Liquidity Flows to Bank-Affiliated Broker Dealers: Insights from Volumes and Prices

Abstract

This paper examines the role of repo lending between counterparties affiliated with the same bank holding company (BHC). Using confidential transaction-level data, we find that Treasury repo rates between affiliated entities are significantly higher than those between unaffiliated parties. This affiliation premium is more pronounced when dealers face tighter balance sheet constraints, suggesting that regulatory capital requirements raise the cost of external borrowing and enhance the value of internal funding. During a temporary period of regulatory relief—when leverage requirements were relaxed—the affiliation premium nearly disappeared, only to re-emerge once the regulations were reinstated. Our findings underscore a unique competitive advantage for dealers within large BHCs: the ability to access internal liquidity from affiliated banks. This internal liquidity channel also facilitates the distribution of liquidity from banks with high level of reserves to the rest of financial system.

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1 Introduction

A sizable share of secured borrowing in the U.S. is conducted by dealers affiliated with large bank holding companies (BHCs). In this paper, we study the role of the BHC internal lending market by leveraging confidential transaction-level data collected by the Federal Reserve. Specifically, we examine liquidity flows between primary dealers and their affiliated counterparties within the same BHCs, analyzing their volumes and pricing. We show that a dealer's ability to manage liquidity internally — tapping funding from affiliated entities — plays a crucial role in its intermediation activities in the broader short-term funding markets.

We use supervisory transaction-level data on the overnight tri-party repurchase agreement (repo) market from February 2018 to March 2025. The tri-party repo market is central to short-term funding in US securities markets, where major primary dealers borrow cash to finance their market-making activities in the US Treasury market.[1] In this market, cash-rich investors lend to large and creditworthy dealers through a third-party custodian that handles clearing and collateral management.[2]

We document that affiliated counterparties within the same BHC are a major source of repo funding for several of the largest primary dealers. On average, nearly half of these dealers' daily tri-party borrowing is sourced from affiliates. For instance, our sample of five primary dealers borrows approximately \$110 billion per day from unaffiliated cash investors and about \$80 billion per day from affiliated entities. Throughout most of our sample, the share of internally provided funding consistently exceeded 25% of total overnight Treasury repo borrowing.

Moreover, our analysis shows that Treasury repo trades between dealers and their affiliates are priced at a consistent premium relative to trades with unaffiliated lenders. We refer to this spread as the affiliation premium. On average, this affiliation premium is approximately

[1] Primary dealers are the main counterparties of the Federal Reserve Bank of New York and are active participants in US Treasury markets. For example, they are expected to bid in all Treasury auctions at reasonably competitive price. See https://www.newyorkfed.org/markets/primarydealers.

[2] In the US, the Bank of New York Mellon (BNY) is currently the sole third-party custodian after JP Morgan's exit in 2017.

$4-5$ basis points (bps). It is statistically significant and persists even after accounting for differences in trade size and other time-varying characteristics of dealers and short-term funding markets. This pattern is evident in simple comparisons of volume-weighted rates and is confirmed through regression analysis at both the aggregate daily level and the transaction level. Affiliated repo transactions tend to be much larger in size but less frequent than unaffiliated trades. However, the higher cost of affiliated funding cannot be fully explained by trade size alone, suggesting that structural factors related to the affiliation itself play an important role.

A key feature of internal repo borrowing — as opposed to external repo borrowing — is that it is less capital intensive. Specifically, borrowing and lending between affiliates within a BHC are netted under regulatory capital rules applied at the consolidated BHC level. The incentive to minimize regulatory capital costs is particularly strong for the Supplementary Leverage Ratio (SLR), which requires banks to maintain a minimum level of Tier 1 capital against their total leverage exposures (a measure of total BHC assets) regardless of risk. Thus, for a dealer to maximize return per unit of capital, both lowering the cost of capital and increasing net returns are crucial considerations.

Given investment opportunities, high borrowing cost results in lower net returns. However, one also needs to consider associated capital charges, particularly for dealers active in Treasury market intermediation. This type of intermediation requires dealer to flexibly expand and contract their balance sheet to intermediate repo funding and provide immediacy in the Treasury cash market, making it a highly balance sheet-intensive activity. Holding equity fixed, non-risk based capital requirements impose a constraint on the size of a dealer's balance sheet, and consequently, on the volume of activity the dealer can dedicate to Treasury repo market intermediation. When dealers allocate balance sheet capacity to repo, they must internalize the opportunity cost of forgoing future opportunities to expand their balance sheet elsewhere. This introduces a non-pecuniary cost to repo intermediation and creates a critical role for affiliated lending. Importantly, borrowing from an affiliate does not increase the size of the consolidated entity's balance sheet. As a result, the dealer avoids the opportunity cost of using its balance sheet for repo, preserving capacity for other profitable activities. In Section 3 we provide a theoretical framework to formalize this mechanism.

Consistent with this intuition, our findings indicate that the affiliation premium is linked to dealer balance sheet constraints. We show that the premium is higher when dealers face tighter balance sheet pressures related to Treasury market intermediation. Specifically, when the dealer-specific balance sheet cost, measured by the difference of its cross-market Treasury repo spread, or the market-wide general balance sheet cost, signals elevated balance sheet pressures, the affiliation premium widens. Our regression analysis indicates that a one basis point increase in a dealer's balance sheet cost leads to an approximately 0.62 bps increase in the dealer's affiliation premium. This implies a substantial pass-through of balance sheet costs into internal funding rates, roughly 60% on the margin.

Notably, this relationship breaks down when regulatory constraints are temporarily lifted. During April 2020–April 2021, US regulators granted a temporary SLR exemption for reserves and Treasuries, which sharply increased SLR ratios and reduced balance sheet costs for holding repo assets. We show that during this exemption period, the affiliation premium nearly vanished — affiliated and unaffiliated repo rates converged — only to re-emerge at its prior level once the exemption expired. This temporal pattern provides compelling evidence that the affiliation premium is driven by regulatory balance sheet frictions.

We also document that internal liquidity is primarily driven by affiliated banks or depository institutions (DIs) that hold substantial reserves. Specifically, these affiliated banks routinely lend tens of billions of dollars per day to their dealer affiliates via repo, while virtually never borrowing externally in the tri-party market themselves. In particular, we find that these banks lend exclusively to affiliated dealers, but not to unaffiliated dealers. This pattern suggests that the bank–dealer affiliation link serves as a conduit through which bank reserves are funneled to dealers. Dealers, in turn, redistribute that liquidity to the broader financial system. Together, this internal repo mechanism increases the "velocity" of central bank reserves: it moves funding from where liquidity is abundant (banks) to where it is in high demand (dealers' counterparties such as hedge funds and other NBFIs). This channel has important implications for market liquidity and the transmission of monetary policy, especially in an environment of abundant reserves.

Lastly, we trace how internal funding translates into market liquidity. We show that for every additional dollar a BHC-affiliated dealer borrows from its internal affiliate, it increases its total reverse repo lending by approximately 55 cents, with about 19 cents lent back to other affiliated entities and 36 cents to unaffiliated borrowers. When we normalize by the dealer's total reverse repo activity, these internal borrowings translate into a 60-cent increase per dollar, with 46−50 cents lending to external entities. Most of this lending occurs in the bilateral repo market, where hedge funds, smaller dealers, and other non-bank financial institutions (NBFIs) are the primary borrowers. This pattern underscores that while internal funds support some intra-group liquidity transfers, a large share of internal borrowings by dealers are passed through to external market participants, enhancing broader market liquidity.

Financial markets have evolved significantly in the decades since the Global Financial Crisis (GFC). Understanding internal liquidity management within BHCs is essential to appreciate the distinct roles of various financial intermediaries. More broadly, the flow of liquidity within the financial system is a critical topic for financial stability. We contribute to this broader agenda by providing the first direct evidence on pricing in internal repo markets and detailed insight into their role in dealer liquidity management. From a policy perspective, our findings suggest that liquidity provided by affiliated banks is an important conduit to overcome regulatory frictions and transmit central bank liquidity to non-bank markets.

Previous studies, such as Caglio, Copeland, and Martin (2021) and Lu, Macchiavelli, and Wallen (2023), document the critical role of internal capital markets for broker-dealer affiliates, especially during periods of market stress. Our paper advances this line of research by documenting a positive affiliation premium associated with internal repo borrowing. We show that this premium is systematically linked to dealers' regulatory capital constraints. Our results also indicate that internal repo markets are important for the distribution of liquidity from cash-rich DIs to the rest of the financial system *through* their dealer affiliates. In so doing, we connect to the extensive literature on internal capital markets, including the work of Gertner, Scharfstein, and Stein (1994), Stein (1997), and Stein and Scharfstein (2000), who emphasize both the benefits and potential inefficiencies of internal capital allocation within firms. Our paper extends this literature by providing novel evidence from the context of large bank holding companies and their broker-dealer affiliates, showing how internal repo transactions facilitate liquidity redistribution and mitigate regulatory constraints.

We also contribute to the extensive literature on non-risk-weighted capital regulation, particularly the SLR, and its impact on Treasury market intermediation. Duffie (2025) argues that leverage constraints significantly restrict dealers' ability to intermediate Treasury markets, while He, Nagel, and Song (2022) provide evidence linking such constraints to market disruptions, including the turmoil in March 2020. Similarly, Favara, Infante, and Rezende (2022) show that shocks to dealer balance sheets reduce their participation in US Treasury markets, particularly affecting dealers closer to regulatory leverage limits; and Bräuning and Stein (2025) provide evidence that dealers with lower SLR buffers reduce their Treasury positions relative to those with high SLR buffers, and are associated with lower turnover and higher bid-ask spreads in the Treasury cash market. Our study provides new empirical evidence by illustrating how these constraints manifest through internal repo pricing. Specifically, we show that the affiliation premium fluctuates significantly with changes in balance sheet costs and regulatory relief.

Lastly, we build on the rich literature analyzing the tri-party repo market structure and its central role in dealer financing.[3] Copeland et al. (2014) study the tri-party market during the 2007–09 GFC, and find that Treasury repo volumes were quite resilient. Krishnamurthy et al. (2014) study repo rates in the tri-party repo market during that period and finding

[3] Copeland et al. (2012) provide a detailed overview of the US tri-party market.

that Treasury repo were quite stable; however, Anbil et al. (2021) document a high degree of repo rate dispersion across repo market segments during the September 2019 repo stress event, indicating that stress in repo markets themselves can spillover across segments. Han et al. (2022) and Paddrik and Ramírez (2025) study both quantities and prices in the tri-party Treasury repo market and underscore the importance of trading relationships, and Huber (2023) quantifies dealer market power over cash lenders in this market. Our paper complements these studies by illuminating the substantial internal funding activities occurring within the tri-party repo market of large domestic BHCs, where affiliated bank-dealer pairs regularly intermediate reserve liquidity. This internal channel, previously understudied, enhances our understanding of reserve distribution in financial markets and highlights a key conduit for monetary policy transmission.

In the remaining paper, we introduce the institutional background in Section 2, build up a model in Section 3, describe the data in Section 4, and present empirical results in Section 5 and policy implications in Section 6. Section 7 concludes.

2 Regulatory Treatment of Repo Transactions and Affiliated Lending

As stated in the introduction, we focus on the general tri-party repo market, an important segment of the US repo market.[4] The repo contracts in this market are general collateral, meaning that cash borrowers can post any securities within a specified collateral class (such as US Treasuries). Because of this feature, the economic motive to trade in the tri-party repo market is to borrow or lend funds, rather than to source or distribute particular securities.[5] Moreover, trading in this market tends to be one-directional: cash lenders generally do

[4]The general collateral repo market consists of the general tri-party repo segment and a much smaller interdealer general collateral repo segment.

[5]The different motivations to enter repo contacts leave an imprint on repo contracting terms, and thus need to be considered when studying repo rates. For example, Duffie (1996) and Infante (2019) show, respectively, that repo rates can trade below the prevailing market rates and that haircuts can be negative if the economic motive is to source a specific security.

not borrow funds, and cash borrowers rarely lend funds. This one-way flow eliminates the possibility of netting positions on dealers' balance sheets.[6]

A large and growing literature has emphasized that non-risk-based capital rules have constrained banks' ability to intermediate low-yielding, balance-sheet-intensive activities. [7] These rules are particularly onerous for Treasury market intermediaries that rely heavily on repo markets to access liquidity. One salient example is SLR, which as mentioned earlier requires banks to maintain a minimum level of Tier 1 capital against their total leverage exposure including on-balance sheet assets, derivatives, and off-balance sheet commitments. SLR was introduced in the US in 2013 as part of the Basel III regulatory framework implementation. This regulation limits BHC-affiliated dealer subsidiaries from expanding their activities by borrowing from *unaffiliated* counterparties, that is, external to the BHC. Holding equity fixed, any additional dollar of dealer repo borrowing from unaffiliated counterparties increases the consolidated balance sheet and thus increases leverage under SLR.

However, when dealers raise funds from affiliated cash lenders, these transactions are netted and do not contribute to the bank holding company's leverage exposure, thereby having no effect on the SLR calculation. This differential regulatory treatment gives a prominent role to internal repo markets. Indeed, Bowman et al. (2024) show that affiliate trades of the largest BHCs (with active dealer subsidiaries) account for roughly one-third of their overall repo activity. We study pricing of affiliated repo lending.

When an affiliated lender and borrower transact, they internalize the benefit of avoiding balance sheet expansion, and this surplus is split between them——resulting in a higher repo rate paid by the dealer (borrower), which benefits both the borrower (through lower regulatory cost) and the lender (through a higher return). Moreover, we should expect this spread to increase when dealer balance sheet costs associated with leverage regulations are higher. In effect, an increase in balance sheet cost incentivizes dealers to seek ways to reduce the

[6] Figure 1 in Infante, Petrasek, Saravay, and Tian (2022) shows the total outstanding volumes of primary dealers in different repo market segments, indicating the importance of their borrowing in the general tri-party market and their limited amount of lending.

[7] See Duffie et al. (2023) for a comprehensive overview of the literature.

regulatory size of their balance sheet, increasing the rate they are willing to pay to borrow internally.

Our empirical results are structured around two main hypotheses. First, the spread between affiliated and unaffiliated overnight Treasury repo borrowing rates for BHC-affiliated dealers is positive. Second, this spread increases with the dealer's regulatory balance sheet costs.

2.1 Internal Repo Lending by Affiliated Depository Institutions

While much of our analysis considers all dealer-affiliated borrowing, the affiliated DI — i.e. the commercial bank within the BHC — plays a particularly important role. The DIs in our sample are among the largest banks in the United States and hold significant amounts of liquidity in the form of reserve balances at the Federal Reserve. These balances ballooned after the surge in the Fed's balance sheet following the Global Financial Crisis and the policy response to the COVID-19 pandemic. This suggests that the DIs in our sample are well positioned to be major liquidity providers to their affiliated dealers, and that internal repo lending may be an important channel through which liquidity flows through the financial system.

We show that a large share of affiliated repo transactions in the tri-party market consists of dealers borrowing from their affiliated DI. This implies that internal repo transactions in the tri-party market are a key mechanism by which cash-rich banks within large BHCs deploy funds to their dealer subsidiaries for Treasury market intermediation. In addition, we find that for the BHCs in our sample, virtually all of the DI's tri-party repo lending is to their own affiliated dealer. In other words, the main way that large BHC DIs participate in the tri-party repo segment is by lending to their affiliated dealers. The significant volume of affiliated lending between dealers and their DI affiliates also suggests that the tri-party market is an important segment for channeling reserve balances into the repo market. In sum, the relationship between DIs and their dealer affiliates appears to be a major conduit for central bank liquidity (reserves) to be deployed into the Treasury repo markets.

