of the service of inventorying cash bonds and thereby policing the Treasury cash futures basis. Some observers have attributed this to post-GFC changes in financial regulation, such as the supplementary leverage ratio (SLR) or the Volcker rule. See, for example, Duffie (2023) and Aramonte, Schrimpf, and Shin (2023).

Figure 6. The Treasury Cash Futures Basis



Source: Citadel Securities.

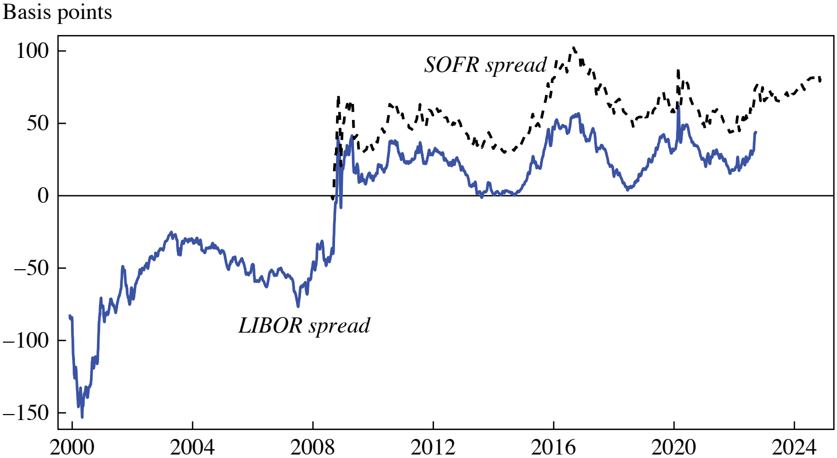
Note: This figure shows the Treasury cash futures basis in annualized basis points. This basis is the difference between the cash futures implied risk-free rate and the maturity-matched term repo rate for the ten-year Treasury futures. We show the largest spread for contracts with tenors between 20 and 150 days to delivery, where the average tenor is three months. We plot the ten-day moving average. The underlying data are daily from January 2016 to December 2024 and were provided by Citadel Securities.

significant portion of the hedge fund book in a rapid unwind, this would represent a proportionately very large increase in their commitment to the cash futures arbitrage trade, and hence a potentially serious impingement on their ability to devote resources to market making and repo intermediation.

Regarding assumption 4, we have already referenced the Flow of Funds data on the size of pension fund and life insurers' balance sheets. Together they have over $25 trillion in liabilities, while the entire universe of investment-grade global dollar-denominated corporate bonds with maturities greater than ten years is under $3 trillion. So it is simply not possible for these asset managers to find enough long-term high-grade corporate debt to match the maturity of their liabilities. Which is why, if they wish to have some exposure to corporate credit while at the same time doing this maturity matching, they will have to resort to taking long positions in interest rate derivatives.

Figure 6 shows the Treasury cash futures basis since 2016. We measure the basis for the ten-year Treasury futures contract as the difference between the cash futures implied interest rate on the one hand, and a maturity-matched

Figure 7. The Treasury Swap Spread



Source: Bloomberg.
Note: This figure shows the Treasury swap spread in annualized basis points. The swap spread is the difference between a thirty-year Treasury security and the fixed par rate on a thirty-year swap (where the floating leg is LIBOR in the solid line and SOFR in the dashed line). We plot the ten-day moving average. The data are daily from January 2000 to December 2024.

term repo rate on the other hand. On any given trading date, there are multiple futures contracts of varying maturities that hedge funds can trade. We restrict our analysis to the most liquid contracts with maturities between 20 and 150 trading days and report the largest arbitrage spread (in annualized basis points) among the contracts.[25] The basis, as posited in assumption 5, is typically positive, with an average value of 5 basis points over the sample period. The dramatic spike in March 2020 stands out; we will come back to this point shortly.

Figure 7 shows the Treasury swap spread, which we are able to obtain over a longer sample period of 2000–2024. The swap spread is the difference between the yield on a thirty-year Treasury security and the fixed rate on a thirty-year swap. We show two swap rates, where the solid line represents a swap where the floating-rate leg is based on three-month rates of London Interbank Offered Rate (LIBOR) and the dashed line represents a

25. The Treasury futures basis is challenging to measure because of synchronicity and optionality issues. To accurately measure the basis, we need synchronous prices for cash Treasuries and futures contracts. Treasury futures contracts also contain a cheapest-to-deliver option, where one of many Treasuries within a maturity bucket can be delivered.

Table 1. Treasury Supply and Hedge Fund Futures Positions

	Δ *Hedge fund net futures*			
	(1)	*(2)*	*(3)*	*(4)*
Δ Treasury supply	−0.053***	−0.042***	−0.054***	0.007
	(0.010)	(0.011)	(0.013)	(0.032)
Tenor FE	Y	Y	Y	Y
Time FE	N	Y	Y	Y
Adjusted R^2	2%	8%	8%	10%
N	2,336	2,336	1,904	264

Source: CFTC as described in figure 4 and the Treasury.

Note: This table shows the estimates of equation (10), where we estimate the association between changes in Treasury issuance (ΔQ) and changes in hedge fund net Treasury futures positions. We estimate this for a panel of weekly data from January 2016 to December 2024, where we match issuance by tenor to hedge fund futures positions by tenor. The set of tenors includes maturities of five, seven, ten, twenty, and thirty years. Column 1 includes a tenor fixed effect; column 2 adds a time fixed effect; column 3 limits the sample to the tenors and weeks for which one-week lagged hedge fund net futures positions are negative; and column 4 limits the sample to the tenors and weeks for which one-week lagged hedge fund net futures positions are positive. The numbers in parentheses are robust standard errors that are clustered by auction date to account for error correlations within a trading date. The asterisks indicate that we can reject the hypothesis that the coefficient is statistically different from zero at the one percent level of significance.

swap where the floating-rate leg is based on the secured overnight funding rate (SOFR). Since the GFC, the LIBOR swap spread has averaged 25 basis points and the SOFR swap spread has averaged 58 basis points.[26] The positive values of the swap spread tell the same story as the positive values of the Treasury futures basis in figure 6. As discussed earlier, the swap spread undergoes a pronounced regime shift around the time of the GFC, shifting from consistently negative territory before the GFC to consistently positive territory in the years since.

Having established that the premises underlying the model are satisfied, we turn to its four main predictions. Hypothesis 1 gets to the heart of our model's implications about the potential consequences of an expanding Treasury market. It holds that ongoing increases in the supply of Treasury bonds will induce hedge funds to take larger leveraged positions in the Treasury futures basis trade. In an effort to test this proposition, in table 1 we run weekly regressions of the following form:

$$(13) \qquad \Delta HF_{i,t} = \alpha_i + \alpha_t + \beta \Delta Q_{i,t} + \varepsilon_{i,t},$$

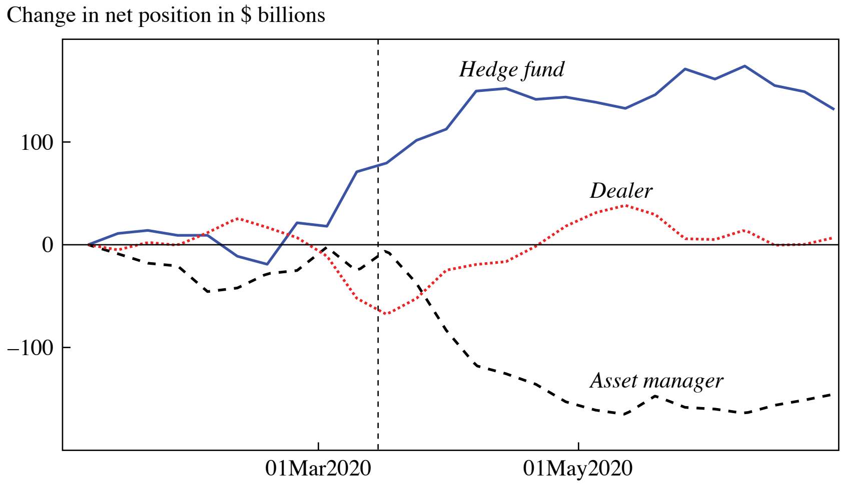
26. Due to data limitations and the transition from LIBOR to SOFR, the Bloomberg series on the LIBOR swap spread ends on October 10, 2022, while the SOFR swap spread extends to the end of our sample in December 2024.

where $\Delta HF_{i,t}$ is the dollar change in hedge fund net futures positions for contract maturity $i \in \{5, 7, 10, 20, 30\}$ and week t, and where $\Delta Q_{i,t}$ is the dollar quantity of Treasuries auctioned that fits the delivery specifications of contract i between $t - 1$ and t. The α's are contract maturity and time fixed effects. The sample runs from March 8, 2016, to August 27, 2024. Consistent with the model, we see in columns 1 and 2 that an increase in Treasury supply of $100 leads to hedge fund short positions going up by approximately $5, where column 1 includes contract fixed effects and column 2 in addition includes time fixed effects. Columns 3 and 4 make the point that this effect is entirely driven by the majority of months and tenors where hedge funds start out with short positions. In column 3 the regression is run only over the observations when hedge funds had a net short position in the prior month and tenor, and the estimated coefficient is very similar to that for the full sample. In contrast, column 4 estimates the regression only over the observations when hedge funds had a net long position in the prior month and tenor (which happens in just about 10 percent of observations). In these cases, changes in Treasury supply have no effect.

Although there are obviously numerous caveats in terms of extrapolating from these weekly-frequency regressions, the magnitudes that they imply are economically meaningful in the context of a Treasury market that is expected to grow by roughly $20 trillion over the coming decade (CBO 2024). Taken at face value—and again, there are many reasons not to—our regression estimates would imply that this would increase hedge fund cash futures basis positions by about $1 trillion.

Figure 8 speaks to hypothesis 2, regarding the dynamics of hedge fund unwind in a period of market stress. In March 2020, we see a sharp reduction in hedge fund short positions in Treasury futures. Specifically, over the brief interval from March 3 to 17, hedge funds reduce these short positions by $62 billion. Subsequent analysis revealed a similar decline in their repo-financed securities holdings (Kruttli and others 2021). Over the same time frame, broker-dealers increased their short positions in the same futures contracts by $57 billion, effectively serving as the frontline shock absorbers for this fire sale of the hedge fund arbitrage book. Consistent with the idea that taking on this book was a difficult stretch for the dealers, over the next several weeks, dealer positions in futures begin to revert, and asset managers take on a secondary role in accommodating the unwind. In particular, as hedge funds continue to shrink their short positions in futures, asset managers start to scale back their long positions significantly, presumably in response to the widening of the cash futures basis, which implies that it has

Figure 8. The Hedge Fund Basis Trade Unwind, March 2020



Source: CFTC as described in figure 5.

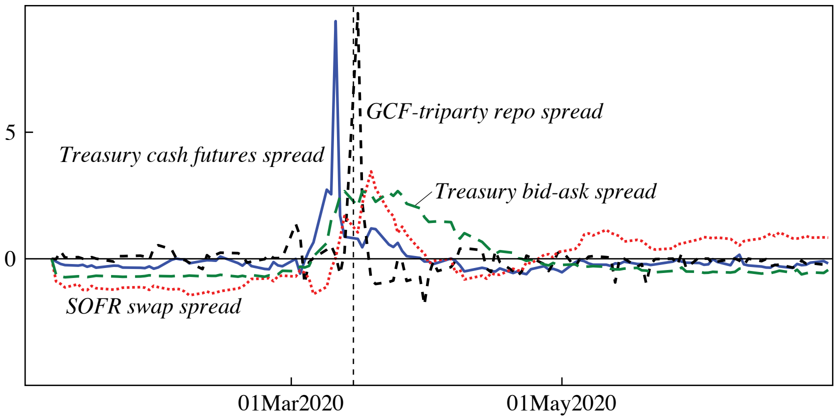
Note: This figure shows hedge fund, asset manager, and dealer net positions in Treasury futures. The positions are normalized to be zero as of January 7, 2020. The data are weekly from January 7, 2020, to June 30, 2020. The reference line marks March 15, 2020, which is when the Federal Reserve had an emergency meeting, lowered interest rates, and announced plans to begin purchasing Treasury securities.

become even more expensive than before for them to take a long duration position via futures instead of in cash Treasuries.

Figure 9 addresses hypotheses 3 and 4, plotting four series in the months surrounding March 2020: (1) the Treasury cash futures basis; (2) the Treasury SOFR swap spread; (3) Treasury bid-ask spreads; and (4) the spread between the general collateral finance (GCF) and triparty repo rates.[27] All series are normalized to be zero as of January 7, 2020, and to have unit standard deviation. During this period of market stress, the cash futures basis jumps by 9 standard deviations and the swap spread increases by 3.5 standard deviations, confirming hypothesis 3. Moreover, consistent with spillover effects to other broker-dealer activities as in hypothesis 4, we find that repo intermediation spreads and bid-ask spreads widen by 10 standard deviations and 2.7 standard deviations, respectively. Notably, the cash futures basis spike is the first shoe to drop, occurring nearly a week before spreads

27. The spread between GCF and triparty repo rates can be thought of as the difference between the rate at which a broker-dealer firm borrows from a money fund in the triparty market and the rate at which it lends to, for example, a hedge fund in the so-called general collateral market. In other words, it is the repo market intermediation spread.

Figure 9. Comovement of Treasury Futures Basis, Treasury Swap Spread, Market Liquidity, and Repo Intermediation Spreads, March 2020



Source: Citadel Securities; Bloomberg; DTCC GCF Repo Index; and OFR (2025).