It is important to note that internal transactions between a dealer and its affiliated bank are subject to additional regulations, such as Regulation W, which governs transactions between banks and their affiliates. However, these regulations do not place quantity restrictions on transactions involving liquid assets like Treasuries. The absence of quantity restrictions for internal transactions that use Treasury collateral is a likely reason why internal Treasury repo markets are so important for the flow of liquidity withing a BHC. On average, for the five dealers in our analysis over the sample period, roughly half of their daily internal secured funding is sourced via overnight repurchase agreements collateralized by Treasuries. The only requirement that Regulation W imposes for transactions using Treasury collateral is that the pricing of inter-affiliate loans must be at market rates. As we will show below, affiliated repo transactions are priced higher (the dealer pays more) than comparable market trades, indicating that this pricing restriction does not appear to be binding.

Naturally, there may be various reasons — besides regulatory constraints — why dealers and DIs would engage in internal borrowing and lending. For example, information asymmetries between affiliated counterparties may be lower, or a DI may feel compelled to support its dealer subsidiary during times of need. However, it is unclear how such factors would affect affiliated repo rates outside of stress periods, and neither would predict a systematic relationship between affiliated repo spreads and balance sheet costs. By contrast, our focus (and our model's prediction) is that balance sheet cost considerations drive a wedge between internal and external repo rates. In the next section, we provide a simple theoretical framework to illustrate how balance sheet costs influence the pricing of affiliated lending and the flow of internal funds.

3 The Affiliation Premium: Theoretical Framework

The regulatory landscape described in Section 2 and the relationship between dealers and affiliates suggests that affiliated lending plays an important role in the reallocation of funds within a BHC. Specifically, dealers and their affiliated lenders are incentivized to use internal lending to reduce balance sheet costs. To understand these effects more clearly, in this section, we present a simple model in which a dealer and an affiliated lender engage in a bargaining game to determine the amount and pricing of internal liquidity transfers.

We assume a representative dealer has an exogenous need to finance a purchase of Treasury securities.[8] Given this funding demand, our focus is on the dealer's decision of what fraction of financing should come from an affiliated lender versus an unaffiliated lender. When an affiliated entity lends to the dealer there is an opportunity cost. In the case where the affiliated lender is a bank, this opportunity cost has a clear interpretation: it is the interest on reserve balances (IORB) that the bank could earn at the Fed, plus any additional liquidity benefits that reserves provide.[9] For other types of affiliated lenders, the opportunity cost of deploying funds internally may reflect the forgone "safe asset" convenience yield that could be earned elsewhere.[10] In our model, the affiliated lender's outside option (holding safe assets) is the main cost of internal lending.

We also assume that the BHC is subject to a balance sheet cost that affects both the dealer and the affiliated lender. This balance sheet cost decreases as the fraction of affiliated lending increases, since internal financing effectively reduces the total amount of external (unaffiliated) borrowing. In the model, the reduction in balance sheet cost from greater affiliated lending is the main benefit of internal funding. Using this setup, we formalize

[8] Alternatively, we could assume that the dealer has an exogenous reason to lend via reverse repo backed by a Treasury rather than to purchase a Treasury. The balance sheet implication and gains between affiliated and unaffiliated borrowing are identical.

[9] For example, Acharya and Rajan (2024) and Lopez-Salido and Vissing-Jorgensen (2023) highlight the specific benefit central bank reserves provide to manage the risks of deposit outflows.

[10] For example, D'avernas and Vandeweyer (2024) and Infante (2020) show that different types of safe assets provide different levels of safe asset benefits, providing an additional incentives for financial firms to hold them.

the two main hypotheses of the paper: that the affiliation premium is positive, and that it increases with dealer balance sheet constraints.

3.1 Setup

Consider a dealer with no initial endowment that seeks to fund an amount T of Treasury securities. The dealer chooses the fraction θ of T that will be financed through their affiliated counterparty, at a negotiated repo rate of rp^A, and the fraction $1-\theta$ of T that will be financed by raising funds from an unaffiliated counterparty in repo market, at an exogenously specified rate rp^U.

The affiliated lender is endowed with a (large) quantity of funds R that earn interest at an interest rate r^O. This interest rate captures both the return on holding funds and any convenience yield associated with holding these funds. In the context of DI lenders, a natural lower bound for r^O is IORB, the interest that banks receive on their balances with the Fed. The affiliated borrower and lender choose the amount of lending they want to do internally θT, and then both parties negotiate the affiliated repo rate rp^A between eachother. For now, we will assume that R is large relative to T, so the affiliate is not concerned about running out of funds to finance affiliated positions.[11] We will assume that the payoff from the affiliates outside option is greater than the exogenously assumed repo rate the dealer pays when borrowing from unaffiliated counterparties, $rp^U < rp^O$. If this condition did not hold, affiliated lenders would be willing to lend *all of their* cash balances R to their affiliated dealers because of the higher return from investing in repo and the reduction in balance sheet costs. In Section 5 we provide evidence that that this is the empirically relevant case.

Both the dealer and the affiliated lender must comply with non-risk weighted capital rules that in practice place a restriction on the BHCs overall size. Specifically, at the consolidated

[11] An alternative version of the model could assume the financing needs T are much larger than the amount of liquidity held by affiliates R. This would suggest that liquidity constraints may drive internal lending decisions. However, given the types of financial institutions we have in mind, i.e., large US GSIBs that hold vast quantities of central bank reserves, this specification is less empirically relevant for the period of our empirical analysis.

level, given an affiliated lender's initial funds R and the dealer's new Treasury position T, the overall size of the BHC's assets is $R + T$. However, if a fraction θ is financed internally, the affiliated lenders funds θT are converted into an affiliated loan, resulting in a balance sheet size of $R + (1 - \theta)T$.

We model the balance sheet cost as a strictly convex function on the BHC's balance sheet size $C(\cdot)$. This assumption captures how balance sheet constraints affect dealer behavior dynamically: the use of balance sheet capacity today restricts the BHC from adopting future profitable opportunities. Thus, dealers face a cost when expanding their balance sheet to accommodate their Treasury repo borrowing. This effect is stronger if the increase in size is larger, giving rise to a convex cost that depends on balance sheet size.[12] In this set up, the cost of borrowing from unaffiliated counterparties is $C(R+T)$ while the cost of partially borrowing from affiliated counterparties is $C(R + (1 - \theta)T)$.

Figure 1 shows how the internal repo lending between a dealer and its affiliated lender can affect the BHC's overall balance sheet cost. The two T-accounts on the right represent the dealer and affiliated lender balance sheets, and the T-account on the left shows both balance sheets consolidated at the BHC. As the dealer decides to take on T Treasury securities, its balance sheet increases by T. However, if it raises θT funds from the affiliated lender, the overall increase of the BHC's balance sheet size is $(1 - \theta)T$. Thus, the reduction in balance sheet costs is $C(R + T) - C(R + (1 - \theta)T)$.

[Insert Figure 1 Here]

3.2 Payoffs

There is a question about how dealers and affiliated lenders internalize capital costs given that capitalization is enforced at the BHC level. In practice, the allocation of balance sheet capacity is likely to be distributed between affiliates at the BHC level. However, because the

[12] Duffie et al. (2023) present a simple dynamic model to show that regulatory balance sheet constraints in the future imply a convex cost today. This assumption has also been used, for example, by He et al. (2022), D'avernas and Vandeweyer (2024), Infante (2020), and others.

dealer is choosing to fund an amount T of Treasury securities (either a direct purchases or to lend via a reverse repo) we assume that the dealer bears the entire balance sheet cost of taking on the additional Treasury.[13] That is, even in absence of internal lending, dealers net profitability is assessed by internalizing the holding company's capital cost. The payoff to the dealer for funding the position with an unaffiliated (u_D^U) and affiliated (u_D^A) counterparty is given by:

$$
\begin{aligned}
u_D^U &= \tilde{r}T - rp^U T - C(R+T) \\
u_D^A &= \tilde{r}T - rp^U(1-\theta)T - rp^A\theta T - C(R+(1-\theta)T),
\end{aligned}
$$

where $\tilde{r}$ is the payoff of the dealer's Treasury investments.

The payoff to the affiliated lender, either holding its funds (outside option) or lending internally, is:

$$
\begin{aligned}
u_L^U &= r^O R \\
u_L^A &= r^O(R-\theta T) + rp^A\theta T.
\end{aligned}
$$

Thus, the *excess payoff* (gain) for each party from engaging in the affiliated transaction (relative to the outside option) can be written as:

$$
\begin{aligned}
u_D^A - u_D^U &= (rp^U - rp^A)\theta T + [C(R+T) - C(R+(1-\theta)T)] \\
u_L^A - u_L^U &= (rp^A - r^O)\theta T.
\end{aligned}
$$

In these expressions, $(rp^U - rp^A)\theta T$ is the dealer's interest differential from borrowing θT internally, and $(rp^A - r^O)\theta T$ is the lender's excess interest earned over its outside option (if

[13] In an alternative specification, we could assume that the dealer bears $\alpha \in [0,1]$ of the cost and the affiliate lender bears the rest. This specification assumes that the lender internalizes the benefits of reducing the holding companies overall balance sheet cost. While this modeling choice does have an effect on how gains are distributed between the borrower and lender, it does not affect the total surplus of the consolidated entity.

$rp^A > r^O$). The term involving $C(\cdot)$, which only affects the dealer, captures the payoff from reducing balance sheet cost using internal borrowing.

The dealer's optimal internal financing share θ and the equilibrium internal repo rate rp^A will be determined through bargaining, as we describe next.

The total surplus at the BHC level from internalizing the transaction is the sum of the two parties' excess payoffs:[14]

$$\begin{aligned}\Pi &= \left[u_D^A - u_D^U\right] + \left[u_L^A - u_L^U\right] \\ &= -(r^O - rp^U)\theta T + [C(R+T) - C(R + (1-\theta)T)] \end{aligned} \tag{1}$$

The first term $-(r^O - rp^U)\theta T$ is the net loss of interest income to the BHC from shifting θT into an internal loan (the BHC forgoes r^O on θT and only earns rp^U on that amount, hence, overall the BHC losses are $(r^O - rp^U)$ per unit). The second term is the reduction in balance sheet cost from replacing θT of external borrowing with internal funding. The optimal amount of affiliated repo market trading at the BHC level is given by the FOC,

$$\begin{aligned}\left.\frac{\partial \Pi}{\partial \theta}\right|_{\theta=\theta^*} &= -(r^O - rp^U)T + C'(R + (1-\theta^*)T)T = 0 \\ &\implies C'(R + (1-\theta^*)T) = r^O - rp^U \end{aligned} \tag{2}$$

Condition (2) says that, at the BHC level, agents will borrow from affiliates until the marginal cost of the consolidated balance sheet equates the spread between the interest rate on their outside option and the unaffiliated repo rate. Intuitively, the BHC will increase internal funding until the point where the benefit of further balance sheet cost savings just equals the opportunity cost of using internal funds.

For internal funding to be an interior solution ($0 < \theta^* < 1$), we require $C'(R+T) > r^O - rp^U > C'(R)$. In other words, if the marginal cost of the balance sheet with no internal

[14] Note that the expression for total surplus would still be the same if the lender assumed a fraction of the balance sheet cost.

borrowing is higher than the interest rate spread, and the marginal balance sheet cost of borrowing all internal borrowing lower than the interest rate spread, an interior solution exists, that is, $0 < \theta^* < 1$.

3.3 Nash Bargaining Game

Having conditions that maximize the surplus of liquidity provision between the dealer and its affiliated lender, we turn to how the dealer and affiliated lender split said surplus through the affiliated repo rate rp^A. For simplicity, we assume that the dealer has bargaining power $\eta \in [0, 1]$ (and the bank affiliate $1 - \eta$). In the classic Nash bargaining game, both the dealer and the affiliated lender solve the following problem:

$$Max_{rp^A} \left(u_D^A - u_D^U\right)^{\eta} \left(u_L^A - u_L^U\right)^{(1-\eta)} \Big|_{\theta=\theta^*}$$

The first-order condition for this problem yields the equilibrium condition:

$$\frac{\eta}{(u_D^A - u_D^U)} = \frac{(1-\eta)}{(u_L^A - u_L^U)}$$

Intuitively, because the rate is quasi-linear in both excess payoffs, the equilibrium condition is to equate both excess payoff scaled by the relative bargaining power. Replacing the expression for the dealer and lenders excess payoff results in the following affiliated repo rate,

$$rp^A = \eta r^O + (1-\eta) rp^U + (1-\eta) \frac{[C(R+T) - C(R + (1-\theta^*)T)]}{\theta^* T}. \tag{3}$$

Equation (3) implies that the affiliated repo rate is between the unaffiliated repo rate and the outside option rate—scaled by the dealer and affiliated lender's market power—plus the gain from reducing the BHCs balance sheet cost that benefits the dealer directly.

Note that a necessary condition for the lender and dealer enter into the Nash bargaining game, that is, $(u_D^A - u_D^U) > 0$ and $(u_L^A - u_L^U) > 0$. The expressions in (3), and the optimal condition in (2), indicate that these conditions hold when $\frac{[C(R+T)-C(R+(1-\theta^*)T)]}{\theta^* T} > C'(R + (1-\theta^*)T)$. That is, when the average savings cost is higher than the marginal cost, which holds when $C(\cdot)$ is strictly convex.

Finally, in such an equilibrium, we have that the *Affiliated Premium*, defined as the spread between the affiliated repo rate and the unaffiliated repo rate, $rp^A - rp^U$, satisfies

$$Affiliated\ Premium = \eta(r^O - rp^U) + (1-\eta)\frac{[C(R+T) - C(R+(1-\theta^*)T)]}{\theta^* T} \tag{4}$$

which is always positive.

Intuitively, if the dealer has all of the bargaining power, $\eta = 1$, then the affiliated premium is merely the affiliated lenders' opportunity costs of providing internal funds. If, in contrast, the affiliated lender has all of the bargaining power $\eta = 0$, then they reap all of the balance sheet savings through a higher affiliated premium. In this case, the affiliated premium is larger than the opportunity cost because in equilibrium $r^O - rp^U = C'(R + (1-\theta^*)T) < \frac{[C(R+T)-C(R+(1-\theta^*)T)]}{\theta^* T}$. In this stylized model, the affiliated lender's compensation, captured by the affiliated premium, is always higher than the affiliated lenders' opportunity cost of using internal funds.

To study how the equilibrium changes with balance sheet costs, we assume that the balance sheet cost $C(x; c_0)$ depends on a parameter c_0 such that $\frac{\partial C(x;c_0)}{\partial c_0}$ is increasing in x.[15] That is, an a higher level of c_0 is associated with a higher marginal balance sheet cost for the dealer. In that case, we have the following proposition that characterizes the equilibrium and main comparative statics,

Proposition 1 *Given the rate on the affiliated lender's outside option r^O, an unaffiliated repo rate rp^U such that $r^O > rp^U$, and balance sheet costs $C(x; c_0)$ with $\frac{\partial C'(x;c_0)}{\partial c_0} > 0$, such that $C'(R + T; c_0) > r^O - rp^U > C'(R; c_0)$, then there exists affiliated repo equilibrium in*

[15]A simple example of the type of balance sheet cost we have in mind is $C(x; c_0) = \frac{c_0}{2} x^2$.

which the affiliated premium given equation (4) *and*

$$\frac{\partial Affiliated\ Premium}{\partial c_0} = (1-\eta)\left(\frac{\partial C(R+T;c_0)}{\partial c_0} - \frac{\partial C(R+(1-\theta^*)T;c_0)}{\partial c_0}\right) > 0$$

3.4 Discussion of Model Assumptions

Proposition 1 states conditions under which an affiliated repo equilibrium exists and shows that the affiliation premium is unequivocally increasing with balance sheet costs. Intuitively, if the dealer has to bear more of the balance sheet cost, then they would be willing to borrow internal funds from their affiliated bank at a higher rate. In this section we discuss two of the main assumptions of the model that are relevant to consider how to interpret the equilibrium.

3.4.1 Configuration of Rates

An important tradeoff that pins down affiliated lending in the model is between the dealer's balance sheet cost savings and the spread between the lender's outside option and unaffiliated repo rates. Specifically, the lender has to be incentivized to lend to its affiliated dealer, which increases the dealer's financing cost above what they would receive from an outside lender. Dealers are willing to engage in this transaction because of their balance sheet savings. Thus, in equilibrium, the dealer is willing to finance its position at a higher rate to reap the netting benefits of affiliated lending.

The model's core assumption for an interior equilibrium ($\theta^* \in (0,1)$) is that the affiliated lender's outside option, r^O, is greater than the unaffiliated repo rate, rp^U. If we interpret r^O as the interest on reserve balances (IORB) and rp^U as the prevailing private market repo rate (e.g., TGCR or SOFR), the empirical evidence shown in Section 4confirms that $r^O > rp^U$ is the relevant case for the majority of our sample period (2018-2025). This configuration is characteristic of the Federal Reserve's "ample reserves" or floor system, where the consolidated BHC bears a net interest loss of $-(r^O - rp^U)\theta T$ on the internal transaction, which must be strictly offset by the regulatory gain C'.

However, this condition is regime-dependent. The equilibrium outcome changes when the inequality is reversed, i.e., $rp^U \geq r^O$. This configuration occurs when the reduction in aggregate liquidity in the financial system puts upward pressure short-term rates, and pushes them above the Fed's administered IORB rate.

1. Realizing a pecuniary gain, as the DI can earn a rate (rp^A) above its outside option (r^O).

2. Still avoiding the regulatory balance sheet cost (C').

Since the internal transaction now generates both a pecuniary and a regulatory gain, the core trade-off formalized by the model is eliminated. The BHC's incentive shifts toward maximizing the volume of internal funding, potentially leading to an extreme equilibrium outcome where the dealer borrows the maximum possible amount from its affiliated lender, $\theta^* = 1$, limited only by the physical amount of reserves R held by the DI. In this scenario, however, lenders may be more cautious with deploying their additional reserves into repo. This observation underscores that the relevant tradeoffs to participate in affiliated markets depend crucially on the overall configuration of rates and system-wide liquidity levels.

3.5 Role of the BHC

The model assumes that the dealer and lender maximize their joint surplus and split the gain through the negotiated affiliated repo rate rp^A, with the dealer having bargaining power $\eta \in [0, 1]$. This is equivalent to assuming a strategic BHC whose incentives are completely aligned with both affiliates.

In the real world, BHCs face institutional constraints that we do not model explicitly. In particular, Sections 23A and 23B of the Federal Reserve Act, implemented through Regulation W, impose quantitative limits and collateral requirements on "covered transactions" between banks and their affiliates, including certain repo-style transactions.[16] Large institutions also overlay these statutory constraints with internal limits, funds-transfer pricing

[16]Section 23A limits the total amount of covered transactions between a bank and a single affiliate to

schemes, and risk-management objectives that can influence the level and pricing of internal repo.

Our modeling choice is to abstract from these additional frictions and to treat the BHC as a consolidated decision-maker that maximizes joint surplus subject to a reduced-form balance sheet cost $C(\cdot; c_0)$. This abstraction allows us to isolate the balance sheet channel and derive sharp comparative statics for the affiliation premium and affiliated volumes without taking a stand on the full institutional details of internal capital markets. In this sense, the assumption is best viewed as a disciplined benchmark: it is consistent with the empirical evidence that BHCs actively reallocate liquidity across affiliates and adjust internal funding structures in response to regulatory balance sheet costs, while recognizing that in practice the extreme corner solution $\theta^* = 1$ would be tempered by Regulation W limits, internal risk constraints, and other organizational considerations.

Overall, the assumptions discussed in this subsection are not intended to provide an exhaustive description of all institutional features of bank-affiliated repo markets. Rather, they are chosen to capture a central and empirically relevant mechanism: affiliated lending as a response to balance sheet costs in an ample-reserves environment, in a tractable way that is consistent with observed patterns in volumes and prices across affiliated and unaffiliated repo transactions.

In what follows, we explore the empirical relevance of the model's main prediction in Proposition 1 on the level and sensitivity of the affiliation premium.

4 Data

We focus on the five largest domestic primary dealers in the overall repo market. To study their balance sheet management, we utilize two confidential data sources: (i) transaction-

10% of the bank's capital stock and surplus, and to 20% with all affiliates combined, and imposes collateral quality and valuation requirements; Section 23B requires that transactions with affiliates be on terms at least as favorable to the bank as those prevailing in comparable transactions with non-affiliates. See, for example, Federal Reserve (2025), "Affiliate Transactions (Regulation W)," and related legal interpretations.

level data from the tri-party repo platform, and (ii) regulatory liquidity reports (FR 2052a Complex Institution Liquidity Monitoring Report). The tri-party transaction data allow us to observe repo transaction terms and analyze dealers' funding costs across different counterparties, including their affiliates. The FR 2052a data captures the aggregate repo and reverse repo volumes by collateral type and counterparty type for large institutions. By merging the two data sets at the dealer-day level, we can construct dealer-specific funding rates in the tri-party market and measure their overall repo volumes across market segments. Our sample spans from February 2018, which is when the SLR took effect, through March 2025. Below, we introduce these data in detail.

4.1 Tri-party Repo Data

To compare dealers' Treasury repo financing cost with affiliated and unaffiliated counterparties, we use supervisory data from the tri-party repo platform, a dataset of transaction-level repurchase agreements collected by the Federal Reserve Bank of New York (FRBNY) on a mandatory basis pursuant to its supervisory authority. We focus on the overnight segment of the tri-party repo market which is an important source of secured short-term funding that supports liquidity of key fixed income markets, including US Treasury and agency securities. The overall overnight tri-party Treasury-collateralized repurchase agreement market has accounted for about $600 billion in daily volume over our sample period, on average, and provides a unique venue in which a diverse set of market participants invest their cash primarily with large credit-worthy dealers, many of which are affiliated to large BHCs.

For each repo transaction, we observe the transaction size, rate, trade date and time, maturity date, the cash lender name, cash borrower name, collateral class, and whether the trade has any special features or forward-settling terms. We filter the data to include only overnight Treasury-collateralized repos. These are the most common type of repo. We exclude forward-settling trades and any trades with optionality that could shorten their effective maturity to ensure we are analyzing true overnight funding.

To analyze trading relationships, we map each tri-party trading account to its legal entity and ultimately to its parent organization.[17] Using this mapping of counterparties to institutions, we identify which repo trades occur between affiliated entities within the same BHC versus unaffiliated entities.

We then further restrict our sample to focus on dealers that consistently transact with both affiliated and unaffiliated counterparties over our sample period. This leaves us with the five large US broker-dealers who conduct overnight Treasury-collateralized tri-party repos with both affiliated and unaffiliated lenders. These dealers are affiliated to the largest BHC in the US and are important intermediaries in Treasury cash and repo markets, accounting for approximately 33 percent of all overnight Treasury tri-party repo market borrowing in our sample period.

The tri-party market is often viewed as consisting predominantly of dealer borrowing from unaffiliated MMFs. However, our data mapping reveals that this market also involves significant repo volumes between affiliated entities, which are usually excluded from standard market reports and reference rate calculations such as the secured overnight financing rate (SOFR). Affiliated counterparties in our data are primarily depository institutions (i.e., banks), other broker-dealers, or internationally affiliated entities of the same BHCs.

[Insert Figures 2 and 3 Here]

Figure 2 shows the aggregate daily tri-party repo trading volume for primary dealers in our sample, broken down by counterparty type, with the the chart on the left showing dealers' repo borrowings and the chart on the right showing their repo lendings (reverse repo).[18] We observe that, on average, historically affiliated borrowing accounts for approximately 46% of these dealers' aggregate overnight Treasury tri-party repo volume, with about 30% of total

[17]Such identification has posed a challenge in the past because names in the tri-party data are not uniform. To identify each account with a legal entity we adopt the account mapping strategy as developed in Bostrom (2025). For cash lenders, this strategy uses a combination of automated and manual methods to determine each account's associated legal entity. For cash borrowers, this strategy links tri-party transaction trading accounts to the tri-party allocation data provided to FRBNY, which contains detailed cash borrower names but does not contain as certain transaction-level information.

[18]Figure A.1 in the appendix shows the repo and reverse repo trading volume of the dealers in our sample across all repo market segments, broken down by counterparty type.

volume coming specifically from their depository affiliates. This indicates that borrowing from affiliated banks is a major funding source for dealers. We also observe that dealers lending is nearly negligible, underscoring that the tri-party segment is primarily where dealers raise funding (as opposed to deploying funding).

Panel A of Figure 3 provides another perspective, focusing on the activity of non-dealer affiliates. We find that non-dealer affiliates in our sample rarely borrow in the tri-party repo market. On the rare occasion they do, it is exclusively from their own affiliated dealer. They also lend only to their affiliated dealers, with daily lending volumes ranging roughly \$20 $\sim$ \$75 billion (and most days above \$50 billion). Similar patterns exist in Panel B when we narrow non-dealer affiliates down to DIs. DIs borrowings are close to zero and when they lend, they do it uniquely to affiliated dealers.

In other words, outside of their dealer subsidiaries, other affiliates (especially the banks) do not actively use tri-party to borrow or lend with external parties. The affiliated channel is effectively the conduit through which reserves held by the banks are deployed into the tri-party repo market via their dealer affiliates.

[Insert Table 1 Here]

Table 1 Panel A provides summary statistics for repo rates and transaction volumes in the tri-party repo market, segmented by affiliation type. Panel A highlights that affiliated trades, particularly those involving DIs, exhibit systematically higher average repo spreads relative to the interest on reserve balances (IORB) compared to unaffiliated trades, about $4-5$ bps higher. These affiliated transactions are also notable for their larger average size, though they occur less frequently. Panel B offers aggregate statistics of 5-day changes of market-wide repo and reverse repo volumes in the broad repo market (not limited to the tri-party repo segment) at the dealer level , illustrating that both affiliated and unaffiliated overnight repo volumes fluctuate significantly over short periods, indicative of active liquidity management practices. Collectively, these figures underscore the prominence and distinctive pricing dynamics of internal capital markets within BHCs. Panel C shows the summary statistics for control variables in the empirical analysis, such as CDS spreads, aggregate repo rates, and Treasury supply variables which we describe in Section 4.4.[19]

4.2 Measuring Balance Sheet Costs

To measure dealers' balance sheet intermediation costs, we adpot the Cross-Market Treasury Repo ($CMTR$) spread as introduced in Chabot et al. (2024). The CMTR spread is a dealer-level measure that isolates the compensation dealers receive for intermediating overnight Treasury repos across different market segments. Specifically, it is each dealers' volume-weighted average overnight reverse repo rate in the centrally cleared segment of the repo market—–excluding trades that are motivated by sourcing collateral—–minus its volume-weighted average repo rate in the tri-party market. We calculate the CMTR individually for each of the dealers in our sample using confidential data collected by FRBNY on a mandatory basis pursuant to its supervisory authority. The CMTR is constructed focusing on financing-motivated trades (excluding those aimed at sourcing specific collateral) and excludes any trades between affiliates in tri-party. By construction, the $CMTR$ captures the extra yield a dealer earns by borrowing in one segment (tri-party) and lending in another (cleared bilateral), which should reflect compensation for balance sheet usage and intermediation frictions.

Traditionally, a common proxy for the cost of balance sheet intermediation is the spread between the General Collateral Finance rate and the tri-party General Collateral Rate in the overall market, the $GCF–TGCR$ spread.[20] However, in recent years the GCF market has shrunk considerably, raising questions about the informativeness of the $GCF–TGCR$ spread. Moreover, that measure is market-wide and not dealer-specific. By contrast, the $CMTR$ spread is based on trading volumes and is computed at the dealer level.

For our analysis, we use the dealer-level CMTR spreads for each of the five dealers in our sample. For robustness, we also look at the traditional GCF–TGCR spread as alternative

[19]Table A.1 in the appendix provides a summary of variable descriptions and their sources.

[20]$TGCR$ is obtained from public data on the FRBNY website, while the GCF rate is obtained publicly from the Depository Trust & Clearing Corporation's (DTCC) website.

cost proxies; these yield similar results in our tests.

4.3 FR 2052a Data: Aggregate Repo Market Activity

To calculate each dealer's total overnight repo and reverse repo positions (across all market segments), we use the FR 2052a Complex Institution Liquidity Monitoring Report. The FR 2052a is a regulatory report collected by the Federal Reserve to monitor large banking organizations' liquidity profiles daily. The largest domestic BHCs and foreign banking organizations are required to report, providing separate reports for the parent company and any major US broker-dealer or bank subsidiaries. The data include secured borrowing and lending transactions, wholesale funding transactions, unencumbered asset positions, and various other liquidity-relevant items.

From the FR 2052a, we extract each dealer subsidiary's daily borrowing and lending volumes for overnight and open repos, segmented by collateral type (we filter to Treasury collateral) and counterparty type (affiliated vs. unaffiliated). This allows us to identify, for each dealer-day, how much the dealer borrowed from affiliates vs. outsiders, and how much it lent to affiliates vs. outsiders.

4.4 Control Variables

In our empirical analysis, we control for various factors that might affect dealers' repo activities or rates, including general market conditions and institution-specific factors:

To capture BHC credit risk, we include each BHC's daily five-year senior credit default swap (CDS) spread from Bloomberg. High reserve balances for banks might ease the availability of internal funding. To measure overall liquidity conditions in the banking system, we use confidential Federal Reserve data on the daily level of reserve balances held by the affiliated DIs in our sample.

We include four variables to account for the repo rate environment. First, we create a dummy for the period when the federal funds target rate was at the zero lower bound (ZLB), to allow for structural changes when rates are near zero. Second, we make a quarter-end dummy for the last business day of each quarter and the two days before/after (*Quarter-End*) to capture any rate moves around regulatory reporting dates. Third, we add in the secured overnight financing rate ($SOFR$) published by FRBNY, as a proxy for the general level of repo rates on a given day. Fourth, we add a measure of daily liquidity in the banking system: the sum of total reserve balances held by banks plus usage of the Fed's Overnight Reverse Repurchase Agreement (ON RRP) facility. ON RRP allows eligible counterparties to lend cash to the Fed overnight in exchange for Treasuries. This combined measure accounts for any effects Fed-provided liquidity may have had on the tri-party private repo market rates.