Note: This figure shows the Treasury cash futures basis, the Treasury SOFR swap spread (inverted for visual convenience), Treasury bid-ask spreads, and the spread between GCF and triparty repo rates. All four series are normalized to be zero as of January 7, 2020, and to have unit standard deviation. Both the Treasury cash futures basis and the GCF-triparty repo spread exhibit spikes of nine standard deviations on March 11 and March 16, 2020, respectively. The Treasury SOFR swap spread and Treasury bid-ask spreads show smaller but more protracted increases over two to four weeks. The reference line marks March 15, 2020, which is when the Federal Reserve had an emergency meeting, lowered interest rates, and began quantitative easing.

widened in the repo market. This suggests a direction of causality where, as in our model, the broad set of disruptions in the Treasury market originated from an unwind of the hedge fund trade in Treasury futures.

III. Policy Implications

There are several policy approaches that might be helpful in addressing Treasury market fragility. Some of these have been the subject of considerable prior attention from a range of commentators. These include modifying the SLR; creating a standing, broad-access Federal Reserve repo facility; and imposing centralized clearing and harmonized universal margin requirements on Treasury securities. However, the logic of our model suggests a novel approach that we believe can be a valuable addition to the policy tool kit, namely, hedged purchases of Treasuries by the Fed in times of extreme market stress. We begin with a discussion of this new idea and some of the questions it raises. We then briefly summarize how it relates to some of the other policy proposals that have been previously put forward.

III.A. Hedged Central Bank Purchases of Treasuries

In response to the Treasury market turmoil of March 2020, the Federal Reserve initiated an extraordinarily aggressive program of buying cash Treasuries: Between the beginning of March and the end of May, the Fed bought approximately $1.6 trillion of Treasury bonds (Federal Reserve Board 2020d). Given the apparent success of this program in restoring market function, a number of authors have since argued that such market function–motivated bond purchases should become a standard part of central bankers' crisis management tool kit, and that more thought should be given to design considerations such as under what precise conditions such purchases should be triggered, how to make clear the distinction with monetary policy–motivated bond purchases, and how to commit to unwinding the purchases in a relatively timely manner (Hauser 2022; Duffie and Keane 2023; Duffie 2023; Kashyap 2024).

Our theory and evidence suggest an alternative, more surgical approach that may have a number of advantages over simple purchases of cash securities by the Fed. The key insight is that the fire sale by hedge funds, which in turn creates the severe strain on dealer balance sheets, is not simply an outright liquidation of cash Treasuries. Rather, it is an unwinding of a *hedged* long cash Treasuries/short derivatives position. Thus, to relieve the stress on dealers, it would be sufficient for the Fed to take the other side of this hedge fund unwind, by purchasing cash Treasuries and fully hedging this purchase with an offsetting short position in Treasury derivatives. Simply buying unhedged cash bonds from the dealers—that is, taking duration risk off of their hands—does not provide them with any extra relief relative to this hedged approach, since, as we have seen, they tend not to have any duration exposure in the first place, even in times of extreme market stress.

One important advantage of this hedged approach to bond buying is that it would make transparently clear the distinction between market function interventions and those intended to serve a monetary policy objective: If the Fed hedges its bond purchases with derivatives, it is not removing net duration from the market, and hence to a first approximation not attempting to exert downward pressure on long-term interest rates. This draws a key distinction between market functioning purchases, which are designed to stabilize market conditions by providing a buyer of last resort over the short term, and quantitative easing, which is intended to supplement traditional forms of monetary policy (see, e.g., Gagnon and others 2011; Bernanke 2020). As a by-product, hedged purchases allow the Fed to intervene to support market function without exposing it to undue interest rate risk, something that came back to bite it when rising policy rates in 2022 and 2023 generated large losses on the bonds that the Fed had bought over the prior couple of years.

In her discussion, Vissing-Jorgensen (2025) points out that, in the context of our simple model, hedged purchases may actually have greater bang for the buck than unhedged purchases in terms of reducing the Treasury futures basis, and may therefore allow for smaller overall interventions. Whether or not this specific point holds in a more general setting, the essential advantages of hedged purchases as a more surgical form of intervention remain.

As noted above, a basis purchase facility of the sort we have in mind is not that far afield from current open market operations. The Federal Reserve's Standing Repo Facility (SRF), for example, purchases Treasury securities under a contractual agreement to resell them in the future at a price specified at the time of trade. In the early years of Fed repo offerings, the authority to enter into such contracts was cited as an important enabling clause of the Federal Reserve Act (Menand and Younger 2023). Treasury futures similarly represent a contractual agreement to sell a defined set of Treasury securities at a price specified at the time of trade. The one key difference is that, in a repo contract, the seller in the opening leg and buyer in the closing leg are the same counterparty; in a basis position, they are potentially different parties.[28]

MORAL HAZARD CONSIDERATIONS A natural reaction to our proposal is to worry about the specter of moral hazard. If the Fed effectively takes hedge funds' arbitrage trade off their hands when the trade is going bad, won't this implicit backstop lead the hedge funds to be more aggressive ex ante, that is, to take even larger leveraged positions in the trade, thereby amplifying the risk of a disorderly unwind?

Although we certainly do not intend to dismiss moral hazard considerations entirely, it is important to note that they are more nuanced in this particular case than they might appear at first glance, and almost certainly less severe than in the case of unhedged bond purchases such as those undertaken in March 2020. If market participants come to expect the Fed to implement unhedged purchases at times of market stress—thereby removing substantial amounts of duration from the market—this would be

28. As noted above, we do not take a stance on the specific legality of this proposal under the current interpretation of the relevant clauses of the Federal Reserve Act.

expected to have a first-order impact on the pricing of interest rate risk and hence on the term premium. In effect, the market would anticipate a more powerful Fed put with respect to interest rate risk, particularly to the extent that episodes of market dysfunction are expected to coincide with general upward pressure on rates.

By contrast, our hedged-purchase approach to a first approximation does not create any such Fed put on interest rates, as it is a duration-neutral policy. But by bailing out the hedge funds, does it nevertheless still not create some sort of distortion? To see why this is a somewhat subtle question, it is useful to start with a limiting case. Suppose hedge funds conjecture that the Fed will step in with certainty and take the arbitrage trade off their hands when the spread widens by a given amount. With this source of tail risk eliminated, we might expect them to trade more aggressively ex ante. In the limit where they become risk neutral and there is perfect competition, this more aggressive behavior will drive the Treasury futures basis x, and hence expected hedge fund profits, to zero. It is of course true that there will still be states of the world where the Fed has to take over a potentially large hedge fund book, but if the Fed is perfectly hedged with respect to interest rate risk, and given that it can never be forced out of its position prematurely, the social cost of having to assume this hedged position is arguably negligible. Thus in this limit case, the policy creates no distortions with respect to the pricing of interest rate risk, eliminates hedge fund arbitrage profits, and imposes no costs on the Fed or society as a whole. In other words, there is no moral hazard effect to speak of.

Indeed, in this limiting case, a policy of certain ex post intervention that effectively removes the tail risk to the hedge funds is isomorphic to one in which the Fed itself—rather than the hedge funds—polices the Treasury futures basis ex ante, by continuously maintaining a large enough position in the hedged cash derivatives trade that the basis is always forced to zero. In this case, there is no incentive for leveraged hedge funds to enter the market in the first place, and hence no risk of disorderly unwinds. While such an arrangement may sound unrealistic from a political economy perspective, it is a useful conceptual benchmark because it can be thought of as an application of the Friedman (1969) rule. Recall that Milton Friedman advocates that a central bank should reduce the opportunity cost of holding fiat money to zero to the extent that it can produce fiat money at zero social cost. Similarly, the logic here would be that the central bank should reduce the cost that asset managers pay to others to hold cash Treasuries on their behalf to zero, since—by virtue of its ability to create money and hence never be forced out of a hedged trade prematurely—it can perform this balance sheet rental service at near-zero social cost, whereas leveraged hedge funds manifestly cannot.

To be clear, the limit case considered above is too strong, and we would not want to argue that a policy whereby the Fed intervenes ex post to stabilize the Treasury futures basis is completely without moral hazard complications. In particular, many of the hedge funds that engage in this arbitrage trade are broadly diversified and have a variety of other positions in place as well. So if they are induced by the prospect of ex post Fed action to trade more aggressively against the Treasury futures basis than they otherwise would, an adverse shock to this spread may force them to fire-sell other assets that they would not have otherwise had to unload. And these fire sales may in turn have knock-on effects in markets that are not easily stabilized with existing policy tools.

In thinking about how to mitigate this remaining source of moral hazard, it is tempting to invoke the spirit of Bagehot (1873) and ask whether one can impose some sort of "penalty rate" on the hedge funds in the state of the world where the central bank bails them out of the Treasury futures arbitrage trade. It turns out that this is straightforward to do. Recall from figure 9 that in March 2020, the Treasury futures basis spiked to a level 9 standard deviations above its typical mean value. If a future Federal Open Market Committee (FOMC) were to intervene with hedged bond purchases to offset such a dramatic spike, they need not compress the basis all the way back to a normal-times mean value. A lender of last resort seeks to lend at a penalty rate higher than would prevail level in ordinary market conditions but below the currently stressed market level; the Fed could similarly aim to push the basis only partway back to where it was before the market became dysfunctional. To take a concrete example, it could choose to allow the basis to rise by, say, just 2 standard deviations but no more than that. By doing so, it would purposefully leave a meaningful amount of risk on the table for the hedge funds, but at the same time mitigate the worst-case unwind outcomes.

As a practical matter, this Bagehot-style outcome could be implemented with a standing facility that acts to create a cap on the Treasury futures basis and thereby eliminate just the most extreme spikes. The Fed could simply enter the market anytime the basis threatened to breach the cap, buy the requisite amount of cash bonds through a conventional open market operation, and short the equivalent amount of futures. Indeed, such a facility would be closely analogous to a standing repo facility that aimed to cap spikes in repo spreads.

Alternatively, and perhaps somewhat more elegantly, the same objective could be accomplished by having the Fed conduct auctions of bundled basis packages in which primary dealers submit both the cash Treasury security they intend to sell and the futures contract they intend to buy at a specified gross basis. The Fed could then set a minimum bid price on the submitted bundles as a means to impose the desired cap on the basis.

III.B. Other Policy Proposals

DIALING BACK THE SUPPLEMENTARY LEVERAGE RATIO The SLR has been criticized repeatedly in prior work by many others (see, e.g., Liang and Parkinson 2020; Group of Thirty 2021; Duffie 2023 and references therein), for, among other things, its potentially adverse effects on Treasury market liquidity. When it is binding, the SLR—which is an unweighted capital requirement that for the most part treats all bank assets similarly—effectively subjects banks and their dealer arms to significant capital charges on their holdings of Treasury securities and central bank reserves and on their provision of Treasury market repo intermediation. And even when the SLR is not currently binding, the anticipation that it may bind in the future can still have significant effects. Recognizing this problem, the Fed temporarily excluded Treasuries and reserves from the calculation of the SLR in 2020. However, this exclusion was allowed to lapse a year later, so the full SLR remains in force today. Although the Fed, Office of the Comptroller of the Currency (OCC), and Federal Deposit Insurance Corporation (FDIC) have jointly proposed substantive changes to the SLR, in particular recalibrating and tailoring the minimum ratio, their impact on Treasury market intermediation is uncertain and may not be material.[29]

In the language of our model, the SLR can be thought of as one factor that causes dealer balance sheet constraints—particularly with respect to the Treasury market activities of interest to us here—to be tighter than they otherwise would be, which in turn exacerbates fire-sale effects in the face of a hedge fund unwind, with the attendant consequences for market liquidity and repo intermediation spreads. So the logic of the model is clearly supportive of efforts to make the SLR less binding. This could be accomplished by, for example, permanently excluding Treasuries (either all or just those in trading books; see Menand and Younger 2023) and central bank reserves from the denominator of the leverage ratio. Or alternatively, by dialing back the current 5 percent requirement applicable to the eight largest US bank holding companies to some lower value, say, the international standard of 3 percent (Group of Thirty 2021). This need not result in any reduction

29. See 90 Fed. Reg. 30785 (July 10, 2025), https://www.federalregister.gov/d/2025-12787/page-30785.

in overall bank capital levels, which could be maintained by making an appropriate compensating adjustment to the risk-based capital regime—as the Bank of England did when it exempted reserves for UK banks.

At the same time, it is far from clear that such a dialing back of the leverage ratio would by itself solve substantially all or even much of the problem we have been concerned about. Although there is still considerable debate, some researchers have recently argued that the temporary exclusion of Treasuries from the SLR in 2020–2021 did not materially improve market-making capacity (Cochran and others 2023). Further, given a massive unwind of the hedge fund Treasury futures arbitrage position, it seems unlikely that it is just the SLR that would make it costly for broker-dealers to step in and take the other side of this unwind. The Treasury futures basis trade faces the usual convergence and liquidity risks that bedevil many such arbitrage trades. Thus standard limits-of-arbitrage arguments à la Shleifer and Vishny (1997) suggest that even dealers unconstrained by regulatory capital charges would tend to proceed cautiously in terms of blowing up their positions, particularly at a time of extreme market stress when measures of volatility are spiking and their internal risk limits are tightening (Hanson, Malkhozov, and Venter 2024).