We also consider a dummy for the SLR exemption period (April 1, 2020 to March 31, 2021) when reserves and Treasuries were excluded from SLR calculations in the context of COVID bond and Treasury market disruption. During this period, SLR constraints were effectively relaxed, so we expect the relationship between balance sheet costs and the affiliation premium to be attenuated. This dummy allows us to test for a change in our results during the exemption.

Lastly, we include variables related to Treasury market supply that could affect repo dynamics: the daily levels of Treasury coupon securities and bills outstanding held by the public, as well as their five-day log changes. These series proxy for net issuance or supply shocks in Treasuries, which might influence repo financing conditions. That is, a surge in bill supply or coupon supply could affect repo rates. Both series are released by the US Treasury Department at a daily frequency and include the both Federal Reserve System Open Market Account (SOMA) holdings and non-SOMA holdings. Panel C of Table 1 shows summary statistics for these Treasury supply and aggregate liquidity variables.

To summarize, Table 1 provides summary statistics of the key variables employed throughout our empirical analyses. It includes both the level and the 5-day changes of major variables such as the affiliation premium, $CMTR$, the GCF–$TGCR$ spread, dealer-specific CDS spreads, and broader liquidity indicators. Notably, the average affiliation premium is approximately 4 bps, indicating a meaningful, persistent cost differential for affiliated repo borrowing. The $CMTR$ spread, a critical measure of dealer-level balance sheet cost proxy, averages around 6 bps, providing considerable variation needed for robust empirical identification. Overall, these summary statistics reveal substantial variation across key indicators, supporting our analytical approach and underscoring the economic significance of the studied frictions.

5 The Affiliation Premium and Its Drivers

We begin our empirical analysis by first documenting how dealers obtain financing in the tri-party repo market and their reliance on affiliated repo transaction. We then show the differential pricing of affiliated vs unaffiliated transactions and how non-risk based capital requirements drive these differences.

Dealers raise short-term secured funding from a range of cash investors, including MMFs, other dealers, DIs, offshore funds, securities lenders (e.g., insurance companies), and other investment vehicles. Prior research has extensively documented the role of repo markets in facilitating the flow of cash and collateral in the financial system (e.g., Adrian et al., 2013; Infante and Saravay, 2025; Correa et al., 2020, and Bowman et al., 2024). However, less attention has been given to the significant funding that dealers obtain from affiliated counterparties, such as affiliated DIs within the same BHC.[21]

Our model and empirical analysis focus on the economic attractiveness of affiliated transaction from the (risk-adjusted) return on capital perspective. As shown in Figure 2, approximately 46% of these dealers' daily tri-party repo borrowing volume is from affiliated lenders. In particular, funding provided by affiliated bank (DI), the blue region in Panel A, generally fluctuates between \$20 billion and \$75 billion, with most days exceeding \$50 billion. The share of affiliated funding in tri-party was generally above 25% for much of our sample, un-

[21] Hempel et al. (2023) document that the volume of affiliated tri-party repo transactions is sizable.

til 2023 when–due to the Fed's quantitative tightening policies–money market funds moved large amounts of cash from the Fed's Overnight Reverse Repurchase Agreement facility back into private repos (increasing the unaffiliated share).

In this section, we first present general results on the existence and magnitude of the affiliation premium for the dealers. In the next section, we delve into the factors influencing this premium.

5.1 Affiliated vs. Unaffiliated Repo Spreads to IORB

To quantify the effect of BHC affiliation on repo rates, for each dealer-day, we construct the volume-weighted average repo spread to IORB for that dealer's borrowing from unaffiliated lenders and from affiliated lenders. We then compute the affiliation premium as the difference between the affiliated spread and the unaffiliated spread.

[Insert Figures 4 and 5 Here]

Figure 4 plots the five-day moving average of the daily tri-party borrowing rate spreads (relative to the IORB) for affiliated versus unaffiliated lenders, aggregated across the five dealers. We use spreads to IORB, the Fed's interest on reserve balances rate, to control for shifts in the policy rate that affect the level of all short-term rates. It is evident that the repo spreads on affiliated transactions are consistently higher than those on unaffiliated transactions. In other words, dealers pay a higher spread over IORB when borrowing from affiliates, which is what we call dealer affiliation premium. The spread only briefly turns negative between April 2021 and April 2022 when the Fed's policy rate was at zero lower bound (ZLB), which also includes the sub-period when Treasury securities and reserves were exempted from the SLR. At the ZLB, the unaffiliated repo rates were restricted near zero, which put downward pressure on the measured affiliation premium, since the affiliated rates could not go much below zero either.

Figure 5 shows the time series of the affiliation premium (all affiliates) compared to the DI affiliation premium (only bank affiliates). Our theoretical setup abstracts from the possibility of different subsidiaries. But it is natural to imagine that pricing could vary for different subsidiaries. This is what we see in Figure 5. Spreads for all types of subsidiaries are positive throughout the sample. Although DI subsidiaries appear to benefit the most from transacting with its dealers.

Panel A of Table 1 contains summary statistics for affiliated and unaffiliated transactions, confirming that affiliated trades carry higher rates. For unaffiliated trades, the daily volume-weighted average rate spread to IORB is −7 bps, while the affiliated spread to IORB is −3 bps, resulting in an average affiliated premium being about 4 bps. We also see that when looking at DI affiliated trades compared to unaffiliated trades, the DI affiliated premium is slightly larger than the affiliated premium, at roughly 5 bps, on average. These premiums might appear economically small in absolute terms but persistent.

We formally test the difference in rates using a panel regression framework. Specifically, we estimate the following baseline model on the daily panel of dealer tri-party repo borrowing rates:

$$\begin{aligned} Repo\ Spread_{D,L,t} \;=\;& \alpha + \delta Affilated\ Lender_{D,L,t} \\ & + \beta_1 Repo\ Volume_{D,t} + \beta_2 \ln(Reserves)_{D,t} + \beta_3 CDS_{D,t} \\ & + \beta_4 \ln(System\ Liquidity)_t + \beta_5 QTR\_End_t + \beta_6 ZLB_t \\ & + \beta_7 \ln(Coupon\ Supply)_t + \beta_8 \ln(Bill\ Supply)_t \\ & + \beta_9 SOFR_t + \varepsilon_{D,L,t}, \end{aligned} \tag{5}$$

where D identifies the dealer (cash borrower), L identifies the cash lender (affiliated vs. unaffiliated), and t corresponds to the trading day. Consistent with Figure 4, *Repo Spread* is aggregated using volume-weighted transactions during the day for each dealer-lender pair minus IORB.

The primary variable of interest, *Affiliated Lender*, is a binary indicator set to one if cash lender and borrower belong to the same BHC, and zero otherwise. The dependent variable, $RepoSpread_{D,L,t}$, defined as the difference between the tri-party repo rate and IORB, measures the efficiency of the short-term funding market. The literature has documented a set of factors that may affect repo spreads. For example, Cordes and Infante (2025) show that repo rates are sensitive to Treasury issuance. Munyan (2017) documents that financial institutions with low capital ratios appear to temporarily withdraw from the tri-party repo market before each quarter-end in order to appear safer and less levered.[22] Kahn et al. (2023) show that the decline of reserves contributed to the repo rate spike in September 2019.

To account for potential influences on the repo spread, we control for the dealer characteristics and market conditions. The dealer-level variables include the aggregate daily repo volume by each dealer, the log of reserves of the affiliated DI, the CDS spread of dealer's parent BHC. The market conditions consist of the log of Treasury coupon securities or Treasury bills held by the public ($\ln(Coupon\ Supply)_t$, $\ln(Bill\ Supply)_t$), the log of Fed-provided liquidity—reserve balances plus ON RRP—($\ln(System\ Liquidity)_t$), and the secured overnight financing rate (SOFR). We also control for the quarter-end dummy (QTR_End_t) which is equal to one for the 2 days around the quarter-end date to capture dealers' window dressing activity and the zero-lower-bound dummy (ZLB_t) equal to 1 when the Feds policy rate is at zero, given that these periods correspond to significantly lower repo spreads. All specifications also incorporate the dealer-fixed effect and the last specification adds the day-fixed effect. Standard errors are clustered by day.

[Insert Table 2 Here]

Table 2 reports the results. In the simplest specification (column 1), the coefficient on $Affiliated$ is 4.32 bps (t-stat of 11.99), indicating that affiliated borrowing carries a premium of 4.32 bps as compared to unaffiliated borrowing, and it is highly statistically significant. In columns (2) through (5), we sequentially add dealer- and market-level control variables. Our results suggest that repo spreads tend to be smaller when the dealer-affiliated BHC has higher credit risk, the DI has higher reserves, and the amount of Fed-provided liquidity is high. Additionally, repo spreads tend to rise at the zero-lower-bound and at the end of

[22] Figure A.2 in the appendix shows that DI affiliated premiums tend to increase around quarter-end, consistent with the increase in balance sheet costs.

quarters (as documented by Correa et al. (2020)). The spreads also increase when SOFR is higher and the coupon supply elevates. With all these control variables, the affiliation premium remains positive and statistically significant, between the range of 4.15 to 4.77 bps when dealers get repo financing from affiliated lenders. In column (5), we add a calendar-day-fixed effect to control for unobserved time-varying conditions in the repo and Treasury markets. The result is stable to these additional controls.

5.2 Transaction Size and the Affiliation Premium

The analysis above relies on dealer-day volume-weighted average rates. We next examine whether the affiliation premium manifests similarly across trades of different sizes. Since our focus is on the overnight tri-party repo market, all transactions share identical terms (overnight) and collateral quality (Treasury collateral). Consequently, the primary distinguishing feature across transactions is their size. [23]

[Insert Figures 6 Here]

We visualize how trade sizes differ, Figure 6 provides density plots of tri-party repo transaction volumes by affiliation. We observe that affiliated trades have a distribution skewed toward larger sizes compared to unaffiliated trades. In fact, transactions above $5 billion are much more frequently affiliated (often DI-to-dealer trades), whereas unaffiliated trades are typically smaller (e.g., MMF lendings are often $1−$2 billion or less). This further underscores that affiliates serve as a large and continual source of liquidity for these dealers, capable of providing very sizable repo loans.

Taking a step back, the relationship between repo transaction size and repo rates is nuanced. Kotidis and Van Horen (2018) demonstrate that large clients in the repo market may secure more favorable rates due to their market power. Conversely, Perli (2024) highlights

[23] Another important feature of repo contracts is haircut. However, haircut rates for Treasury securities in the tri-party overnight repo market are generally stable, with most transactions receiving a standard 2 percent haircut. For our sample, the median haircut is 1.96 percent with a standard deviation of 0.33 percent. For robustness check, we repeat Table 3 by including haircut in the analysis and report the results in Table A.5 of the appendix.

that market liquidity and volatility can influence price impact; during periods of stress or low liquidity, larger transactions may exert a more pronounced effect on prices, potentially leading to higher rates for larger trades. To investigate the role of transaction size in shaping repo spreads of affiliates vs. unaffiliated lenders, we leverage transaction-level data (note the number of observations) and replicate the regression analysis in Table 2. The dependent variable is the repo spread of each individual transaction relative to IORB, $Repo\ Spread_{D,L,t,s}$, where t refers to a specific transaction on a given day t. We also replace the dealer-level aggregate daily trading volume $Repo\ Volume_{D,t}$ with the volume of each individual repo transaction, $Transaction\ Size_{D,L,t,s}$. All other variables remain unchanged.

[Insert Table 3 Here]

Table 3 presents the results of regressions that control for transaction size. Consistent with earlier findings, we continue to see a positive and significant affiliation effect in transaction-level data. However, the magnitude of the affiliation premium at the transaction level is somewhat smaller than in the dealer-day aggregates. In the univariate regression (column 1), affiliated transactions are about 2.76 bps more expensive than unaffiliated (t-stat of 9.24). With dealer and day fixed effects in column (5), the premium is about 1.57 bps (t-stat of 7.34). These are roughly half the size of the dealer-averaged estimates, suggesting that some portion of the premium is realized through dealers perhaps choosing to do larger trades with affiliates (or other composition effects).

In unreported results, we also examined whether the premium varies with trade size by including an interaction of $Affiliated\ Lender \times Transaction\ Size$. We find a positive interaction term, indicating that the affiliation premium is a bit larger for larger trades, which is consistent with cash lenders receiving better rates when deploying large amounts funds. However, the economic magnitude of this interaction is modest as the affiliation dummy remains positive and statistically significant and most unaffiliated trades are not large in magnitude.

In summary, the transaction-level analysis confirms the presence of an affiliation premium across trades of various sizes and shows that larger trades do not eliminate the premium. If anything, after accounting for trade size, the affiliation effect remains robust, and larger affiliated transactions carry an additional premium compared to smaller trades. These findings underscore the pervasiveness of the affiliation premium and suggest that it is not driven solely by differences in trade size or negotiating power, but rather by structural factors related to the affiliation itself.

5.3 Non-Risk-Based Capital Constraints and The Affiliation Premium

The previous subsection established that affiliated repo borrowing rates are higher than unaffiliated ones. At first glance, this finding might seem counterintuitive: why would a dealer borrow at a higher rate, when it can get cheaper financing externally? As outlined in Section 3, internal repo transactions help reduce the burden of balance sheet costs associated with external repos, and the premium is a by-product of sharing these gains between the dealer and the affiliated lender.

In this subsection, we empirically test whether the affiliation premium is driven by non-risk-based capital requirements. As outlined in Section 3, borrowing externally in the tri-party market expands the balance sheets of the dealer and its BHC, thereby increasing regulatory capital requirements (like the SLR). In addition, banks may have internal risk limits or other motives to constrain balance sheet usage. Because repo funds raised via internal transactions with affiliates do not affect the consolidated balance sheet or capital ratios, the BHC can economize on balance sheet costs by using internal funding. Thus, when balance sheet costs are high, dealer borrowers should have a stronger incentive to curtail external borrowing and instead borrow internally, even if it means paying a premium to the affiliated lender. Figure 7 graphically shows how the affiliated premium co-moved with two measures of balance sheet costs: *CMTR* and *GCF-TGCR* spread.

[Insert Figure 7 Here]

To test this hypothesis, we examine how the affiliation premium moves with measures of dealer balance sheet cost. We estimate panel regressions where the dependent variable is the change in a dealer's affiliation premium over time, and the key independent variable is a change in that dealer's balance sheet cost. Specifically, we run regressions of the form:

$$\begin{aligned} \Delta Affiliation\ Premium_{D,t} &= \alpha + \delta \Delta BSCost_{D,t} + \sum \gamma_k \Delta BSCost_{D,t} \times Z_t^k \\ &\quad + \sum \beta_k Z_t^k + \sum \eta_k M_{D,t}^k \\ &\quad + \Delta Affiliation\ Premium_{D,t-5} + \varepsilon_{D,t}. \end{aligned} \tag{6}$$

where $\Delta Affiliation\ Premium_{D,t}$ is the five-day change in dealer D's affiliation premium on day t. $\Delta BSCost_{D,t}$ is the five-day change in the balance sheet cost proxy (e.g., the CMTR spread) for dealer D. We include interaction terms of $\Delta BSCost$ with key dummy variables Z_t^k (such as the SLR exemption period dummy) to see if the relationship changes in those regimes. We also include controls Z_t^k for factors like ZLB, quarter-end, system liquidity changes, etc., and $M_{D,t}^k$ for any dealer-specific controls (e.g., changes in reserves at the dealer's affiliate bank). We include a lagged change in the affiliation premium to control for persistence. Standard errors are adjusted for dealer-level clustering and time-series correlation (using Driscoll-Kraay as needed given the panel spans are short).

Before presenting regression results, we note that Figure 7 which looks at the balance sheet cost proxies visually suggested a correlation. The affiliation premium and the two balance sheet cost proxies, the dealer-specific $CMTR$ spread and the market-wide *GCF-TGCR* spread, move together and all fell markedly during the SLR exemption period (Apr 2020 to Apr 2021). We formally confirm this with regressions.

[Insert Tables 4 and 5 Here]

Tables 4 summarizes our main findings using the change of the balance sheet cost measure.[24] The results show that affiliation premiums are higher when balance sheet costs are

[24] Table A.2 presents a robust test using the level of the balance sheet cost measure.

higher, and they increase as balance sheet costs increase. Specifically, we find that a one basis point increase in the dealer's $CMTR$ spread is associated with approximately a 0.62 bps increase in that dealer's affiliation premium (t-stat of 4.704). This is a substantial pass-through: roughly 63% of marginal balance sheet cost increases are reflected in a wider internal/external repo spread.

This relationship holds even after controlling for lender characteristics, interest rate environment shifts, and Treasury market conditions. Notably, the correlation between the affiliation premium and the $CMTR$ spread weakens during the SLR exemption period. In particular, when we interact the change in $CMTR$ with the SLR exemption dummy, the coefficient on the interaction is approximately –0.49 bps (t-stat of –3.79) in Specification (4), nearly offsetting the base effect, which is 0.53 in that specification. In other words, during the period when SLR constraints were relaxed, the sensitivity of the affiliation premium to balance sheet costs essentially vanished. This is consistent with our hypothesis: when balance sheet constraints were effectively neutralized by the temporary rule change, internal vs. external funding should have been on a more equal footing cost-wise, and indeed the premium largely disappeared and became unresponsive to the cost proxy.

As a robustness check, we also use the traditional market-wide measure, the *GCF-TGCR* spread instead of $CMTR$. Those results in Table 5 also show a positive relationship: using changes, the coefficient on Δ *GCF–TGCR* is about 0.19 bps (t-stat of 4.47) for the average affiliation premium.[25] While smaller than the dealer-specific measure's coefficient, it is still significant, indicating that even a coarse market-wide cost proxy picks up some of the effect.

Taken together, the findings in this section demonstrate that non-risk-based capital requirements are a key driver of the affiliation premium. Using both a dealer-specific balance sheet cost measure and more generic measures, we show that higher balance sheet costs lead to a significantly higher premium. Moreover, this effect disappears when regulatory constraints are relaxed during the SLR exemption period, strengthening the causal interpretation that

[25] Table A.3 and A.4 present a robust test using the level of the *GCF-TGCR* spread.

the premium is indeed related to regulatory cost pressures. These results highlight that the affiliation premium can be viewed as a form of regulatory arbitrage: dealers pay extra to borrow internally, effectively compensating their affiliates, but in doing so they ease their consolidated capital constraints.

5.4 The DI Affiliation Premium

Our investigation of the tri-party repo market uncovers another important fact: DIs of large BHCs actively deploy their reserve holdings in this market through their dealer affiliates. In the era of ample reserves (post-2008 and especially post-2020), large banks have been holding surplus reserves far above their immediate needs. Acharya and Rajan (2024) warn that flooding banks with central bank reserves doesn't automatically translate into more lending or market liquidity — banks may just hold the reserves, undermining the stimulative intent of monetary policy and causing money market distortions. In this section, we take a closer look at the specific affiliated lenders: DIs, and examine their behavior and the resulting premium.

The dealers in our sample are affiliated with largest BHCs whose bank subsidiaries hold vast quantities of reserves and thus have ample liquidity to deploy. Importantly, these banks have a very clear outside option for their funds: simply leaving them as reserve balances at the Fed to earn the $IORB$ rate. Earlier, we noted in Figure 2 that dealers actively borrow from their affiliated DIs in the tri-party market, and that the premium on this bank-provided funding is especially large, as shown in Figure 5. Also, Panel B in Figure 3 shows that the DIs themselves do not use tri-party to borrow and only use it to lend, and lend exclusively to their affiliated dealers. The combination of these observations suggests that the bank-dealer internal channel is how reserve liquidity held at banks gets funneled into the repo market.

[Insert Table 6 Here]

Table 6 replicates the results in Table 2, separating the volume weighted average affiliated premium into DI affiliated lending and non-DI affiliated lending to directly measure effect of

DI affiliate lending. There we observe that the DI affiliated premium is much larger than the effect of average affiliated premium across both DI and non-DI affiliates, with point estimate of 7.19 (t-stat of 15.53) vs. 4.32 (t-stat of 11.99) . The increased premium of DI lending is indeed consistently higher across all specifications.

[Insert Table 7 Here]

Similarly, Table 7 repeats the empirical exercise in Table 4 and show how the DI affiliated premium changes with balance sheet costs. The results corroborate that the effects of balance sheet constraints are concentrated at the DI-level. Specifically, the results suggest that the sensitivity of the DI affiliated premium to balance sheet costs is 0.46. This suggests that the reduction in balance sheet costs is salient for DI lending.

In summary, we observe a distinct bank affiliation premium: when the affiliate is a bank, the repo rate paid by the dealer tends to be even higher. This is intuitive given the bank's opportunity cost is IORB and its bargaining power might be stronger. Thus, the affiliated bank charges a premium that roughly compensates it for giving up IORB interest. The dealer is willing to pay this as long as it's still beneficial compared to raising funds externally under balance sheet constraints. We find that this bank affiliation premium drives the overall affiliation premium in relation to balance sheet costs.

The takeaway is that affiliated banks play a pivotal role in internal repo markets: they supply internal lending at rates that incorporate the cost-of-funds considerations (IORB) and relieve balance sheet pressure for the dealer. This internal liquidity channel is an important piece of the modern market intermediation puzzle, as it connects the banking system's excess liquidity with the financing needs of non-bank market participants via the broker-dealer.

6 Liquidity Transmission: Internal Borrowing and Market Liquidity Provision

6.1 Pass-Through of Internal Funding to Market Liquidity

Figure 2 showed that the tri-party repo market primarily serves as a source of funding for dealers (left-hand side), and dealers engage in very little lending back into that same market (right-hand side). It is reasonable to hypothesize that funds raised by dealers in the tri-party market — whether from affiliated or unaffiliated lenders — are subsequently intermediated into other repo market segments, particularly the bilateral repo market. In the bilateral market, primary dealers act as key lenders to various NBFI clients. If this is the case, the higher internal funding costs, that is, the affiliation premium, could be passed through to external borrowers such as hedge funds and mortgage REITs that rely on dealers for financing in the bilateral market.

In this subsection, we empirically test the relevance of internal borrowing for dealers' overall lending activities in other repo segments. Using the FR 2052a data, we analyze how dealers' borrowing from affiliated vs. unaffiliated sources relate to their reverse repo lending to other entities. Although this dataset lacks transaction-level details and pricing information such as repo rates, it provides daily aggregate volumes of borrowing and lending segmented by counterparty type for each dealer in our sample. For each dealer (D) on each day (t), we compute the following:

- $Repo_{D,t}^{Aff.}$: the total overnight repo volume borrowed from affiliated institutions (internal borrowing);
- $Repo_{D,t}^{UnAff.}$: the total overnight repo volume borrowed from unaffiliated lenders (external borrowing);
- $ReverseRepo_{D,t}^{Aff.}$: the total overnight reverse repo volume the dealer lent to affiliated counterparties (internal lending);

- $ReverseRepo_{D,t}^{UnAff.}$: the total overnight reverse repo volume lent to unaffiliated counterparties (external lending);

- $ReverseRepo_{D,t}^{All}$: the total overnight reverse repo volume lent to all counterparties.

We then consider the five-day changes in these volumes to examine the flow-through. Specifically, we estimate panel regressions of the form, an approach similar to that of Carlson and Macchiavelli (2020):

$$\Delta ReverseRepo_{D,t}^{All} = \alpha + \gamma \Delta Repo_{D,t}^{Aff.} + \delta \Delta Repo_{D,t}^{UnAff.} + \beta CDS_{D,t-5} + \mathbb{1}_D + \mathbb{1}_t + \varepsilon_{D,t}, \quad (7)$$

$$\Delta ReverseRepo_{D,t}^{Aff.} = \alpha + \gamma \Delta Repo_{D,t}^{Aff.} + \delta \Delta Repo_{D,t}^{UnAff.} + \beta CDS_{D,t-5} + \mathbb{1}_D + \mathbb{1}_t + \varepsilon_{D,t}, \quad (8)$$

$$\Delta ReverseRepo_{D,t}^{UnAff.} = \alpha + \gamma \Delta Repo_{D,t}^{Aff.} + \delta \Delta Repo_{D,t}^{UnAff.} + \beta CDS_{D,t-5} + \mathbb{1}_D + \mathbb{1}_t + \varepsilon_{D,t}. \quad (9)$$

In these specifications, we control for dealer credit risk using the five-day lagged CDS spreads of the dealer's holding company ($CDS_{D,t-5}$) and include dealer fixed effects ($\mathbb{1}_D$) and day fixed effects ($\mathbb{1}_t$). Standard errors are computed using Driscoll-Kraay corrections with 12-day lags, to account for cross-sectional dependence and serial correlation.

[Insert Tables 8 and 9 Here]

Table 8 presents our core findings on the relationship between a dealer's internal borrowing and its reverse repo lending. We find a strong pass-through effect: for every additional dollar a BHC-affiliated dealer borrows from affiliated counterparties, its total reverse repo lending increases by approximately 55 cents **(*t*-stat of 14.90)** in column (1). Of this, about 19 cents (*t*-stat of 7.57) is lent back to other affiliated entities within the BHC in column (3), and about 36 cents (*t*-stat of 11.55) flows to unaffiliated borrowers in column (5). This pattern suggests that while some portion of internal funding is recycled within the holding company, a majority of funds borrowed by dealers — more than two-thirds — flows to unaffiliated parties (external borrowers), enhancing market-wide liquidity. Notably, most lending occurs in the bilateral repo market, where hedge funds, smaller dealers, and other NBFIs are the primary borrowers.

Recognizing that absolute trading volumes vary with dealer size, we perform a robustness check by examining the proportion of trading volume allocated to each counterparty type, scaled by the dealer's total repo or reverse repo volume on each day. Table 9 confirms that the results remain consistent in magnitude and statistical significance across alternative specifications. For every additional dollar of internal borrowing, reverse repo lending increases by 60-64 cents relative to prior-period levels, with roughly 14 cents of this going to affiliated counterparties and the remaining $46-50$ cents flowing to unaffiliated borrowers. This consistency across absolute and relative specifications underscores the robustness of our results.

The role of affiliated dealers as liquidity conduits is further highlighted by additional analyses when we focus on the internal repo borrowing specifically from DIs with large central bank reserves. Table 10 shows that the above pattern holds when disaggregating internal borrowing into DI-affiliated and non-DI affiliated sources. For every dollar of reverse repo lending, about 42-45 cents (in level terms) or about 50-61 cents (in ratio terms) is linked to increased reverse repo activity via DI affiliates, compared to 61–65 cents via non-DI affiliates. These results confirm that both DI and non-DI affiliated channels are important sources of liquidity redistribution.

Taken together, the evidence suggests that internal funding obtained by BHC-affiliated dealers is not merely a mechanism for intra-group liquidity management, but a crucial channel for redistributing reserves and liquidity to the broader financial system. These internal flows enable affiliated dealers to intermediate between cash-rich affiliates (such as depository institutions) and external counterparties, thereby sustaining liquidity provision even when balance sheet constraints bind. The capacity of affiliated dealers to tap into internal funding thus plays a critical role in maintaining market functioning, particularly during times of market dislocation or regulatory stress.

Moreover, the funding costs the dealer faces, such as the affiliation premium, can indeed be transmitted outward. If internal funds are more costly and those funds constitute a sizable portion of the dealer's funding base that it uses to extend loans, one might expect that to put upward pressure on the rates the dealer charges its borrowers, say hedge funds. Essentially, the dealer needs to cover its funding cost. We do not directly observe the rates in the bilateral market for each dealer's clients due to the data limitation. However, we can indirectly gauge the effect by looking at market indicators, which we do next.

6.2 Spillovers to Repo Market Pricing and Policy Implications

Our findings thus far indicate that (i) affiliated borrowing is more expensive due to balance sheet costs, and (ii) roughly half of the repo funds dealers raise internally flow out to unaffiliated borrowers. This naturally raises the question: How does the affiliation premium affect broader repo market pricing or near-arbitrage relationships?

Unfortunately, there is no comprehensive pricing data for all repo market segments. However, we can gauge the effect of the increased tri-party repo funding costs to (near) arbitrage activities in the Treasury market, say the cash-futures basis trade. This trade entails going long Treasury securities while shorting Treasury futures, and it requires repo financing for the cash bonds. The profitability and scale of the basis trade depends on the cost of repo funding. When repo funding is expensive or constrained — as might happen when balance sheet costs bite, the basis trade widens.

[Insert Figure 8 Here]

Specifically, we compare the general financing cost in the bilateral repo market with that in the tri-party repo market. A key consideration is that a bilateral repo transaction may be driven by either the need for financing or the demand for specific collateral, the latter of which can create "specialness" in the repo rate. Therefore, to ensure a fair comparison of financing costs, our analysis focuses on financing-motivated repo transactions. Although the limited availability of detailed transaction data in the bilateral repo market poses challenges, the approach we borrowed from Gilcoes, Iorio, Monin, and Petrasek (2024) successfully isolates these financing-driven costs.[26] By combining our analysis of repo volumes and pricing with their insights, we can infer the impact of internal funding frictions on broader market pricing.

We find evidence that the affiliation premium's fluctuations correlate with movements in the Treasury cash-future basis. When the affiliation premium declined sharply during the SLR exemption (internal funding became cheaper), dealers were able to intermediate more freely, and the Treasury basis narrowed as observed in early 2021. Conversely, when the affiliation premium re-emerged after the exemption ended, the basis widened again. Figure 8 shows that reductions in the affiliation premium are closely followed by decreases in the observed cash-futures basis spread labeled as *TRACE Proxy* in Gilcoes et al. (2024). This suggests that when internal funding frictions are alleviated, it has a tangible effect on market pricing, reducing dislocations.

In policy circles, one proposal to address the persistent Treasury basis spread has been for the Fed to directly intervene by borrowing in repo or using its balance sheet to relieve dealer constraints; for example, Kashyap, Stein, Wallen, and Younger (2025) argue the Fed could take on the basis trade itself.[27] This policy proposal is attractive because it would not alter the Feds interest rate exposure, could (in principle) be a short-term intervention, and would provide Treasury futures for asset managers that demand them. Such interventions, however, involve the Fed's participation in the futures market in potentially complex ways.