CREATING A BROADER-ACCESS REPO FACILITY In the wake of the March 2020 market disruptions, the Federal Reserve created two standing repo facilities to provide financing on a collateralized basis against Treasury securities: one, the SRF, for which only banks and primary dealers are eligible, and the other, the Foreign and International Monetary Authorities (FIMA), for just foreign central banks and other foreign monetary authorities.[30] Here we consider two potential improvements to the SRF designed to lessen the probability and impact of a basis trade unwind.

First, policymakers could expand the set of eligible counterparties for the SRF. For example, a Group of Thirty Working Group recommended that a Fed standing repo facility should be made available not just to banks and broker-dealers, but to essentially any market participant who can pledge Treasury securities to the Fed (Group of Thirty 2021). The rationale for such a broader-access repo facility follows closely from the logic in our model: It is precisely at times of market stress that banks and dealers, who are themselves severely balance sheet constrained, find it especially difficult to

30. Another major source of Treasury selling pressure in March 2020 came from foreign central banks and reserve managers who were not leveraged but who were rushing to convert their longer-term Treasuries to cash (Vissing-Jorgensen 2021). The FIMA facility, which would allow these foreign official investors to monetize their Treasuries without having to sell them, is a potentially quite helpful solution to this specific problem.

provide repo market intermediation. Thus one cannot count on them borrowing from the Fed and turning around and on-lending to, for example, hedge funds that are struggling to finance their Treasury holdings. So allowing these hedge funds to borrow directly from the Fed and thereby bypass the temporarily clogged pipe of dealer intermediation might significantly ease funding constraints at a time when doing so is particularly helpful.

Another improvement to the SRF would be to clear its transactions through a centralized counterparty. That would allow dealers to net their borrowings from the facility against lending to hedge funds for regulatory reporting purposes (Yadav and Younger 2025). Reducing the regulatory capital that is consumed when dealers intermediate funding obtained from the SRF would enable them to pass that funding along more efficiently to other market participants.

We believe that removing frictions to repo market intermediation could be quite helpful, and we are supportive of broadening SRF access. But it is also important not to exaggerate what such changes can do in the face of a major market stress episode like March 2020. Recall that in our baseline model, there can be powerful fire-sale effects even when the repo market is working completely frictionlessly, and hedge funds have undiminished access to repo funding throughout the episode. This is because the primary problem that drives the effects is one of capital, not funding: On the one hand, hedge funds are forced to liquidate their arbitrage positions because either futures market margin calls, losses on their trades, or investor outflows have impaired their capital position, and on the other hand, broker-dealers are reluctant to absorb these positions without large price concessions because of the scarcity of their own capital. It is certainly true that piling funding constraints on top of these capital shortages would make things worse, which is why addressing the funding issue with something like a broad-access repo facility is desirable. But doing so cannot be expected to be a cure-all, especially in more extreme circumstances.

REGULATORY MINIMUM MARGIN REQUIREMENTS ON TREASURIES Metrick and Tarullo (2021) argue for the imposition of regulatory minimum margin (or "haircut") requirements on a broad set of market players undertaking Treasury financing transactions. The fundamental principle driving their argument is one of regulatory congruence. To the extent that, for example, hedge funds are more lightly regulated than dealer firms, this will tend to drive activity into the most vulnerable and highly leveraged parts of the financial sector and thereby increase systemic risk; this is an undesirable outcome, and the goal of any regulatory regime should be to lean against it wherever possible.

As Metrick and Tarullo (2021) discuss at length, achieving this sort of regulatory congruence in the US institutional setting is likely to be extremely challenging as a practical matter, given the diversity and complexity of market arrangements and the highly fragmented nature of regulatory authority over the different players. Nevertheless, it is worth asking whether, in a perfect world where one could directly impose the equivalent of a universal margin requirement on all Treasury-collateralized borrowing, this would in fact make a decisive difference in a market unwind scenario of the sort we have been entertaining.

It turns out the answer to this question is a bit more subtle than might be expected at first glance and depends on some specific assumptions. To see why, it is useful to consider a simple example. Suppose that in an initial unregulated case, haircuts on Treasury repo transactions are 2 percent, and there is a set of hedge funds that collectively are long $1 trillion of Treasuries supported by $20 billion of investor capital. To keep the example as simple as possible, ignore the margin requirements on their offsetting short futures positions, though, as emphasized above, these are also important in reality. Now imagine a shock that depletes $5 billion, or 25 percent, of hedge fund capital. This shock could come from a number of sources, but it is perhaps easiest to think of it as representing an unexpected withdrawal by hedge fund limited partners.

If nothing else changes and haircut requirements remain at 2 percent, the remaining $15 billion of hedge fund capital can now support only $750 billion of Treasury long positions (750 = 15 / 0.02), and hence hedge funds will be forced to fire-sell $250 billion of Treasury securities. However, this is an unrealistically optimistic case, since as the March 2020 CME Group example makes clear, private market–determined margins are highly cyclical, with lenders and clearinghouses seeking to better protect themselves when market volatility spikes up. If the haircut requirement doubles to 4 percent, the hedge fund sector will now only be able to maintain a long position of $375 billion (375 = 15 / 0.04) and so will be forced to fire-sell $625 billion of Treasuries, or 62.5 percent of their initial position.

Now consider how a regime with regulatory minimum margin requirements might work. Suppose that regulators impose a 5 percent margin in good times. With this higher haircut requirement, the arbitrage trade presumably becomes less attractive to hedge funds, so it seems reasonable to posit that in equilibrium they would do it in less size and that spreads would widen as a result. For the purposes of illustration, let us assume that they now devote $30 billion of capital, which allows them to be long $600 billion of Treasuries.

Imagine that the hedge funds are hit with the same 25 percent outflow from investor withdrawals as before, which now implies a $7.5 billion loss of capital. Assume further that now margins do not have to go up as much in percentage terms in the stress scenario, that is, the cyclicality in margins is mitigated. This is the presumptive benefit of the higher initial margin, in that it reduces the imperative for private actors to further raise margins under stress. For concreteness, let us suppose that margins go from 5 percent to 7.5 percent; this is a 50 percent increase, as opposed to the 100 percent increase in the unregulated case. Now the shock leaves hedge funds with $22.5 billion of capital, which can support $300 billion in long Treasuries (300 = 22.5 / 0.075) and which therefore implies a fire sale of $300 billion, or exactly half of their initial position. This is clearly better both in absolute and relative terms than in the unregulated case, but at the same time still quite significant.

The difficulty here is directly analogous to a problem with bank capital regulation. As Hanson, Kashyap, and Stein (2011) and Greenwood and others (2017) point out, high initial capital requirements alone are not sufficient to prevent large reductions in bank lending when banks suffer an adverse shock to their capital. In order to prevent this credit crunch effect, there needs to be dynamic adjustment on at least one of two margins: The capital requirement actually needs to be reduced when an adverse shock hits, or banks need to raise significant amounts of new capital at this time. Similarly, unless one can design a regulatory regime where haircuts fall in the midst of an episode of market turmoil or hedge funds raise new equity capital, there is always going to be something of a fire-sale concern with significant initial leverage. This is not to say that reform along the lines of Metrick and Tarullo (2021) is not desirable. But as with SLR reform and a broader-access Fed standing repo facility, one would not want to count on it being the sole line of defense.

MANDATED CENTRAL CLEARING One early proposal for improving the resiliency of the Treasury market in response to the COVID-19 shock was mandated central clearing (Duffie 2020). This refers to a structure in which trades between market participants are transferred to a central counterparty. That central counterparty reduces the risk created by the default of a participant by mutualizing losses among its members, which tend to be large, well-capitalized financial institutions. Mandated central clearing rules for Treasuries were finalized in late 2023 and are scheduled to be phased in over the next three years.[31]

31. See 89 Fed. Reg. 2714 (January 16, 2024), https://www.govinfo.gov/content/pkg/FR-2024-01-16/pdf/2023-27860.pdf; and SEC (2025).

Although central clearing may have significant benefits, they are largely orthogonal to the issues of concern here; we have assumed away the possibility of anyone defaulting on an obligation to their counterparties. One exception is that central clearing may facilitate the cross-margining of cash and derivative transactions (Younger 2021; Kahn and McCormick 2025). When volatility increases, margin requirements can increase as well, potentially triggering forced unwinds. One way to reduce this risk is to set overall margin based on net exposures, not separately on the two legs of the trade. The benefits of such cross-margining can only be achieved, however, if market participants are commonly clearing both legs of their basis trades (see Yadav and Younger 2025).

IV. Conclusions

We have identified the cash futures basis trade as a potentially critical source of instability in the Treasury market. Data suggest that hedge funds currently have on the order of $1 trillion of highly leveraged long positions in cash Treasury securities tied up in this specific arbitrage trade—positions that are at risk of being rapidly unwound if these hedge funds are hit by any one of a number of different possible shocks. Given that such an unwind would have to be absorbed in the short run by a broker-dealer sector that is itself capital constrained, it would likely lead to significant disruption in other activities for which broker-dealer firms are central, such as providing liquidity to the secondary market for Treasuries and intermediating the market for repo borrowing and lending. Moreover, our theory suggests that the continuing rapid growth of the Treasury market should be expected to further increase the size of the leveraged hedge fund presence, thus amplifying these risks.

Although we believe that another round of large-scale bond buying by the Federal Reserve should be seen as a last resort in any future episode of Treasury market dysfunction, the limitations of some of the other currently available policy tools suggest that one should not rule out its use in a relatively extreme scenario. And our main point has been that in such a scenario, it would be preferable for any bond purchases to be undertaken on a fully hedged basis, so that while cash bonds are removed from the market, on net no duration risk is taken out of public hands.

Implementing the policy this way has several advantages relative to the unhedged form of market function quantitative easing that was done in March 2020: (1) It makes clear the distinction with monetary policy–motivated quantitative easing; (2) it is essentially self-liquidating, and thus removes the need to make commitments about the timing of future bond sales; (3) it shields the Fed from taking on interest rate risk that it may prefer not to bear; and (4) it eliminates an ex ante form of moral hazard, whereby the anticipation of future unhedged bond purchases distorts the market's pricing of interest rate risk. For all these reasons, we hope that policymakers will give this option serious consideration going forward.

As a final note, after this paper was presented at the March 2025 *BPEA* conference, there were several days of considerable stress in the Treasury market following the announcement by President Trump on April 2 of a set of dramatically increased tariffs on the United States' trading partners. Some portion of that stress appears to have been attributable to hedge funds unwinding arbitrage positions of the sort that we have been discussing here—long cash Treasuries and short derivatives, either futures or swaps. Although as of this writing the consequences have not been as problematic as in March 2020, the episode does underscore the concerns we have raised here and the urgency of developing policy tools that can address these concerns.

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Comments and Discussion

COMMENT BY

HYUN SONG SHIN[1] The great financial crisis (GFC) was a watershed event that set in motion two related structural changes to the global financial system.[2] Those changes define the state of the system today and form the backdrop to this important and timely piece by Kashyap, Stein, Wallen, and Younger. The first is the shift in the underlying claims in the financial system from those on private sector borrowers (especially mortgages) to claims on the government in the form of sovereign bonds. The second structural change is the shift from banks to nonbank financial intermediaries. The post-GFC financial system casts portfolio managers as the main actors to take center stage.

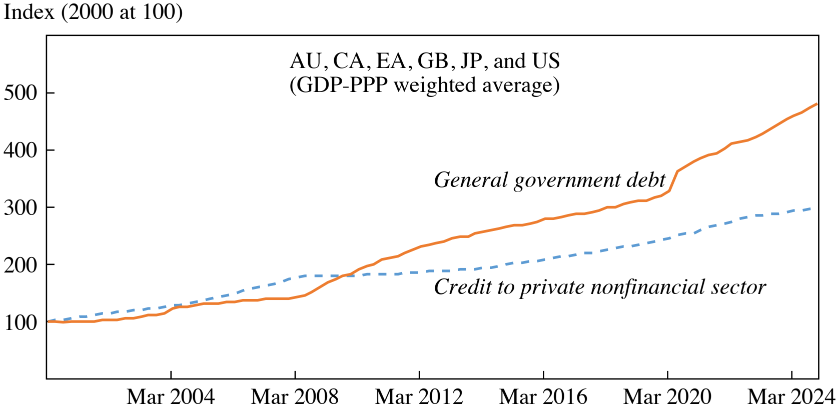
Figure 1 illustrates the relative growth of credit of private sector borrowers and public sector borrowers for several economies, indexed to one hundred in the first quarter of 2000. Up to the GFC, private sector credit outpaced credit to the government, but after the GFC, borrowing by governments outpaced private borrowing. Panel B shows the individual series for the United States and the euro area. The growth in public debt in the United States is particularly notable, while the euro area public debt growth has been comparatively more contained. The fiscal implications of the COVID-19 shock are also clear in these charts. Expansive US fiscal policy in place in recent years is an important backdrop for this paper.

1. My thanks to many Bank for International Settlements (BIS) colleagues for helpful discussions and to Burcu Erik for research support. The views here are mine, and not necessarily those of the BIS.

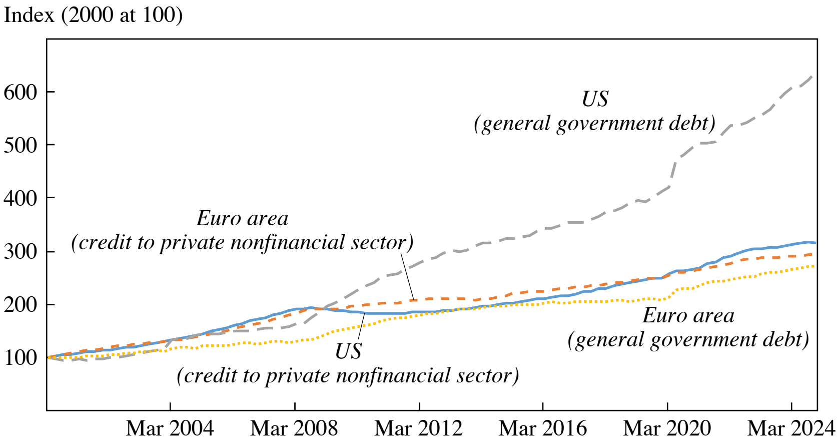
2. "Great financial crisis" is the BIS's preferred terminology of the 2008 crisis.

Figure 1. Credit to Government Has Outpaced Credit to the Private Sector

Panel A: Selected advanced economies



Panel B: United States and euro area



Source: BIS (2025) and author's calculations.
Note: Amounts outstanding in local currency, 2000:Q1 = 100.

This is where the second structural change comes in. Even as expansive fiscal policies in the United States and elsewhere have meant that sovereign bond issuance has outpaced the growth of private sector debt, portfolio managers of all stripes have absorbed the rapid issuance of sovereign bonds. The role of relative value hedge funds who use high leverage to hold Treasuries has become central to the story.

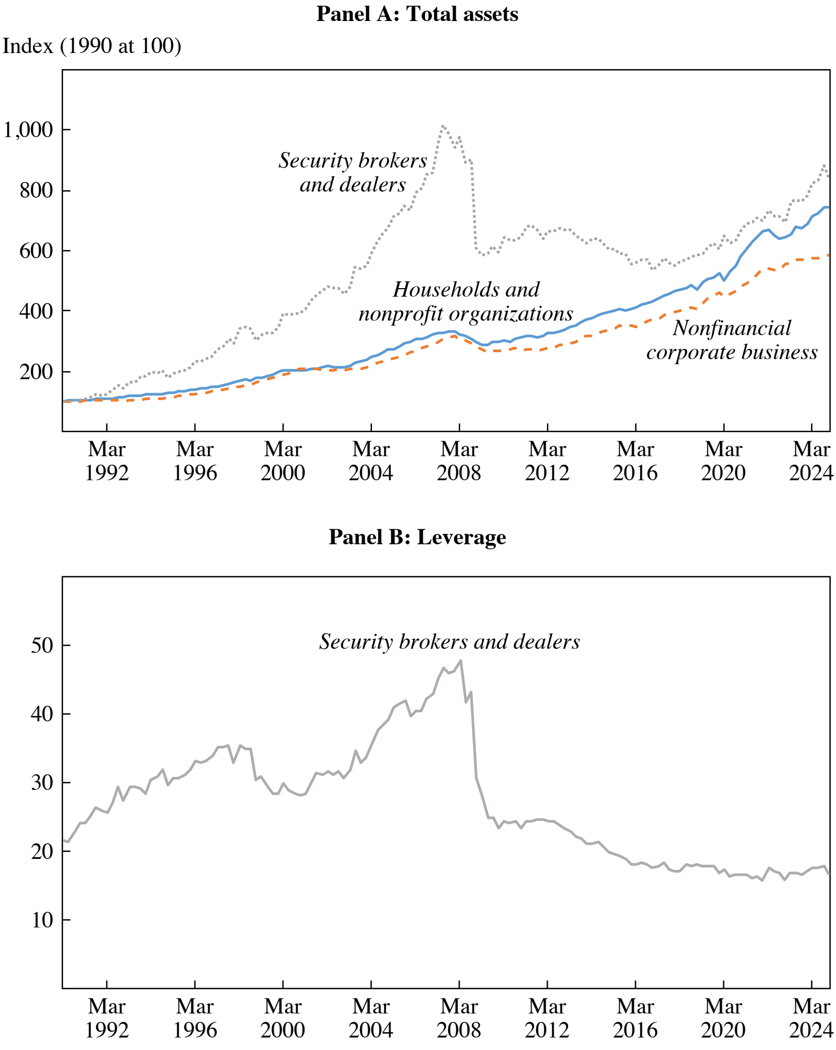
Figure 2 illustrates the diminished role of the securities broker-dealer sector in the United States. Panel A shows the time path of total assets of the broker-dealer sector, normalized to one hundred in the first quarter of 1990, in comparison to two other sectors—the household sector and nonfinancial corporate sector—also normalized to one hundred in 1990:Q1. On the eve of the financial crisis of 2008, the total assets of the household sector and nonfinancial corporate sector had roughly tripled in size from 1990:Q1, but the broker-dealer sector had grown by a factor of ten. Leverage (defined as total assets divided by book equity) started at just over twenty at the beginning of the period but rose to around fifty on the eve of the crisis, before dropping sharply with the onset of the crisis. Thereafter, both the total assets and the leverage of the broker-dealer sector declined further. Assets of the broker-dealer sector have recovered in recent years, but leverage has stayed low.

In place of the regulated banking sector, market-based intermediation activity has increasingly migrated to places that are not easily captured in the traditional balance sheet aggregates. Hedge funds have become large players in the market for Treasury securities. While their involvement in government bond markets is not new, hedge funds' rapid expansion in recent years has increased their heft in the market. There has also been increased importance of central clearing through new financial market infrastructures that has enabled the assembling of leveraged positions by hedge funds without going through the traditional channel of dealer balance sheets. Figure 3 illustrates schematically the various intermediation channels available to hedge funds in the Treasury market.

The authors examine relative value trading strategies that rely on assembling a large Treasury position based on high leverage and combining the large holdings with hedging positions that mitigate the exposure through short positions in closely related markets. They focus on the cash futures basis trade, where the hedging leg is built on Treasury futures. An alternative route is to use interest rate swaps, which has become feasible as a hedge in recent years as the swap rate has fallen below the yields available on Treasury securities.

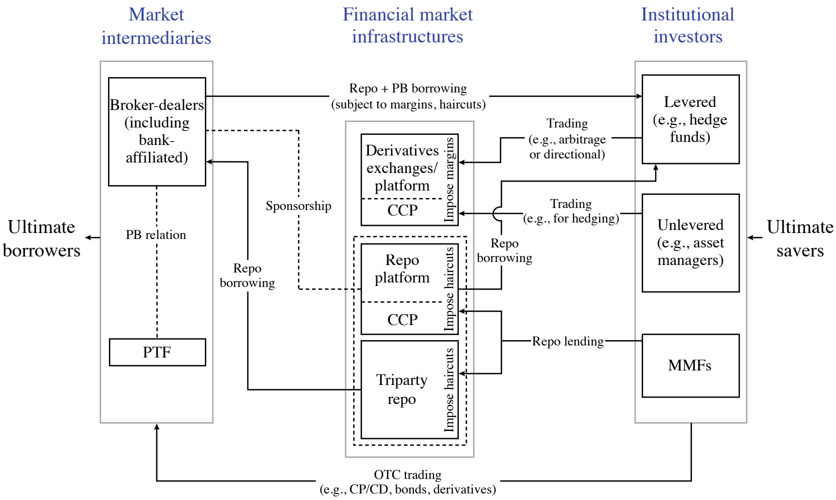
Before delving into the details of such trades, it is worth considering the bigger picture on why relative value strategies have become so prevalent. Relative value strategies are made possible by the ready availability of short-term funding in the repo market, often on highly favorable terms. Repo financing can be provided either by traditional dealers or through a clearing infrastructure. In both cases, razor-thin margins enable the construction of highly leveraged holdings of Treasuries.

Figure 2. Broker-Dealer Balance Sheets Have Smaller Heft in the Financial System Post-GFC, as Market-Based Intermediation Has Migrated Elsewhere



Source: Federal Reserve Financial Accounts of the United States and author's calculations.
Note: In panel B, leverage refers to ratio of assets to equity.

Figure 3. Hedge Funds, Repo Markets, and Clearing Infrastructures Have Taken a Greater Role in Market Intermediation



Source: Author's elaborations.

Note: CCP = central counterparty; MMF = money market fund; PB = prime broker; PTF = proprietary trading firm; OTC = over-the-counter trading; CP = commercial paper; CD = certificate of deposit.

Indeed, a recent estimate highlights how over 70 percent of bilateral repos are provided by dealer banks at zero haircuts, implying that creditors place little constraint on leverage in the treasury market (Hempel and others 2023). Some authors have even noted that *negative* haircuts have become common (Lu and Wallen 2025).

The availability of repo financing on favorable terms is a reflection of the broader phenomenon of the growth of the short-term funding market in the era of large central bank balance sheets that result from asset purchase programs used for monetary policy purposes. When central banks buy government bonds or other assets, these purchases are paid for by crediting the account of the dealer bank that has sold the government bond. In this sense, the central bank issues money, to be held by the banking sector. If the commercial bank surrenders the asset, the accounting would show a substitution on the asset side of the commercial bank's balance sheet. If the asset sold was previously owned by the commercial bank, that would be the end of the accounting change.

The more interesting case is when the commercial bank acts as the dealer bank for assets surrendered by nonbanks—for example, pension funds, insurance companies, or asset management funds. In this case, there is an increase in reserves of the banking sector as well as an increase in the deposits at the commercial bank of the sellers of the assets. This is because the dealer banks are acting as intermediaries for the nonbank asset owners who have surrendered their bonds. The dealer bank credits the account of the sellers as increased deposits. Thus, central bank asset purchases create money in two ways. The reserves of the banking system increase, but (more importantly for this discussion) the deposit balances of the sellers of the assets in the commercial banking system also rise.

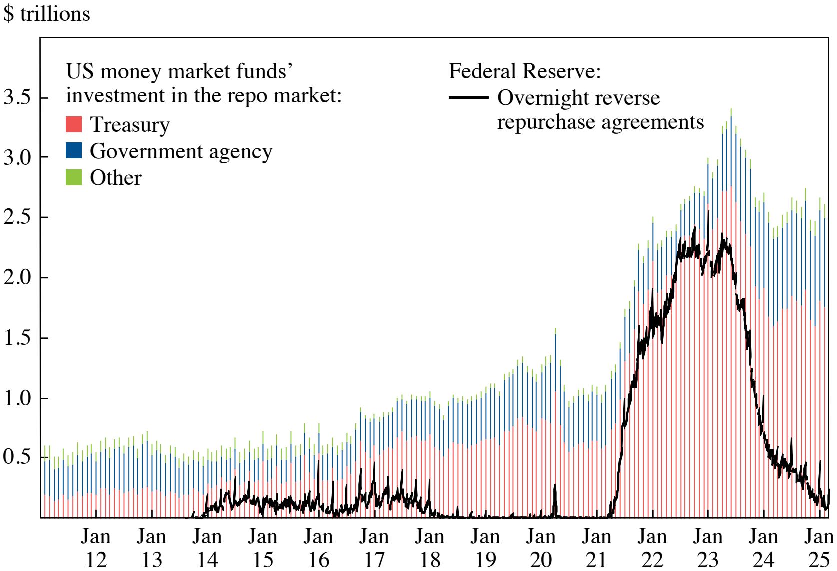
In this way, the growth of deposits of financial entities held against the banking sector is a key underlying structural development in the financial system, which follows from large central bank asset purchases. As the short-term liquid claims of financial institutions grow, the availability of short-term funding to the financial system as a whole also grows. At the margin, short-term funding finds its way to other institutions such as money market funds, which in turn lend against collateral in repo agreements and other short-term financing intermediated by the banking sector. In this way, large central bank balance sheets tend to go hand-in-hand with permissive short-term funding conditions.

Figure 4 plots repo financing provided by money market funds secured on Treasury securities. Repo funding values have increased after the COVID-19 pandemic. Added to these sums would be the bilateral repos provided by dealer banks in the United States (see Hempel and others 2023; Lu and Wallen 2025), as well as the sizable dollar-denominated repo financing available in European markets. Dollar funding markets are global in this respect. There are few definitive estimates of the size of global dollar repo markets, but the various subcomponents are large and have grown rapidly in recent years.

With the repo-financed leveraged Treasury holdings being the centerpiece of hedge fund leveraged trades, the other leg of the relative value trade is the hedging leg consisting of a short position in a closely related instrument that can hedge out market risk arising from yield fluctuations. The hedging leg could be provided either through interest rate swaps or through Treasury futures contracts. Both futures and interest rate swaps are zero-money-down bets, which do not entail taking on large initial positions that use up balance sheet capacity. For this reason, Treasury futures tend to trade at a slight premium to the underlying Treasury security, opening up a small yield differential that can be exploited for gain using leverage.

Of more interest is the interest rate swap market. In the last several years, interest rate swap rates have fallen below that of Treasury yields, in spite of the fact that the counterparty in the interest rate swap is a private sector

Figure 4. Repo Markets Have Grown, Enabling Larger Hedge Fund Relative Value Trades



Source: Federal Reserve Bank of New York (retrieved from FRED series RRPONTSYD) and OFR (2025).

entity and hence incorporates credit risk. Evidently, the overhang in the supply of Treasuries has been sufficient to compensate for the credit risk and has flipped the sign of the spread. Adding to these small gaps in yields between Treasury securities and related hedging instruments is the behavior of asset managers—especially for mutual funds—who take a long position in futures contracts to add to the total duration of their portfolios to meet duration benchmarks (Barth and others 2024).