Our findings point to a more straightforward policy lever: reducing the binding nature of leverage requirements (like SLR) during stressed times or permanently recalibrating them. Doing so would directly lower balance sheet costs, shrinking the affiliation premium, and thereby allowing funding to flow more freely through the short-term funding system. This type of policy, along with central bank open market operations or standing facilities that provide repo funding, may be an effective way for liquidity to be deployed more broadly, ultimately alleviating market stress.

[26] Panel B of Figure 8 is copied from the original Figure 6 in Gilcoes et al. (2024).

[27] See Barth, Kahn, et al. (2021) for an alternative model that characterizes how intermediaries support the cash-future basis trade.

In essence, the affiliation premium we document can be seen as a barometer of balance sheet strain in the system. A high premium indicates dealers are effectively paying extra to shuffle liquidity internally to avoid balance sheet costs, which in turn affects market pricing and liquidity. Keeping that premium in check, either via regulatory tweaks or central bank facilities that provide cheap financing, can help ensure liquidity flows across markets and prevent large distortions.

7 Conclusion

Understanding internal liquidity management within bank holding companies is crucial for understanding the unique roles played by different financial intermediaries in the modern financial system. Moreover, the efficient flow of liquidity in U.S. funding markets is central to the functioning of financial markets and the transmission of monetary policy. In this paper, we show that the internal capital markets of large bank holding companies play a pivotal role in redistributing liquidity across the financial system by mitigating regulatory constraints faced by intermediaries.

Our paper provides the first in-depth analysis of internal repo market looking at both volumes and prices. Using confidential, transaction-level data from the tri-party Treasury repo market, we find that affiliated entities—specifically commercial bank subsidiaries within the same BHC as dealers—routinely lend to their dealer affiliates, but rarely to unaffiliated dealers. These internal repo transactions account for a substantial share of dealers' daily borrowing and are consistently priced at a premium of approximately 4 basis points relative to trades with unaffiliated lenders. We refer to this spread as the affiliation premium.

We argue that this premium reflects regulatory arbitrage within the BHC: while internal transactions are economically similar to external ones, they do not increase the consolidated balance sheet and therefore do not incur additional capital charges under the Supplementary Leverage Ratio (SLR). The resulting regulatory surplus is shared between the affiliated lender and borrower, giving rise to a positive pricing premium.

Notably, we find that the affiliation premium is tightly linked to dealers' balance sheet costs. It increases with proxies for balance sheet pressure (particularly those related to Treasury market intermediation) and disappears during the temporary SLR exemption for reserves and Treasuries.

These findings highlight how the regulatory environment shapes liquidity flows and dealers' intermediation activity. In particular, they show that commercial banks' willingness to deploy reserves into broader funding markets depends on their ability to deliver regulatory relief at the BHC level. As a result, internal capital markets within BHCs serve as a conduit for transmitting bank liquidity to non-bank financial institutions. The effectiveness of this channel, however, is conditional on the structure of regulatory constraints—such as the SLR—that influence the internal cost of balance sheet usage.

References

Acharya, Viral, and Raghuram Rajan, 2024, Liquidity, liquidity everywhere, not a drop to use: Why flooding banks with central bank reserves may not expand liquidity, *Journal of Finance* 79, 2943–299.

Adrian, Tobias, Brian Begalle, Adam Copeland, and Antoine Martin, 2013, Repo and securities lending, in *Risk topography: Systemic risk and macro modeling*, 131–148.

Anbil, Sriya, Alyssa G Anderson, and Zeynep Senyuz, 2021, Are repo markets fragile? evidence from september 2019, *Board of Governors of the Federal Reserve System working paper.*

Barth, Daniel, R Jay Kahn, et al., 2021, Hedge funds and the treasury cash-futures disconnect, *OFR WP* 21–01.

Bostrom, Erik, 2025, Insights from mmf portfolio allocations amid balance sheet normalization, *FEDS Notes.*

Bowman, David, Yesol Huh, and Sebastian Infante, 2024, Balance-sheet netting in us treasury markets and central clearing, *Board of Governors of the Federal Reserve System working paper.*

Bräuning, Falk, and Hillary Stein, 2025, Evidence that relaxing dealers' risk constraints can make the treasury market more liquid, *Federal Reserve Bank of Boston Research Paper Series Current Policy Perspectives Paper* 25-4.

Caglio, Cecilia, Adam M Copeland, and Antoine Martin, 2021, The value of internal sources of funding liquidity: Us broker-dealers and the financial crisis, *FRB of New York Staff Report*, no. 969.

Carlson, Mark, and Marco Macchiavelli, 2020, Emergency loans and collateral upgrades:

How broker-dealers used federal reserve credit during the 2008 financial crisis, *Journal of Financial Economics* 137, 701–722.

Chabot, Lia, Paul Cochran, Sebastian Infante, and Benjamin Iorio, 2024, Dealer balance sheet constraints evidence from dealer-level data across repo market segments, *FEDS Notes*.

Copeland, Adam, Darrell Duffie, Antoine Martin, and Susan McLaughlin, 2012, Key mechanics of the us tri-party repo market, *Economic Policy Review* 17.

Copeland, Adam, Antoine Martin, and Michael Walker, 2014, Repo runs: evidence from the tri-party repo market, *The Journal of Finance* 69, 2343–2380.

Cordes, Lucy, and Sebastian Infante, 2025, Repo rate sensitivity to treasury issuance and quantitative tightening, FEDS Notes.

Correa, Ricardo, Wenxin Du, and Gordon Y Liao, 2020, U.s. banks and global liquidity, *National Bureau of Economic Research Working Paper*, No. 27491.

D'avernas, Adrien, and Quentin Vandeweyer, 2024, Treasury bill shortages and the pricing of short-term assets, *The Journal of Finance* 79, 4083–4141.

Duffie, Darrell, 1996, Special repo rates, *The Journal of Finance* 51, 493–526.

Duffie, Darrell, 2025, How us treasuries can remain the world's safe haven, *Journal of Economic Perspectives* 39, 195–214.

Duffie, Darrell, Michael J Fleming, Frank M Keane, Claire Nelson, Or Shachar, and Peter Van Tassel, 2023, Dealer capacity and us treasury market functionality, *FRB of New York Staff Report*, no. 1070.

Favara, Giovanni, Sebastian Infante, and Marcelo Rezende, 2022, Leverage regulations and treasury market participation: Evidence from credit line drawdowns, *Available at SSRN* 4175429.

Gertner, Robert, David Scharfstein, and Jeremy Stein, 1994, Internal versus external capital markets, *Quarterly Journal of Economics* 1211–30.

Gilcoes, Jonathan, Benjamin Iorio, Phillip Monin, and Lubomir Petrasek, 2024, Quantifying treasury cash-futures basis trades, *FEDS Notes*.

Han, Song, Kleopatra Nikolaou, and Manjola Tase, 2022, Trading relationships in secured markets: Evidence from triparty repos, *Journal of Banking & Finance* 139, 106486.

He, Zhiguo, Stefan Nagel, and Zhaogang Song, 2022, Treasury inconvenience yields during the COVID-19 crisis, *Journal of Financial Economics* 143, 57–79.

Hempel, Samuel J, Calvin Isley, R Jay Kahn, and Patrick E McCabe, 2023, Money market fund repo and the on rrp facility, *FEDS Notes*.

Huber, Amy Wang, 2023, Market power in wholesale funding: A structural perspective from the triparty repo market, *Journal of Financial Economics* 149, 235–259.

Infante, Sebastian, 2019, Liquidity windfalls: The consequences of repo rehypothecation, *Journal of Financial Economics* 133, 42–63.

Infante, Sebastian, 2020, Private money creation with safe assets and term premia, *Journal of Financial Economics* 136, 828–856.

Infante, Sebastian, Lubomir Petrasek, Zack Saravay, and Mary Tian, 2022, Insights from revised form fr2004 into primary dealer securities financing and mbs activity, *FEDS Notes*.

Infante, Sebastian, and Zack Saravay, 2025, Treasury re-use and the demand for safe assets, *Review of Financial Studies* forthcoming.

Kahn, R Jay, Matthew McCormick, Vy Nguyen, Mark Paddrik, and H Peyton Young, 2023, Anatomy of the repo rate spikes in september 2019, *Journal of Financial Crises* 5, 1–25.

Kashyap, Anil K, Jeremy C Stein, Jonathan L Wallen, and Joshua Younger, 2025, Treasury market dysfunction and the role of the central bank, *Brookings Papers on Economic Activity*.

Kotidis, Antonis, and Neeltje Van Horen, 2018, Repo market functioning: The role of capital regulation, *CEPR Discussion Paper*, No. DP13090.

Krishnamurthy, Arvind, Stefan Nagel, and Dmitry Orlov, 2014, Sizing up repo, *Journal of Finance* 69, 2381–2417.

Lopez-Salido, David, and Annette Vissing-Jorgensen, 2023, Reserve demand, interest rate control, and quantitative tightening, *European Central Bank Working Paper*.

Lu, Lina, Marco Macchiavelli, and Jonathan Wallen, 2023, Internal and external capital markets of large banks, *Available at SSRN 4660712*.

Munyan, Benjamin, 2017, Regulatory arbitrage in repo markets, *Office of Financial Research Working Paper*, 15-22.

Paddrik, Mark E., and Carlos A. Ramírez, 2025, Treasury triparty repo pricing, *Working Paper*.

Perli, Roberto, 2024, Facing quarter-end pressures: Understanding the repo market and federal reserve tools, *Speech at New York University*, see https://www.newyorkfed.org/newsevents/speeches/2024/per241112.

Stein, Jeremy, 1997, Internal capital markets and the competition for corporate resources, *Journal of Finance* 111–133.

Stein, Jeremy, and David Scharfstein, 2000, The dark side of internal capital markets: Divisional rent-seeking and inefficient investment, *Journal of Finance* 2537–64.

Figure 1: Stylized View of Dealer, Affiliated Lender, and BHC Balance Sheets

This figure presents a stylized view of dealer, affiliated lender, and BHC balance sheets. The figure shows that when the dealer borrows θT from an affiliated lender, the size of the consolidated firms balance sheet is lower by the same amount. Given a balance sheet cost C, this borrowing results in a reduction of dealer balance sheet costs of: $C(R+T) - C(R+(1-\theta)T)$.

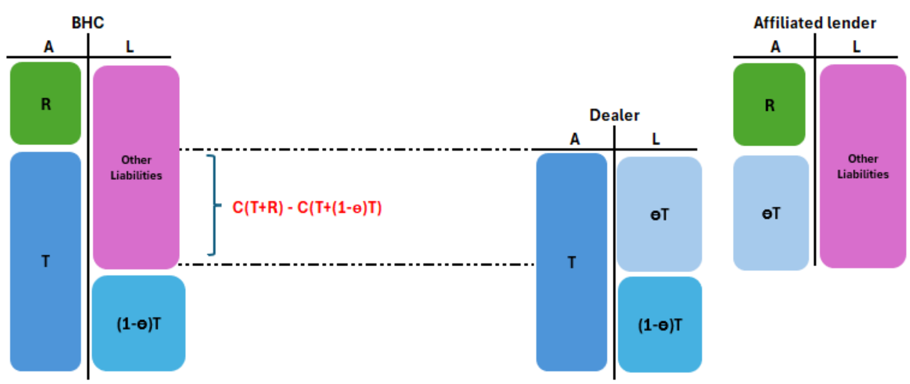


Figure 2: Dealers' Tri-party Repo Volumes by Counterparty

This figure presents the aggregate overnight tri-party repo volume in billion dollars for primary dealers in our sample, broken down by conterparty type. We consider four counterparty types: depository institutions affiliated within the BHC (Affiliated DI), other lenders affiliated within the BHC (Affiliated Other), money market funds and omnibus accounts not within the BHC (Unaffiliated MMF), and other entities that are not affiliated within the same BHC (Unaffiliated Other). Panel A (left) is the daily repo volumes that dealers borrow from and Panel B (right) is the daily repo volumes that dealers lend to. The sample period is from February 2018 to March 2025.

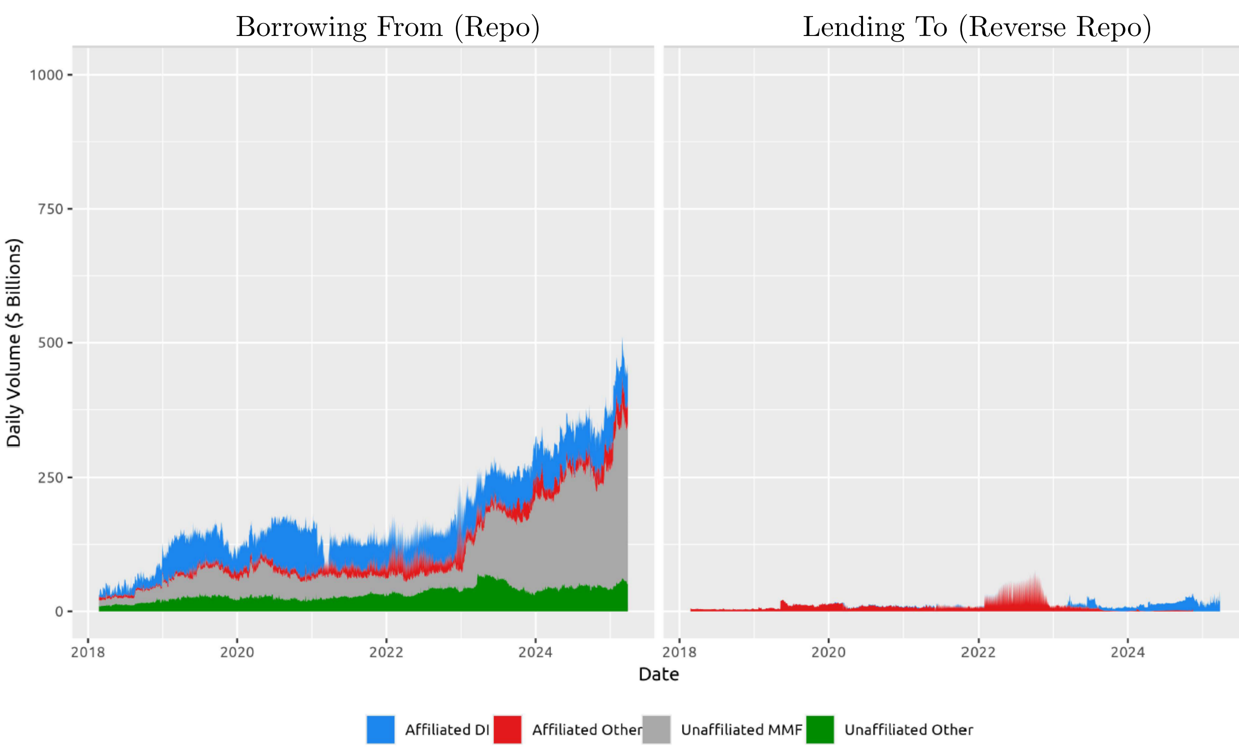


Figure 3: Non-Dealer Affiliates' Tri-party Repo Volumes by Counterparty

This figure presents the aggregate overnight tri-party repo volume in billion dollars for non-dealer affiliates of the five BHCs in our sample, broken down by conterparty type. Panel A is for all non-dealer affiliates and Panel B is for depository institution (DI) affiliates. We consider four counterparty types: dealers affiliated within the BHC (Affiliated Dealer), other lenders affiliated within the BHC (Affiliated Other), money market funds and omnibus accounts not within the BHC (Unaffiliated MMF), and other entities that are not affiliated within the same BHC (Unaffiliated Other). In each panel, the left plot regards to repo volumes borrowing from and the right plot for repo volumes lending to. The sample period is from February 2018 to March 2025.