Prior to the GFC, dealer banks often executed such relative value trades through their proprietary trading desks. Given the small spread available between bond yields and the implied yields of the hedging leg, relative value trades involve high leverage. In recent years, hedge funds have taken a more active role. The authors focus on the futures basis trade where the hedging leg is constructed using Treasury futures. The basis trade was certainly the key trade during the March 2020 stress episode in the Treasury market (Schrimpf, Shin, and Sushko 2020; Kruttli and others 2024), but there is less evidence on the futures basis trade being central in the April 2025 market stress. Instead, the evidence from price dynamics in early April suggests that interest rate swaps were more important as the locus of stress in the

Treasury market. Swap spreads (which measure the difference between the swap rate and the equivalent Treasury yield) widened out to become even more negative during the stress episode, wrong-footing hedge funds engaged in relative value trades using interest rate swaps.

While price fluctuations are hedged out by using a hedging instrument (whether interest rate swaps or futures), the main source of stress that undermines relative value trades is the fluctuations in margins. When margins rise suddenly, leveraged investors must either raise new equity capital or are required to sell underlying assets. Invariably, selling is the most expedient response, setting in motion adverse price and volatility moves that could lead to second-round effects. In this way, margin calls expose hedge funds to deleveraging risks and might lead to disorderly unwinding of positions, causing disruptions in government bond markets. The prevalence of zero haircuts raises the stakes from a rise in margins. While government bonds are safe from credit risk, a sharp rise in their yields transmits tighter financial conditions to borrowing conditions that impact the real economy. For instance, a sharp rise in mortgage rates could impact real economic activity even if the underlying credit risk is absent.

The proposal by the authors is for the Federal Reserve to meet an unwinding of relative value trades by being the counterparty to the unwinding of the trade by hedge funds, taking on both legs of the futures basis trade. Specifically, the policy prescription is to have a Fed facility through which the Fed would intervene to take on the positions that are being unwound by the hedge funds—in other words, the Fed would buy Treasuries and sell the futures.

There is little doubt that a Fed intervention based on such a facility would be highly effective in arresting market turmoil, provided that the unwinding of the relative value trade is coming from the futures basis trade. Even if the relative value trade involves hedging through the interest rate swap market, the authors' proposal could easily be adapted to take account of that case also. There remains the issue of ascertaining in real time which type of relative value trade is being unwound, but this is a minor point.

A more serious issue with such a facility being in place is the potential shift in the underlying risk-reward calculus that hedge funds would engage in. The availability of a Fed facility that rules out the worst losses in the left tail of the return distribution could have a far-reaching impact on the portfolio choice problem and the extent of leverage chosen by the hedge fund. The shift in the optimal portfolio could be quite large, as the constraint on the size of the holdings is typically limited by the value-at-risk (VaR) calculation that gauges the extreme left tail of the outcome distribution. Cutting off even a small part of the left tail could entail a substantial change in the optimal size of holding, and hence the leverage. Since zero haircuts place little constraint on leverage from the creditor side, the VaR calculation would be the main determinant of leverage. In this way, an intervention that would be stabilizing ex post could nevertheless be undesirable ex ante if the size of the potential sell-off is raised materially.

These considerations are reinforced by the argument that the role of hedge funds and the fragilities they bring to the market has been enabled by longer-term structural changes to the Treasury market that has factored in the ample availability of short-term funding. To the extent that the ample supply of short-term funding is related to the balance sheet policies of the central bank, excessive activism of central banks may have unintended consequences, giving greater play to leveraged investors that could undermine financial stability.

An alternative approach would be to take an ex ante perspective and to limit the degree of leverage that is taken on by the hedge funds. This would entail more than simply operating through banking regulations to limit the margins charged by dealer banks. Since clearing infrastructures are also available to hedge funds, minimum margin requirements could be considered as part of a more comprehensive solution. The notion of *congruent regulation* advocated by Metrick and Tarullo (2021) envisages the alignment of the leverage ratio of banks and the leverage implied by the margining practices of clearing infrastructures. As always, the problem with a regulatory approach is to ensure that the regulation can be effective while minimizing unintended side effects.

Beyond regulation, ensuring sustainable fiscal trajectories would be the most important element of keeping the Treasury market on an even keel. This, of course, leads us into even more difficult territory, and goes well beyond my discussion.

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COMMENT BY

ANNETTE VISSING-JORGENSEN This is a very useful paper. The topic of how central banks should design their market functioning purchases is important and understudied. The model elegantly simplifies complex interactions between several types of agents and guides the design of market functioning interventions related to the unwind of the Treasury basis trade. The main policy proposal is that the Fed does not need to take duration risk to counter a Treasury basis trade unwind. Instead, this can be addressed with hedged Fed positions in Treasuries (with the hedging done using short Treasury futures positions). The authors argue that, among other benefits, this would lower the risk of Fed losses.

In my discussion, I first give some background on the March 2020 Treasury yield spike that motivates the paper. I then argue that because of the need for stimulus via quantitative easing (QE), Fed losses may not have been much lower in the period since 2020 with hedged market functioning purchases. Had the market functioning purchases been hedged, the same amount of overall unhedged Fed Treasury exposure would have been needed to ensure a given stimulus effect. In a future episode of market dysfunction at a time where QE is not necessary, hedging could lower the Fed's profit risk, but it is worth remembering that in that scenario, it may be feasible (from a market functioning perspective) to sell the securities purchased fairly quickly as markets normalize, in which case unhedged interventions will tend to be profitable. The Bank of England earned about £3.5 billion from its purchases and sales of about £19 billion of UK government bonds in the fall of 2022 (Goodman and Aldrick 2023).

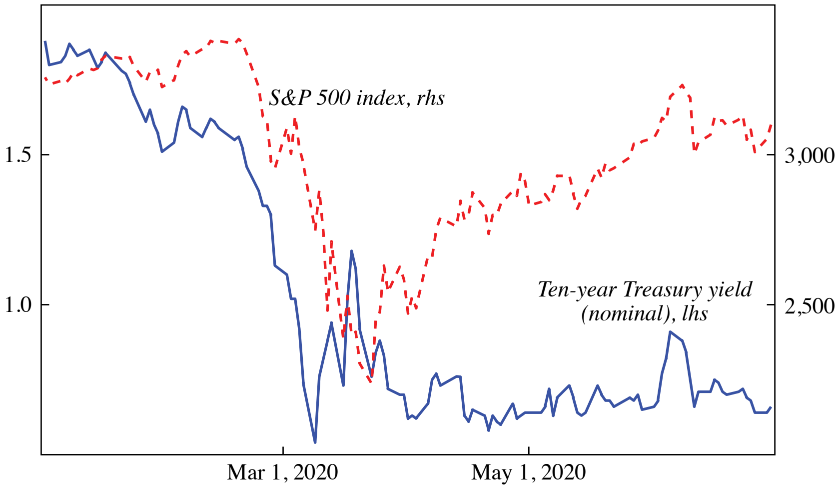
I see two other potential benefits from hedging market functioning Treasury purchases. First, hedging may allow for *smaller* Fed interventions in the Treasury market. I will show this formally within the paper's model. A smaller Fed footprint may be desirable given the risk of distortions from Fed interventions (e.g., via reserve supply affecting bank lending or deposit taking). Second, hedging the Fed's market functioning Treasury purchases may lead to benefits beyond Treasuries. Asset managers use long Treasury futures positions partly to obtain leverage to increase their holdings of corporate assets or mortgage-backed securities (MBS) while at the same time achieving their desired equity duration. If the Fed hedges its market functioning Treasury purchases by taking on short Treasury futures positions, this stabilizes asset managers' cost of leverage and thus may indirectly benefit firms and households.

BACKGROUND: THE TREASURY YIELD SPIKE IN MARCH 2020 AND THE FED INTERVENTION By way of background, figure 1, panel A (taken from Vissing-Jorgensen 2021) illustrates the Treasury market dysfunction that emerged in March 2020. Until March 9, both the ten-year nominal Treasury yield and the S&P 500 stock index moved down as bad news about a potential pandemic arrived. This is as one would expect if bad economic news lowers the expected path for the short rate or lowers the term premium via an investor flight to the safety and liquidity of Treasuries. However, from March 9 to March 18, the ten-year yield spiked by 64 basis points despite the stock market continuing to fall. This was not due to higher expected inflation or Treasury default worries, as real credit default swap-adjusted yields spiked even more. Instead, the spike in medium- and long-term Treasury yields during this period appears to have been driven by the interaction of a negative Treasury demand shock and insufficient intermediation capacity.

The three sectors that sold the most in 2020:Q1 are listed in figure 1, panel B. Vissing-Jorgensen (2021) studies their possible motives. Foreigners (the "Rest of the world" category in the US Financial Accounts) sold heavily, with more of their selling driven by foreign central banks than the foreign private sector. Foreign central banks appear to have sold Treasuries partly for current or potential future foreign exchange intervention (having net sales of US assets overall and increasing holdings of dollar currency and deposits) and partly to reallocate to higher yielding asset classes. Bond funds faced large outflows and disproportionately sold Treasuries to meet them (see also Ma, Xiao, and Zeng 2022). Outflows may have been related to investment-grade bond funds losing their appeal to safety investors amid increased default risk. Treasury sales by US and foreign-domiciled hedge funds contributed to selling by both the foreign private sector and the

Figure 1. The Treasury Yield Spike in March 2020

Panel A: Ten-year nominal Treasury yield and S&P 500 stock index



Panel B: Net Treasury purchase in 2020:Q1

Sector (US Financial Accounts)	*Net purchases 2020:Q1 ($ billions)*
Rest of the world	–287
Mutual funds	–266
Household sector, including hedge funds	–196

Source: Reproduced from Vissing-Jorgensen (2021) with permission by Elsevier.

US household sector, which includes hedge funds. Hedge fund Treasury selling was driven in part by an unwind of the Treasury basis trade (see also Barth and Kahn 2020). The basis trade unwind was thus one of several causes of Treasury selling in March 2020. It may be even more important in a future stress episode because the basis trade is now substantially larger—an estimate based on hedge funds' net short positions in Treasury futures tabulated in the Commodity Futures Trading Commission (CFTC) data puts it at around $1 trillion as of May 2025, more than twice the value in early March 2020.[1]

1. CFTC, "Traders in Financial Futures," https://www.cftc.gov/MarketReports/CommitmentsofTraders/HistoricalCompressed/index.htm.

In response to the Treasury yield spike, the Federal Reserve purchased large amounts of Treasuries. The Fed also addressed a spike in MBS yields with corresponding MBS purchases. Fed purchases appear to have had large yield effects at the time of purchase, as opposed to the time of announcements that the Fed was ready to conduct purchases.[2] This is visible in figure 2, panel A, for Treasuries and panel B for MBS.

Fed Treasury purchases increased on March 19, which is precisely when Treasury yields started falling. MBS purchases increased on March 20 with an associated fall in the option-adjusted spreads on MBS. The fact that the dates of increased Fed purchases differed across the Treasury and MBS markets increases one's confidence that the Fed causally affected asset prices, as opposed to these effects being due to confounding stabilizing factors (also, corporate yields increased on March 19–20 and the stock market fell, suggesting that incoming economic news was negative). If Fed purchases worked more via purchases than announcements, it suggests that the Treasury (and MBS) yield spikes were partly driven by intermediation capacity issues in the dealer sector.

While it is widely agreed that the Fed's Treasury purchases (and its MBS purchases as well as other programs) helped stabilize markets and restore market functioning, the Fed incurred large losses on both its market functioning Treasury purchases and subsequent purchases made for stimulus purposes. The authors' paper argues that losses could have been lower with hedged market functioning purchases (more on this below). Furthermore, hedging would provide a clear distinction of market functioning purchases from QE purchases, thus avoiding any confusion about the Fed's policy stance. Hedged purchases may also lead to less moral hazard by being duration neutral, though clearly some moral hazard remains with respect to hedge funds doing basis trades.

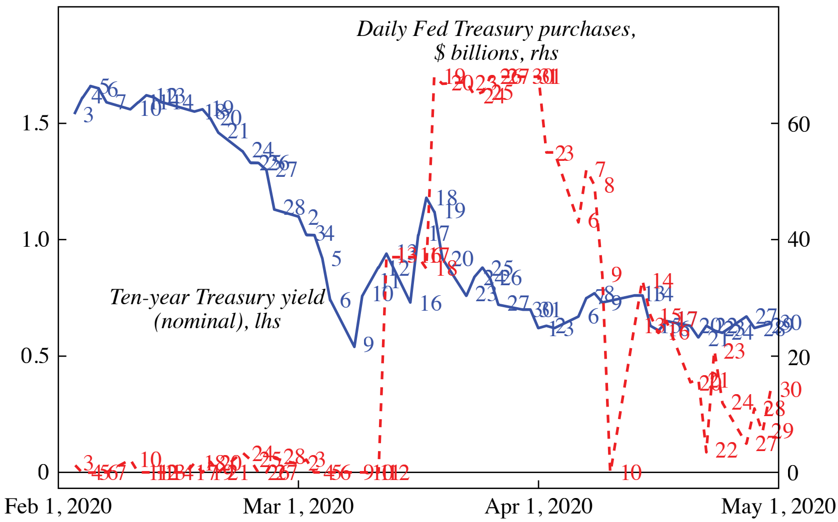
WOULD HEDGED MARKET FUNCTIONING PURCHASES HAVE LED TO LOWER FED LOSSES? Regarding Fed losses, the authors state:

> Without a clear upfront distinction between bond buying for market function purposes versus for monetary policy purposes, the initial round of Treasury purchases in the spring of 2020 morphed into a broader monetary policy effort that eventually saw the Fed add over $4 trillion to its combined holdings of Treasuries and agency mortgage-backed securities by mid-2022. . . . This volume of asset purchases ended up reducing the present value of Fed remittances to the Treasury by roughly $800 billion, potentially representing a substantial hit to taxpayers.

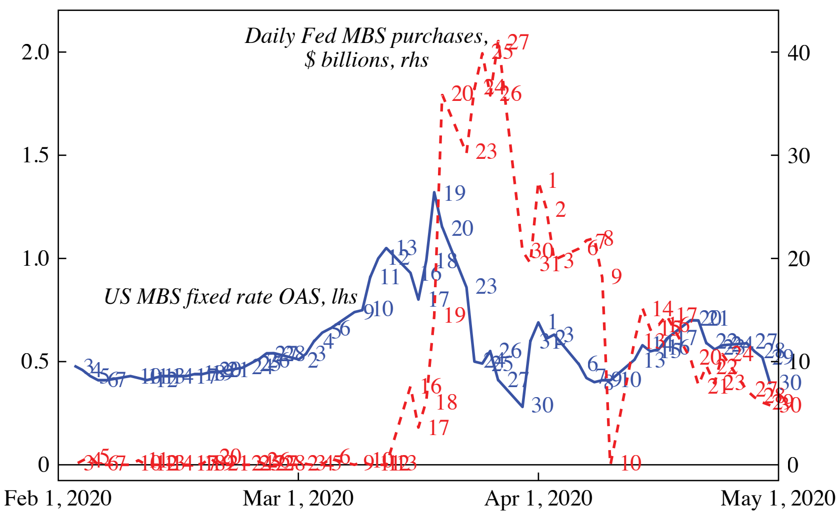
2. The Fed made key announcements on March 15, March 23, and April 9, 2020.

Figure 2. Fed Purchase Effects in Treasury and MBS Markets in 2020

Panel A: Daily Fed Treasury purchases and ten-year Treasury yield



Panel B: Daily Fed MBS purchases and MBS option-adjusted spread (OAS)



Source: Reproduced from Vissing-Jorgensen (2021) with permission by Elsevier.

The argument appears to be that Fed losses would have been lower had purchases for market functioning purposes been clearly distinguished from purchases for economic stimulus (QE) purposes. Furthermore, hedging market functioning purchases would provide that distinction. The paper is, however, not clear on exactly how hedged market functioning purchases would have reduced losses relative to unhedged purchases. It is not obvious. Consider two examples.

Example 1: Suppose the Fed purchased Treasuries for market functioning purposes in 2020:Q1 and 2020:Q2, and then from 2020:Q3 to 2022:Q1 purchased Treasuries for economic stimulus (QE) purposes. If the market functioning purchases were not hedged, they would lower the term premium and would therefore allow the later purchases made for QE reasons to be smaller than with hedged market functioning purchases. Therefore, the Fed's unhedged position at the time when longer-term rates increased materially in 2022 may have been similar whether the market functioning purchases were hedged or not.

Example 2: Might lingering worries about market functioning have led the Fed to buy more Treasuries from 2020:Q3 to 2022:Q1 than was needed for QE purchases alone? If so, hedging market functioning purchases could have reduced subsequent Fed losses. The problem with this argument is that QE purchases could presumably serve the dual purpose of also helping to stave off any market functioning issues, in which case lingering market functioning concerns would not necessitate larger purchases. For market functioning concerns to lead to larger purchases, the Fed would have had to assess that the necessary monthly market functioning purchases exceeded the monthly purchases needed for QE purposes (given the intended number of months of QE purchases). This seems unlikely for three reasons.

First, market functioning improved quickly, and the Fed appeared to recognize that. Daily Fed purchases were adjusted down dramatically from early April 2020 (visible in figure 2, panel A). Furthermore, Treasury securities that were "cheapest to deliver" into Treasuries futures contracts were excluded from Fed purchases from April 20, 2020, indicating that the Fed viewed basis trade unwind to be less important. In addition, the July 2020 minutes of the Federal Open Market Committee (FOMC) noted, "The SOMA manager reported that . . . many market functioning indicators had returned to levels prevailing before the pandemic, and, as a result, purchases were conducted at the minimum pace directed by the Committee" (Federal Reserve Board 2020a, p. 3). Fed staff gave presentations about QE in the standard sense from June 2020 according to the FOMC minutes. Monthly purchase amounts were similar to peak quarterly purchases in QE1/QE2/QE3 from 2020:Q3.

Second, the FOMC's forward guidance in its September 2020 statement made it clear that the Committee viewed strong stimulus as necessary (as opposed to being confused about a continued need for market functioning purchases):

> The Committee . . . expects it will be appropriate to maintain this target range until labor market conditions have reached levels consistent with the Committee's assessments of maximum employment and inflation has risen to 2 percent and is on track to moderately exceed 2 percent for some time. (Federal Reserve Board 2020b, p. 1)

The use of "and" clauses between the criteria for liftoff has been interpreted as the FOMC giving aggressive forward guidance due to these clauses narrowing the range of employment and inflation outcomes that would be consistent with liftoff (see English and Sack 2024).

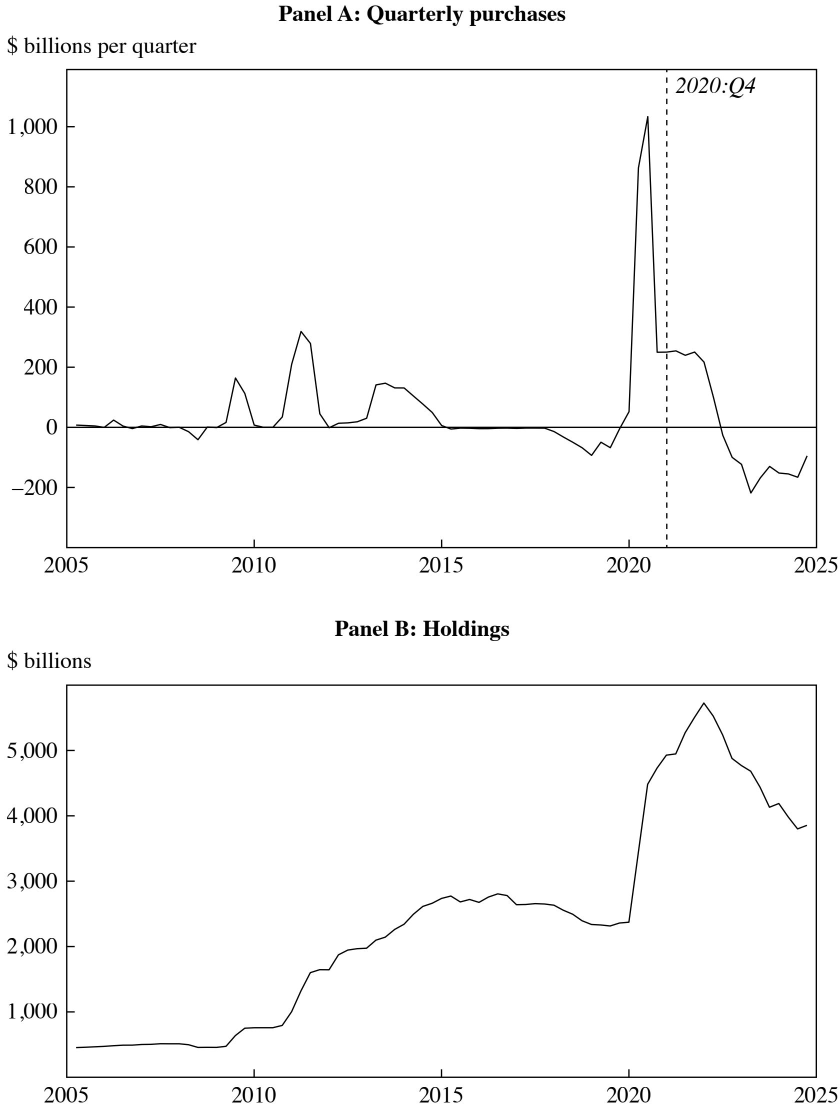
Third, there was no step-down in purchases once the FOMC explicitly focused on the stimulus motive for asset purchases from December 2020. The December 2020 FOMC statement provided outcome-based QE guidance linking buying directly to the economy:

> In addition, the Federal Reserve will continue to increase its holdings of Treasury securities by at least $80 billion per month and of agency mortgage-backed securities by at least $40 billion per month until substantial further progress has been made toward the Committee's maximum employment and price stability goals. (Federal Reserve Board 2020c, pp. 1–2)

Figure 3 shows quarterly Fed purchases of Treasury notes and bonds (panel A) and the level of Fed Treasury holdings of notes and bonds (panel B). The vertical line in panel A marks 2020:Q4, and there is no change in the quarterly purchase amount around this time. This suggests that any lingering market functioning concerns in the second half of 2020 do not appear to have led to inflated purchases during that period, with purchases instead dominated by QE during both the second half of 2020 and the following quarters.

Overall, my take on the Fed profit issue is that hedging market functioning Treasury purchases may not lead to lower losses when market functioning purchases are done at a time where QE is also needed. And when QE is not needed, unhedged market functioning Treasury purchases will tend to be profitable, making hedging a safer but perhaps not so attractive option from a profit perspective. The stronger of the authors' argument for hedging is that it prevents confusion about the Fed's policy stance. I next turn to two other potential benefits.

Figure 3. Fed Treasury Purchases and Holdings, Notes and Bonds Only (Bills Excluded)



Source: Financial Accounts of the United States, tables F.210 (panel A) and L.210 (panel B).

HEDGING MAY ALLOW SMALLER FED INTERVENTIONS An important issue not addressed in the paper is whether the Fed will need to do larger or smaller interventions if these are hedged. From the paper, you may think that the answer is that hedged and unhedged purchases are equally effective at addressing market dysfunction (scarcity of dealer intermediation capacity) during a basis trade unwind. The paper states:

> Thus, to relieve the stress on dealers, it would be sufficient for the Fed to take the other side of this unwind, purchasing Treasury securities and fully hedging this purchase with an offsetting sale of futures; this is, in effect, a more surgical approach to bond buying.

I will show, however, that the authors' model—which elegantly captures the relevant agents and markets—implies that Fed futures positions have powerful effects on market functioning. Therefore, Fed Treasury purchases are *more* effective for addressing market functioning if hedged, implying that hedging may allow for smaller interventions. Specifically, I will argue that the following proposition holds within the model.

> **Proposition 1:** Suppose that (a) hedge funds initially have Treasury holdings worth D_{HT} and equal-sized short Treasury futures positions, and (b) asset managers get a fraction θ of their Treasury exposure via long Treasury futures positions and a fraction $1 - \theta$ via Treasuries. If hedge funds exit their positions (a basis trade unwind), the Fed can return the Treasury futures basis x to the initial value by any of the following interventions: (1) a hedged long Fed Treasury position of size D_{HT} (i.e., the Fed buys D_{HT} of Treasuries and takes an equal-sized short Treasury futures position, thus replacing hedge funds); (2) an unhedged long Fed Treasury position of size D_{HT}/θ; or (3) an unhedged short Fed Treasury futures position of size $D_{HT}/(1 - \theta)$.

The intuition for why the unhedged position in option 2 needs to be larger than the hedged position in option 1 is straightforward: A basis trade unwind is not a term premium problem since hedge funds did not take any duration risk in the first place. Instead, the basis trade unwind leads to a shortage of futures supply to asset managers. This pushes up the Treasury futures basis and leads to market dysfunction more broadly because dealers equalize the return across their activities. The Fed can address this futures supply shortage by taking on short futures positions. If the Fed hedges (as in option 1), the Fed intervention has no effect on the term premium but ensures sufficient supply of futures to asset managers, thus returning the basis to the value it had before the basis trade unwind. Alternatively, the Fed can lower asset managers' demand for long Treasury futures positions by taking on unhedged Treasury holdings (as in option 2), thereby lowering the term premium and in turn asset managers' demand for Treasury exposure. Crucially, this is not very powerful if θ is low, because a large reduction in asset managers' Treasury exposure will be needed for their futures demand to fall by the amount of the futures supply reduction from hedge funds' basis trade unwind.[3] For example, suppose asset managers have Treasury exposure of $5 trillion of which $1 trillion is via futures, that is, $\theta = 0.2$. With $\theta = 0.2$, a basis trade unwind of $200 billion necessitates a hedged Fed Treasury purchase of $200 billion (option 1) but an unhedged Fed Treasury purchase of $1 trillion, five times larger! To lay out the argument more formally, I start by considering the moving parts of the basis and then consider each agent's optimization and the resulting equilibrium.

An asset manager who enters a long Treasury futures position gets the right to delivery of the Treasury (or, more precisely, of the cheapest-to-deliver Treasury within a prespecified set) at a later date and the obligation to pay an agreed-upon price at the later date. The asset manager could borrow via repo instead, but the logistics are more complicated than using futures (futures are exchange traded). Furthermore, the asset manager would have to disclose interest paid on repo borrowing as fees, which Treasury Borrowing Advisory Committee (TBAC 2024) states is one of the reasons asset managers prefer futures to repo. With an asset manager preference for futures over repo and limited willingness of other agents to take corresponding short futures positions, the futures price P_F clears higher than the future value of the cash price $P_T(1 + r_{short})$ (where r_{short} is the repo rate). The Treasury futures basis x measures the (implied) extra cost of borrowing via futures than via repo:

$$P_F > P_T\left(1 + r_{short}\right), P_F = P_T\left(1 + r_{short} + x\right). \tag{1}$$

Consider next the three agents of the model—asset managers, dealers, and hedge funds.