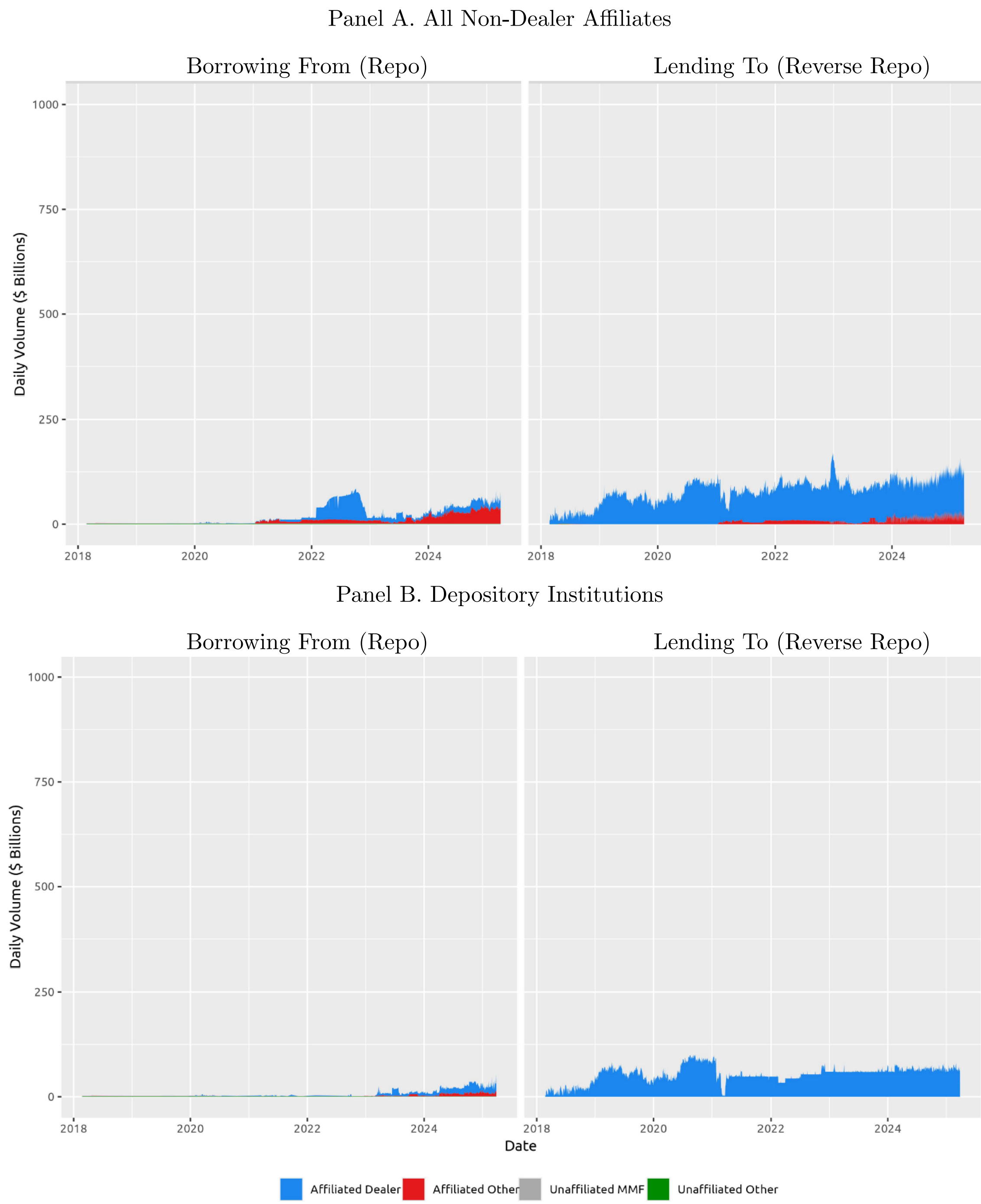


Figure 4: Affiliated vs Unaffiliated Repo Spreads to IORB

This figure plots the five-day moving average of the daily tri-party rate spreads to IORB for affiliated (blue line) versus unaffiliated (black line) lenders, aggregated across primary dealers in our sample. The daily rate is the volume-weighted average across overnight tri-party repo transactions within each counterparty group. The sample period is from February 2018 to March 2025.

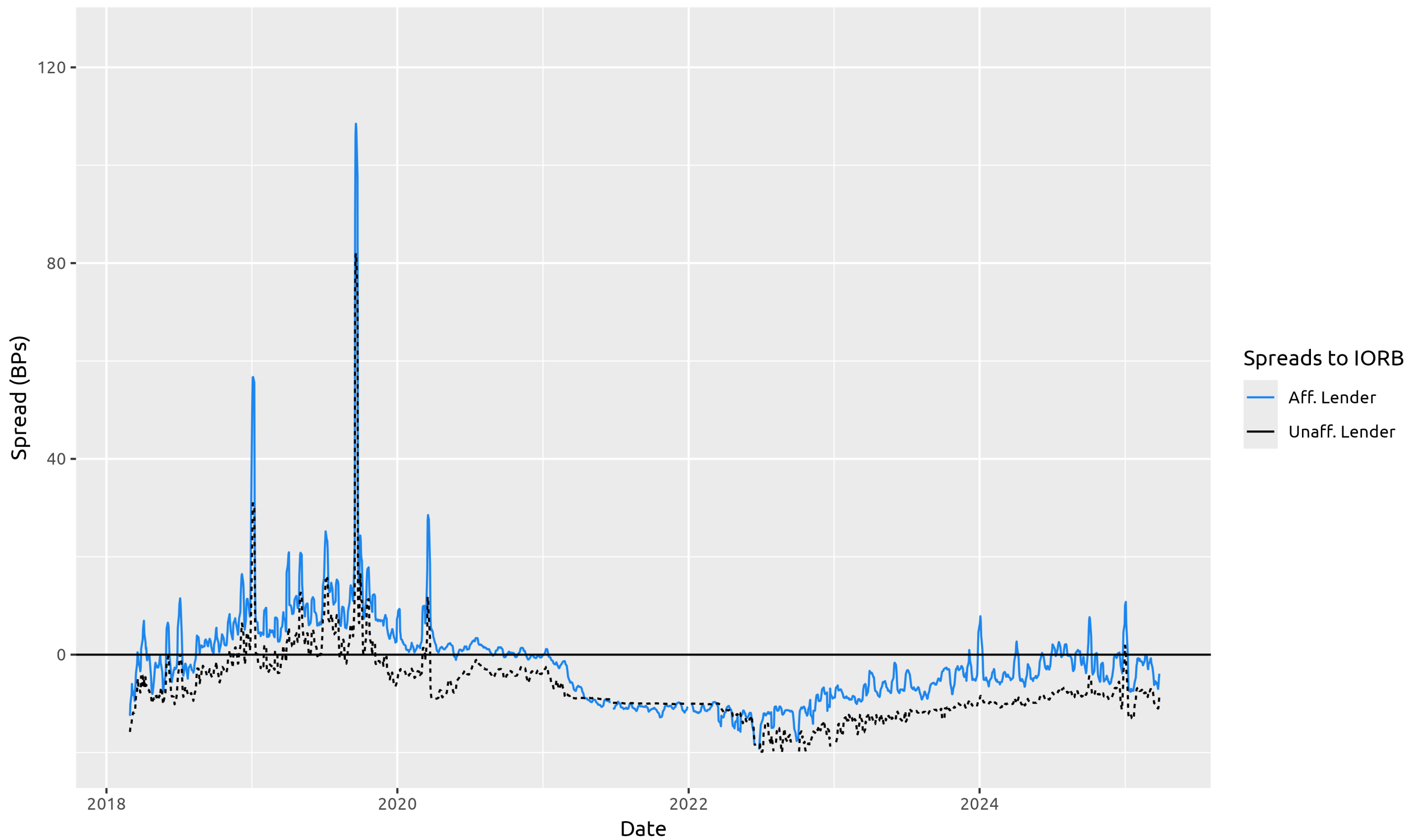


Figure 5: DI and Non-DI Affiliation Premium

This figure plots the five-day moving average of daily affiliation premium (affiliated rate minus unaffiliated rate). The blue line shows the affiliation premium where DI is cash lender, while the red line shows the affiliation premium where non-DI affiliates are cash lenders. The sample period is from February 2018 to March 2025.

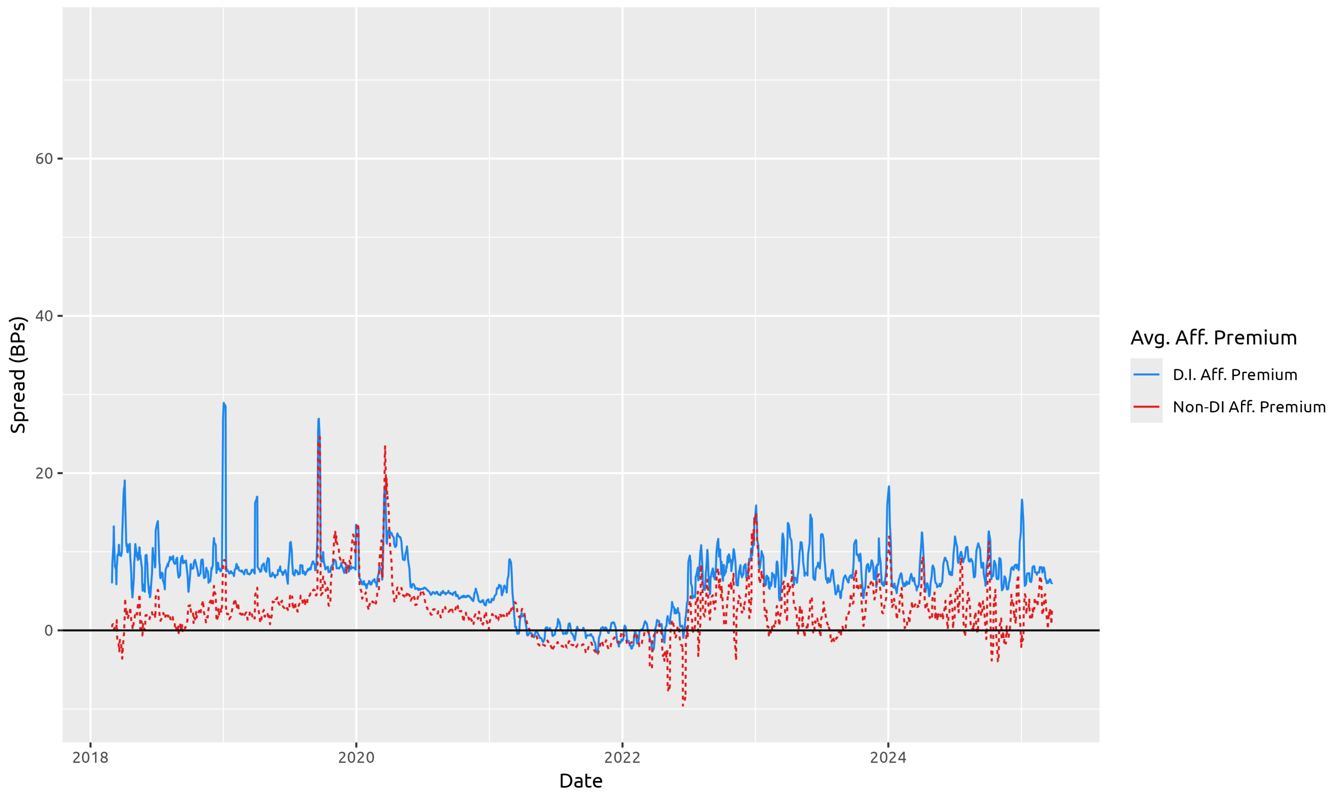
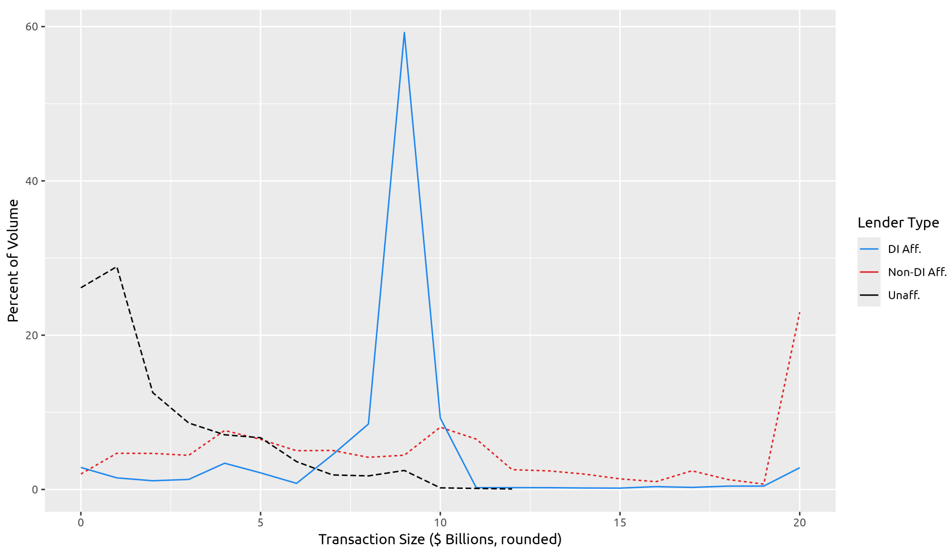


Figure 6: Trade Sizes, Repo Volumes, and Trading Frequency

These figures show overnight tri-party Treasury repo lending, by lender type, to the five dealers in our sample based on individual transaction size. The percent of volume done at each transaction size is shown in Panel A and the percent of number of trades done at each transaction size is shown in Panel B. tri-party repo data is collected by the Federal Reserve Bank of New York The sample period is from February 2018 to March 2025.

Panel A. Trade Frequency



Panel B. Trade Volumes

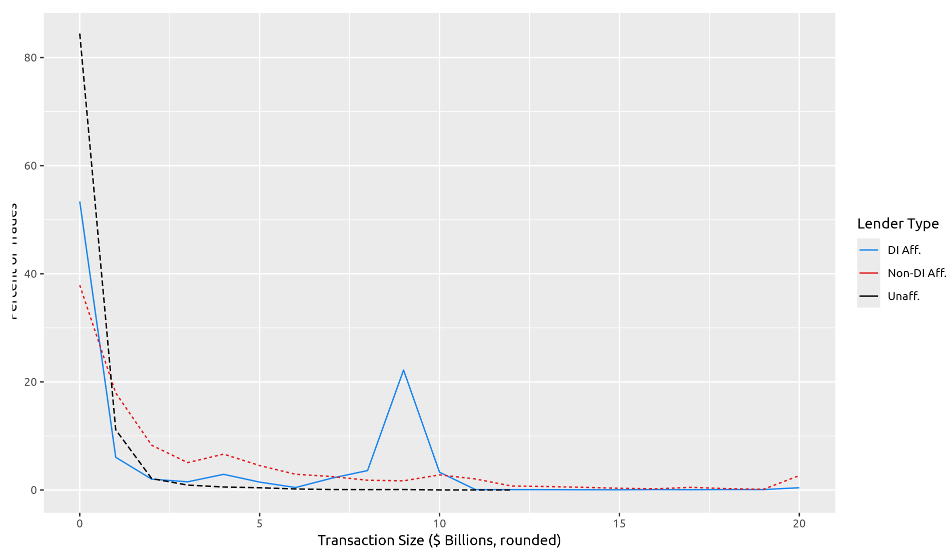


Figure 7: The Affiliation Premium and Balance Sheet Cost Proxies

This figure plots the five-day moving average of daily affiliation premium and two balance sheet cost proxies. The blue line shows the volume-weighted average affiliated premium, the red line shows the cross-market Treasury repo (CMTR) rate average across the dealers in the sample, and the black line shows the spread between the general collateral financing (GCF) rate and the tri-party General collateral rate (TGCR). The sample period is from February 2018 to March 2025.