Asset managers invest in Treasuries and the riskless asset and enter long Treasury futures positions. They get Treasury exposure from Treasury futures and Treasuries in fixed proportions θ and $1 - \theta$, so the relevant

3. Option 3 is less practically relevant since the term premium will increase; it is included just for completeness and will be discussed below. A separate issue is that θ affects the size of D_{HT} in equilibrium (if θ is higher, the basis trade and thus D_{HT} will be larger). That does not affect proposition 1. Given θ, D_{HT} is what it is, and the size of the Fed intervention needed to counter a basis trade unwind depends on the intervention design as laid out in proposition 1.

term premium is $\theta r_F + (1 - \theta)\, r_T - r_{short}$, where $r_F = r_T - x$.[4] Assuming asset managers have mean-variance preferences, their total demand for Treasury exposure depends on the term premium:

$$D_{AF} + D_{AT} = A\left(\theta r_F + \left(1-\theta\right) r_T - r_{short}\right), \tag{2}$$

with A denoting wealth adjusted for risk aversion. Accordingly, asset managers' futures and Treasury demands are:

$$D_{AF} = \theta A\left(\theta r_F + \left(1-\theta\right) r_T - r_{short}\right), \tag{3}$$

$$D_{AT} = \left(1-\theta\right) A\left(\theta r_F + \left(1-\theta\right) r_T - r_{short}\right).$$

Dealers supply futures, hedged with long Treasury positions D_{DT} with the Treasury positions funded 100 percent with equity. Per dollar of equity used, this returns $\frac{P_F}{P_T} = 1 + r_{short} + x$. Furthermore, dealers do bond intermediation, which requires equity M. Per dollar of equity used, this returns $\varphi s(M) + r_{short}$ at $t = 1$. With total equity K_D, dealers' equity constraint is $D_{DT} + M = K_D$. Dealers maximize their $t = 1$ payoff by equalizing marginal returns across activities:

$$\underbrace{x + r_{short}}_{\substack{\text{Marginal return from using equity} \\ \text{to buy Treasuries and short futures}}} = \underbrace{\varphi s\left(M\right) + r_{short}}_{\substack{\text{Marginal return from using} \\ \text{equity for intermediation}}} \tag{4}$$

Assuming $s(M) = a - b \cdot M$, equation (4) implies dealer Treasury demand of $D_{DT}\left(x\right) = K_D - M = K_D - \left(\frac{a}{b} - \frac{x}{b\varphi}\right)$. A key insight of the authors' model is thus that, to affect market functioning more broadly, the Fed needs to manage the Treasury futures basis x. Because dealers have limited equity and equalize marginal returns across activities, a high basis spills over into other important activities done by dealers such as Treasury intermediation and (in the extended version of the model) repo intermediation.

4. With one-period Treasuries, $1 + r_T = \frac{1}{P_T}$. If you invest \$1 in Treasuries at $t = 0$, financed with repo, you get $(1 + r_T) - (1 + r_{short}) = r_T - r_{short}$ at $t = 1$. If you enter a futures position that gives you \$$(1 + r_T)$ at $t = 1$, you need to pay \$$(1 + r_T)P_F = \frac{P_F}{P_T} = 1 + r_{short} + x$ at $t = 1$ for a net payment at $t = 1$ of $(1 + r_T) - (1 + r_{short} + x) = r_T - r_{short} - x$. With r_F defined as $r_T - x$, the net payment is $r_F - r_{short}$. Therefore, if you combine futures investments and Treasury investments funded with repo in proportions θ, $1 - \theta$ you get a net payment at $t = 1$ of $\theta r_F + (1 - \theta)\, r_T - r_{short}$.

Hedge funds supply futures hedged with long Treasury positions D_{HT} to profit from the Treasury futures basis. The Treasury positions are funded in proportions $1-\gamma$ with repo and γ with equity. Hedge funds furthermore use $\$X_H$ of equity for other trading opportunities, which return $r_H(X_H)$ per dollar, where hedge funds recognize that trading opportunities get worse as more is invested. With total equity E_H, hedge funds' equity constraint is $\gamma D_{HT} + X_H = E_H$. They maximize their $t = 1$ payoff by equalizing marginal returns across their activities:

$$(5) \qquad \underbrace{\frac{1}{\gamma}\left[\left(1-\gamma\right)x+\gamma\left(x+r_{short}\right)\right]}_{\substack{\text{Marginal return from using}\\ \text{equity for basis trade}}} = \underbrace{r_H\left(X_H\right)+X_H r'_H\left(X_H\right)}_{\substack{\text{Marginal return from using}\\ \text{equity for other trading activities}}}.$$

Assuming $r_H\left(X_H\right) = r_{short} + c - \frac{\beta}{2}\cdot X_H$, equation (5) implies $D_{HT}\left(x\right) = \frac{E_H - X_H}{\gamma} = \frac{E_H}{\gamma} - \left(\frac{c}{\beta\gamma} - \frac{x}{\beta\gamma^2}\right)$.

The initial equilibrium with Treasury supply S_T and before basis trade unwind is characterized by the market clearing conditions for the Treasury market, equation (6), and the futures market, equation (7):

$$(6) \qquad \underbrace{\left[K_D - \frac{a}{b} + \frac{x}{b\varphi}\right]}_{\text{Dealer demand}} + \underbrace{\left[\frac{E_H}{\gamma} - \frac{c}{\beta\gamma} + \frac{x}{\beta\gamma^2}\right]}_{\text{Hedge fund demand}} + \underbrace{\left(1-\theta\right)A\left[\theta r_F + \left(1-\theta\right)r_T - r_{short}\right]}_{\text{Asset manager demand}} = S_T;$$

$$(7) \qquad \underbrace{\left[K_D - \frac{a}{b} + \frac{x}{b\varphi}\right]}_{\text{Dealers' short position}} + \underbrace{\left[\frac{E_H}{\gamma} - \frac{c}{\beta\gamma} + \frac{x}{\beta\gamma^2}\right]}_{\text{Hedge funds' short position}} = \underbrace{\theta A\left[\theta r_F + \left(1-\theta\right)r_T - r_{short}\right]}_{\text{Asset managers' long position}}.$$

Subtracting equation (7) from equation (6), the term premium is:

$$(8) \qquad \theta r_F + \left(1-\theta\right)r_T - r_{short} = \frac{S_T}{A},$$

while the Treasury futures basis x solves:

$$(9) \qquad \left[K_D - \frac{a}{b} + \frac{x}{b\varphi}\right] + \left[\frac{E_H}{\gamma} - \frac{c}{\beta\gamma} + \frac{x}{\beta\gamma^2}\right] = \theta S_T.$$

With basis trade unwind and no Fed intervention, equations (6)–(9) change to:

$$\left[K_D - \frac{a}{b} + \frac{x}{b\varphi}\right] + \text{Nothing} + \left(1-\theta\right)A\left[\theta r_F + \left(1-\theta\right)r_T - r_{short}\right] = S_T; \tag{10}$$

$$\left[K_D - \frac{a}{b} + \frac{x}{b\varphi}\right] + \text{Nothing} = \theta A\left[\theta r_F + \left(1-\theta\right)r_T - r_{short}\right]; \tag{11}$$

$$\theta r_F + \left(1-\theta\right)r_T - r_{short} = \frac{S_T}{A}; \text{ and} \tag{12}$$

$$\left[K_D - \frac{a}{b} + \frac{x}{b\varphi}\right] + \text{Nothing} = \theta S_T. \tag{13}$$

The term premium in equation (12) is unaffected. A basis trade unwind is not a term premium problem, because hedge funds do not take any duration risk in the basis trade. By contrast, the basis implied by equation (13) is larger than the initial value implied by equation (9). This is needed to induce dealers to use scarce equity to supply the full amount of futures demanded by asset managers. Consider next the three possible interventions in proposition 1.

Option 1: With basis trade unwind and hedged Fed Treasury purchases of size $D_{Fed,T}$, equations (6)–(9) change to:

$$\left[K_D - \frac{a}{b} + \frac{x}{b\varphi}\right] + D_{Fed,T} + \left(1-\theta\right)A\left[\theta r_F + \left(1-\theta\right)r_T - r_{short}\right] = S_T; \tag{14}$$

$$\left[K_D - \frac{a}{b} + \frac{x}{b\varphi}\right] + D_{Fed,T} = \theta A\left[\theta r_F + \left(1-\theta\right)r_T - r_{short}\right]; \tag{15}$$

$$\left[\theta r_F + \left(1-\theta\right)r_T - r_{short}\right] = \frac{S_T}{A}; \text{ and} \tag{16}$$

$$\left[K_D - \frac{a}{b} + \frac{x}{b\varphi}\right] + D_{Fed,T} = \theta S_T. \tag{17}$$

This leads to the same term premium and basis as in the initial equilibrium in equations (6)–(9) before the basis trade unwind if the Fed sets $D_{Fed,T} = D_{HT}$. The Fed replaces the short futures positions previously supplied by hedge funds while this intervention has no effect on futures demand.

Option 2: With basis trade unwind and unhedged Fed Treasury purchases of size $D_{Fed,T}$, equations (6)–(9) change to:

$$\text{(18)} \quad \left[K_D - \frac{a}{b} + \frac{x}{b\varphi}\right] + D_{Fed,T} + (1-\theta)A\left[\theta r_F + \left(1-\theta\right)r_T - r_{short}\right] = S_T;$$

$$\text{(19)} \quad \left[K_D - \frac{a}{b} + \frac{x}{b\varphi}\right] + \text{Nothing} = \theta A\left[\theta r_F + \left(1-\theta\right)r_T - r_{short}\right];$$

$$\text{(20)} \quad \left[\theta r_F + \left(1-\theta\right)r_T - r_{short}\right] = \frac{S_T - D_{Fed,T}}{A}; \text{ and}$$

$$\text{(21)} \quad \left[K_D - \frac{a}{b} + \frac{x}{b\varphi}\right] + \text{Nothing} = \theta\left(S_T - D_{Fed,T}\right).$$

Unhedged Fed Treasury purchases lower the term premium in equation (20) since the Fed now takes on duration risk. As for the futures market, with the Fed not entering this market, the Fed does not replace the short futures positions previously supplied by hedge funds. However, by lowering the term premium, the intervention lowers asset managers' demand for Treasury exposure and thus their demand for long futures. Crucially, a dollar of Fed Treasury purchases only lowers asset managers' demand for long futures by \$θ. Therefore, the Fed needs a Treasury position of size D_{HT}/θ to reduce futures demand by D_{HT} and return the Treasury futures basis to the initial value.

Option 3: With basis trade unwind and unhedged short Fed Treasury futures position of size $D_{Fed,F}$, equations (6)–(9) change to:

$$\text{(22)} \quad \left[K_D - \frac{a}{b} + \frac{x}{b\varphi}\right] + \text{Nothing} + \left(1-\theta\right)A\left[\theta r_F + \left(1-\theta\right)r_T - r_{short}\right] = S_T;$$

$$\text{(23)} \quad \left[K_D - \frac{a}{b} + \frac{x}{b\varphi}\right] + D_{Fed,F} = \theta A\left[\theta r_F + \left(1-\theta\right)r_T - r_{short}\right];$$

$$(24)\qquad \left[\theta r_F + \left(1-\theta\right) r_T - r_{short}\right] = \frac{S_T + D_{Fed,F}}{A}; \text{ and}$$

$$(25)\qquad \left[K_D - \frac{a}{b} + \frac{x}{b\varphi}\right] + D_{Fed,F} = \theta\left(S_T + D_{Fed,F}\right).$$

In this intervention, the Fed's short futures position implies that others have to take on additional duration risk and the term premium increases. This increases asset managers' demand for Treasury exposure and thus their demand for long futures positions—the right side of equation (25). As a result, to return the basis to the initial value from equation (9), the Fed needs to take short futures positions of $D_{Fed,F} = D_{HT}/(1 - \theta)$. I include this third intervention to illustrate the mechanics of supply and demand in the futures markets. It is not practically relevant since it increases the term premium.

To summarize, the basis trade unwind is a basis problem, not a term premium problem. The heart of the problem is a lack of supply of short futures positions as hedge funds exit their positions. Unhedged Fed Treasury positions do not effectively get to the heart of the problem because they seek to solve a *futures supply* problem by lowering *futures demand*. This requires a larger intervention. The hedged intervention can be smaller because the Fed has powerful effects in the futures market when it takes short futures positions to replace those of hedge funds. While I made this argument within the authors' model, the gist of the argument does not seem to hinge on any particular simplifying assumptions made. At a minimum, this issue deserves further consideration because of the huge difference in the amount of necessary intervention implied by the model depending on whether market functioning purchases are hedged or not.

POTENTIAL SPILLOVERS FROM FUTURES MARKETS TO CREDIT AND MBS MARKETS The underlying reason the Treasury basis trade exists is asset manager demand for long Treasury futures positions. If the Fed keeps the Treasury basis contained, it effectively lowers asset managers' cost of borrowing via Treasury futures. To understand what this does to the economy, we need to understand better why asset managers use Treasury futures. The literature on where this demand comes from is at an early stage. This section clarifies two of the main possibilities.

Conceptually, long positions in Treasury futures can be used to add equity duration or to add credit/MBS risk with unchanged equity duration. Consider a fund with $100 million of equity. For simplicity, suppose the fund's benchmark consists of only Treasuries with ten-year duration. With investments in Treasuries with ten-year duration and no futures positions, the

Table 1. Example of Asset Managers' Use of Treasury Futures to Add Duration or Credit Risk

Assets	*Liabilities*
Panel A: Without Treasury futures	
\$100M Treasuries ($D = 10$)	\$100M equity ($D = 10$)
Panel B: Using Treasury futures to add duration	
\$100M Treasuries ($D = 10$)	\$100M equity
\$$X$ ($D = D^F$)	\$$X$ ($D = 0$)
\$100M + \$$X$	\$100M + \$$X$
Panel C: Using Treasury futures to add credit	
\$80M Treasuries ($D = 10$)	\$100M equity
\$20M credit ($D = 0$)	
\$$X$ ($D = D^F$)	\$$X$ ($D = 0$)
\$100 + \$$X$	\$100M + \$$X$

Source: Author's calculations.

fund's balance sheet looks like that in table 1, panel A, with both asset and equity durations of ten. In panel B, the asset manager uses Treasury futures to add leverage and duration.[5] The fund takes a long position in Treasury futures in which the cheapest-to-deliver Treasury has a duration of D^F. The futures contract is a bundle of an asset (the right to get the Treasury security later) and a liability (the commitment to pay for the Treasury later), with zero upfront payment (ignoring margins). X denotes the present value of each leg in millions of dollars. For simplicity, suppose the futures contract expires shortly after we are calculating this, so we can set the duration of the liability in the futures contract to approximately zero. With futures,

$$D_A = \frac{100}{100 + X} \cdot 10 + \frac{X}{100 + X} \cdot D^F \tag{26}$$

$$D_E = \frac{A}{E} \cdot D_A = \frac{100 + X}{100} \cdot D_A = 10 + \frac{X}{100} \cdot D^F.$$

The larger the futures position or the larger D^F, the higher the equity duration.

In table 1, panel C, the fund instead uses Treasury futures to obtain leverage to add credit exposure with equity duration staying at ten. The fund reduces its Treasury holdings by \$20 million and invests \$20 million in

5. The balance sheets shown represent the *true* economic assets and liabilities, as opposed to the accounting balance sheets.

floating-rate credit with zero duration. Without futures, asset and equity duration would only be eight. With futures,

$$D_A = \frac{80}{100+X} \cdot 10 + \frac{X}{100+X} \cdot D^F \tag{27}$$

$$D_E = \frac{A}{E} \cdot D_A = \frac{100+X}{100} \cdot D_A = 8 + \frac{X}{100} \cdot D^F.$$

Equity duration is back to ten if $\frac{X}{100} \cdot D^F = 2$, which would be the case for a \$20 million long position in a futures contract with $D^F = 10$, or a larger position in a futures contract with a lower D^F.

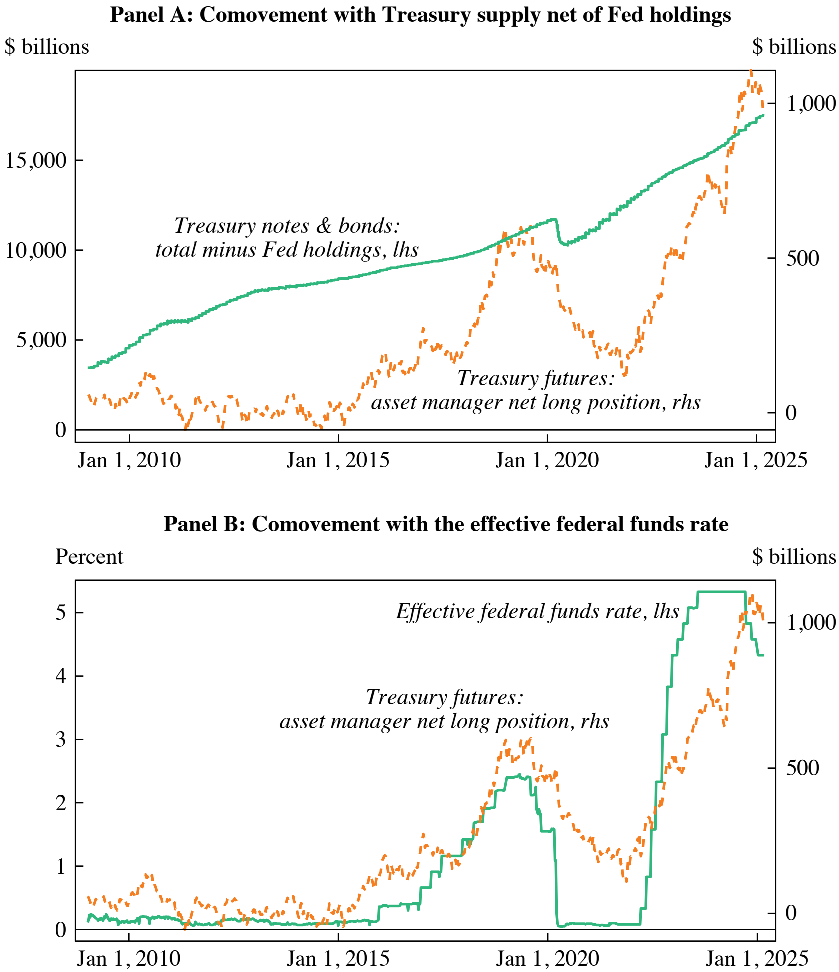
Regardless of the motive, a wider Treasury futures basis will lower asset manager futures demand. Remember that per dollar of Treasury value to be received at contract maturity, the asset manager has to pay $P_F = P_T(1 + r_{short} + x)$ (with r_{short} and x stated for the period length of the futures contract), so the cost of using futures for borrowing is worse for higher x.

The authors' paper touches on both the duration and credit motives. In the model, asset managers hold futures to add duration, while the text focuses on asset manager use of futures to add credit exposure. The authors argue that the private sector is unable to create as many long maturity corporate securities as demanded by asset managers. Asset managers therefore buy shorter duration credit investments and use futures to add leverage and duration.

In terms of evidence, the paper's finding that higher Treasury supply is associated with larger asset manager net long positions (more negative hedge fund net short positions) is consistent with increased supply of duration risk making asset managers add duration risk via futures in equilibrium. Consistent with this, figure 4, panel A, documents how asset manager net long futures positions trend up with the supply of Treasury notes and bonds (net of Fed holdings). Iorio, Li, and Petrasek (2024) suggest that asset managers may particularly use long positions in Treasury futures positions to add interest rate exposure when interest rates are high. Consistent with that possibility, figure 4, panel B, documents a close correlation between asset manager net long Treasury futures positions and the level of the effective federal funds rate.[6]

6. Both explanatory variables are significant in a regression of asset manager net long futures positions on the effective federal funds rate and Treasury note and bond supply (net of Fed holdings).

Figure 4. Asset Manager Net Long Treasury Futures Positions



Source: CFTC; US Department of Treasury; Federal Reserve Board; and author's calculations.

Note: Asset manager net long positions in Treasury futures are calculated from CFTC *Traders in Financial Futures* reports. Treasury notes (excluding floating-rate notes) and bonds held by the public are from the Monthly Statement of the Public Debt of the United States. I subtract Fed holdings obtained from FRED (series TREAST minus series WSHOBL). The sample is 2009 to February 2025.

TBAC (2024) emphasizes both the duration and credit motives, stating that asset managers use Treasury futures to take "active rate views" and to finance "structural credit overweights." Regarding credit, they argue that asset managers would like higher exposure to credit than its weight in benchmark bond indexes because credit is viewed as attractive from a yield perspective. Asset managers can fund these extra credit positions by reducing their holdings of Treasuries and using Treasury futures to keep equity duration unaffected, as in table 1, panel C. TBAC (2024) emphasizes cyclicality of asset managers credit demand, stating that asset managers have a "cyclical preference for credit." If so, then the correlation in figure 4, panel B, may be due not to a time-varying desire to add duration but to a perceived correlation between the attractiveness of credit and the state of the business cycle (which is correlated with the effective federal funds rate). Barth and others (2024) highlight the role of MBS rather than credit as a driver of asset manager long Treasury futures positions and provide supporting evidence for mutual funds (a subset of asset managers).

To the extent that asset managers use Treasury futures to add leverage and hold additional credit or MBS, Fed efforts to contain the basis may indirectly lower the price of credit or prepayment risk and in turn stimulate the private sector. More work is needed to fully understand asset managers' motives for holding Treasury futures.

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GENERAL DISCUSSION Jón Steinsson wondered whether a similar type of hedging that the authors describe could be used in different markets, pointing to other large trades that were happening concurrently, including in the foreign exchange market.

In response, Jeremy Stein pointed to the covered interest rate parity (CIP) basis and how the Fed's swap lines help the Fed close the arbitrage spread when CIP violations are large. He then clarified that the type of agreement that the authors propose in the paper is not that different in nature from the Fed conducting repurchase agreement (repo) lending transactions; it's purchasing bonds with an agreement to sell these bonds forward, the only difference being whether there is one or two counterparties involved. The suggestion they provide in the paper is closer to repo lending than to outright bond buying, Stein concluded.

Michael Kiley raised the issue of what he described as an insatiable demand for duration on the part of asset managers, leading to the spread between cash and futures position prices, which allow corporations and others to take advantage of the demand for duration. Yet such adjustments in issuance and pricing do not seem to be satisfying the demand for duration. He wondered what imperfections in these markets lead to this outcome.

Thinking about the asset managers' objective function, Michael Falkenheim asked about the reasoning behind the preference for corporate bonds: Does it stem from a belief that the spread in corporate bonds is very rich, or is there some market dysfunction that's driving this preference?

He also pondered whether a change in the perception of the risk-free nature of Treasuries could lead to a push toward corporate bonds.

On congruent regulation, Kiley noted that most of the discussion on this topic seems to focus on how to reduce regulation related to banks. He asked the authors what mix of regulation they thought would be appropriate, pointing to the importance of ex ante measures for putting in place ex post measures in mitigating moral hazard.

Stein explained that relative to outright bond buying by the Fed, the moral hazard issue could be improved by using the authors' approach, but he stressed that there is no claim that one can eliminate moral hazard altogether. Stein further clarified that the paper does not suggest other policy tools are not useful but different situations require different tools.

Mark Gertler questioned if it wasn't indeed the case that quantitative easing (QE) works when the Fed can do something that the private sector cannot. We tend to believe that the Fed has the advantage of being more capable to handle duration risk, allowing it to affect term premia with asset purchases. Therefore, Gertler asked, if more positions are hedged, would that not result in a weakening of the Fed's advantage?

In response, Stein agreed that their approach does effectively take away a tool—a monetary policy tool—and in a sense, therefore, the intervention would be more modest. He then highlighted what he called a beautiful and subtle point made by the discussant Annette Vissing-Jorgensen: Hedged purchases of bonds by the Fed may actually be more powerful in addressing market function issues than purchases that are unhedged.

Stein said he believed that the purchases in 2020 were made because dealers had been overwhelmed by Treasury selling—dealers were indeed holding a lot of Treasuries, but they were not overwhelmed by duration; they were completely hedged in March 2020. If the goal is to relieve the stress on the dealers, it can be done by taking the hedged position off them and thereby saving the Fed from having to do anything that looks like monetary policy.

Charles Evans focused on the issue of avoiding the Fed losses, stating that, to economists, the Friedman rule may be very attractive, but the public likely has a limited understanding of the Fed's balance sheet. Policy tools, he argued, need to be devised with this in mind.

Stein, adding some nuance, suggested that discussions on what the size of the Fed's combined footprint should be goes beyond the balance sheet: When the Fed conducts QE, for example, it is stepping on the Treasury's debt maturity choice by changing the consolidated debt maturity.

This is also part of the Fed's footprint, Stein concluded, and should similarly be reduced where possible—for QE, this may be an unavoidable consequence, but this need not be true when the Fed acts for market functioning purposes.

Ben Bernanke asked the authors to comment on the extent to which Dodd-Frank was part of the problem at the time, leading to increased capital and reduced market capacity.

Jonathan Pingle asked whether the authors thought part of their approach's appeal might be how it maintains liquidity. Because, Pingle explained, policies reducing rather than preserving that market activity could risk dampening treasury market liquidity.

Stein expressed that he believed it was a commonly held view that the decline in the size of the dealers relative to the Treasury market is somehow related to regulation, suggesting that the risk-insensitive leverage ratio plays a role in this. He suggested that it could be helpful to dial back the leverage ratio while making a compensating adjustment to risk-based capital, so that overall capital in the system does not decline—admitting that the latter is an important caveat to his suggestion. This would likely move some capacity back to the dealers. Stein underscored that in addition to regulation, dealers' risk preferences, among other things, also play an important role in constraining their willingness to expand their balance sheets.

Jonathan Wallen reminded everyone that large dealer banks have relatively deep pools of liquidity and are able to, for example, reallocate capital internally if one market is in distress, because they intermediate all markets. But as we move toward more intermediation being done by more specialized, more heavily leveraged hedge funds and other asset managers, they do not have the same liquidity as large dealer banks. They are more fragile. As a result, and referring to Matt Levine, Wallen suggested we ought to think of the Fed more as a "synthetic lender of last resort."[1]

1. Matt Levine, "The Synthetic Lender of Last Resort," Bloomberg, March 27, 2025, https://www.bloomberg.com/opinion/newsletters/2025-03-27/the-synthetic-lender-of-last-resort.