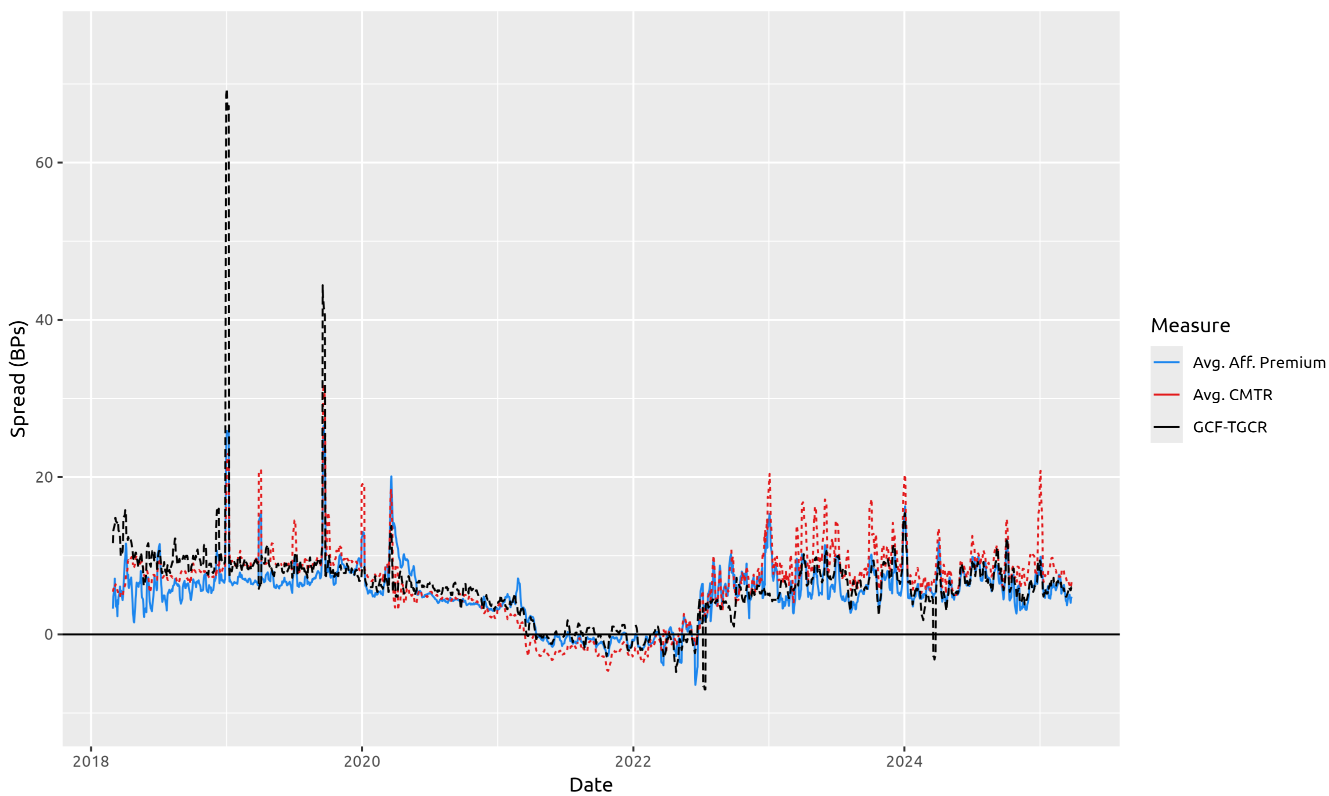
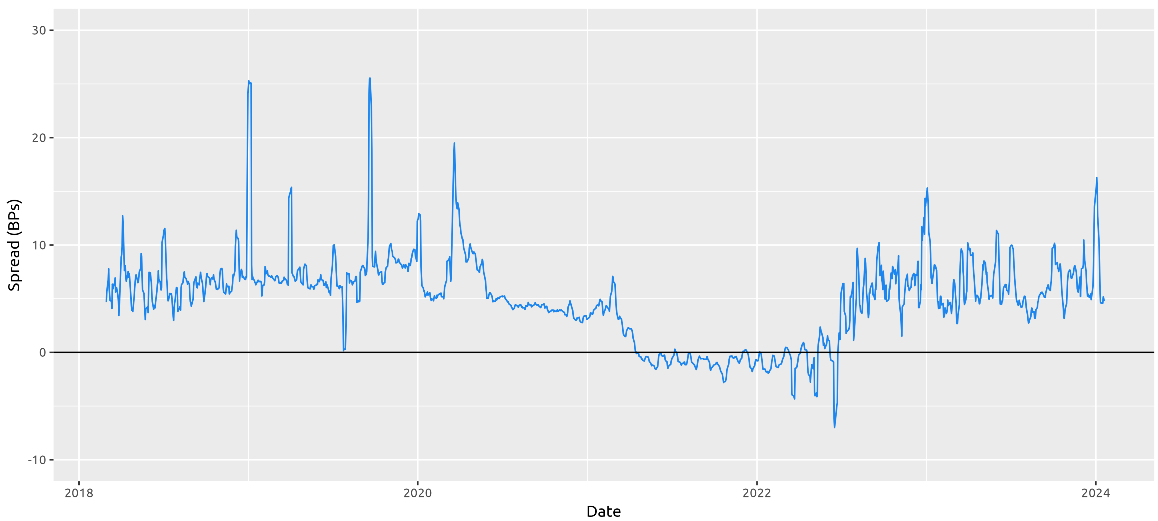


Figure 8: Affiliated Premium and Proxies for Cash-Futures Basis Trading Volume

Panel A plots the five-day moving average of the affiliated premium, as seen in Figure 5. Panel B displays proxies representing the aggregate size of the cash-futures basis trade. The proxies in Panel B are those from taken directly from *Glicoes et al. (2024)*. The sample period displayed for both Panels is February 2018 to January 2024 to match the sample period available in Panel B.

Panel A. Affiliated Premium



Panel B. Basis Trade Measures: TRACE Proxy vs From PF NetRepo

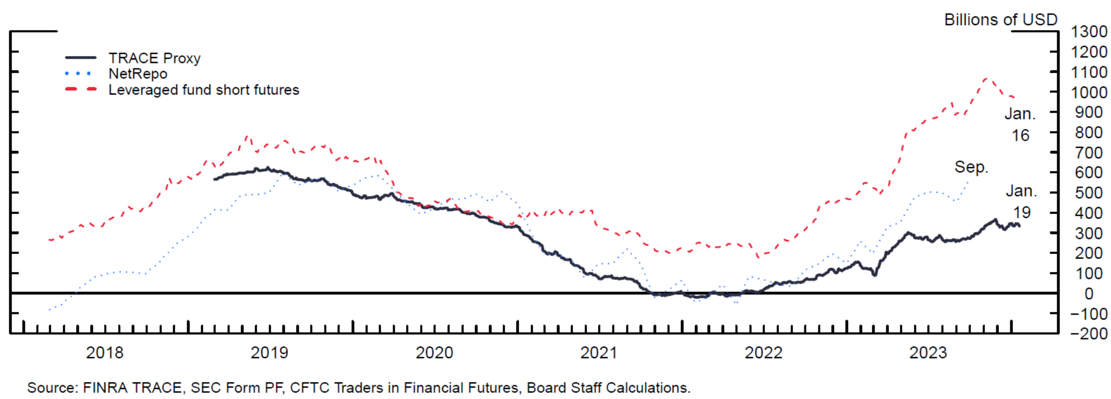


Figure 9: Reference Rates Spreads to IORB

This figure plots the five-day moving average of daily reference rate spreads to interest on reserve balances (IORB) using data from the Federal Reserve Bank of New York. Specifically, we show the tri-party General Collateral Rate (TGCR) spread and the General Collateral Financing rate (GCF) spreads to IORB. TGCR and IORB are from the Federal Reserve Bank of New York, while the GCF rate is for overnight Treasury repo transactions collected by the Depository Trust and Clearing Corporation (DTCC). The sample period is from February 2018 to March 2025.

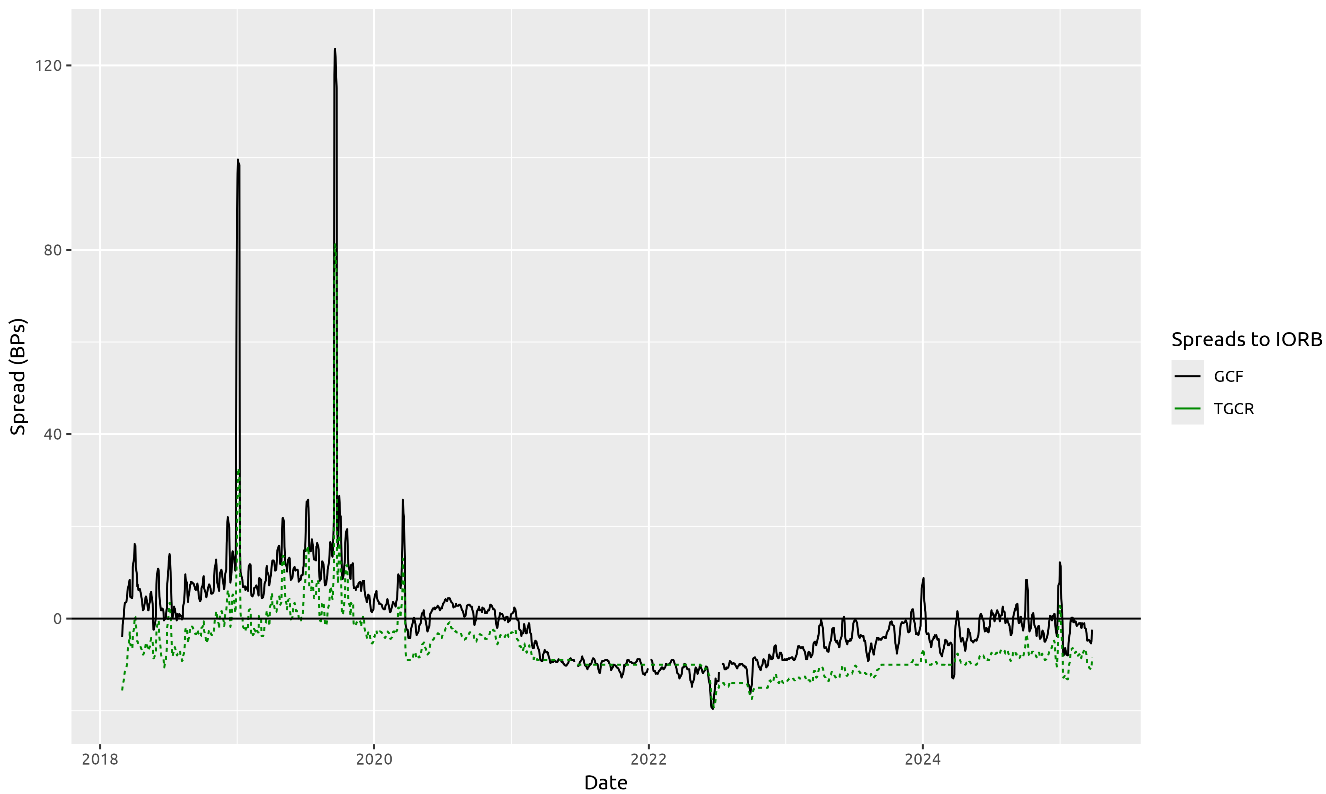


Table 1: Summary Statistics

This table highlights key summary statistics for variables in the analysis. Panel A covers market-specific data, such as those from the Tri-Party market. Panel B covers market-wide data from the FR 2052a/5G collection. Panel C covers additional summary statistics for control variables used throughout the regressions. All changes are 5-day changes and D indicates dealer-specific measurements. For all panels, the data is at a daily frequency and the sample is from 2018 through 2025.

Panel A. Market-Specific Repo Data

Variable	Lender Type	Mean	Median	STD	P25	P75	Count
Tri-Party Repo Spread$_{D,t}$ (bps)	Aff. All	-3.18	-4.54	14.06	-10.00	2.35	8172
	Aff. DI	-0.86	-1.16	13.53	-9.00	4.20	5039
	Unaff.	-7.59	-8.85	12.30	-10.49	-3.43	8323
Tri-Party Repo Volume$_{D,t}$ ($bil)	Aff. All	17.60	9.70	18.75	4.75	24.90	8181
	Aff. DI	18.90	5.50	21.95	1.60	37.66	5044
	Unaff.	23.72	14.88	27.46	6.55	27.07	8331
Tri-Party Aff. Premium$_{D,t}$ (bps)		4.43	3.79	10.72	-0.63	7.28	7784
Tri-Party DI Aff. Premium$_{D,t}$ (bps)		5.04	4.04	8.15	0.06	7.82	4946
CMTR$_{D,t}$ (bps)		6.03	5.96	8.86	1.19	8.83	7935
GCF-TGCR Spread$_t$ (bps)		5.97	6.00	9.26	4.00	8.00	1777
ΔAff. Premium$_{D,t}$ (bps)		0.01	-0.00	12.04	-1.07	1.04	7565
ΔAff. DI Premium$_{D,t}$ (bps)		-0.07	-0.00	7.45	-0.90	0.83	4612
ΔCMTR$_{D,t}$ (bps)		-0.01	0.00	8.68	-1.19	1.15	7733
ΔGCF-TGCR Spread$_t$ (bps)		-0.02	0.00	11.96	-1.00	1.00	1777

Panel B. Market-Wide Repo and Reverse Repo Data

Variable	Trading With	Mean	Median	STD	P25	P75	Count
ΔOvernight Repo$_{D,t}$ ($bil)							
	Aff.	0.12	0.04	7.77	-2.76	2.78	7790
	Aff. DI	0.04	0.00	4.51	-1.00	1.00	7790
	Unaff.	0.17	0.13	10.10	-5.03	5.44	7790
ΔOvernight Rev Repo$_{D,t}$ ($bil)							
	Aff.	0.11	-0.00	4.73	-1.60	1.74	7790
	Aff. DI	0.05	0.00	2.76	-0.30	0.40	7790
	Unaff.	0.16	0.19	9.15	-5.06	5.45	7790
ΔOvernight Repo$_{D,t}$/Total Repo$_{D,t-5}$ (%)							
	Aff.	0.17	0.02	4.99	-1.59	1.64	7790
	Aff. DI	0.04	0.00	2.48	-0.55	0.54	7790
	Unaff.	0.20	0.09	5.73	-3.09	3.32	7790
ΔOvernight Rev Repo$_{D,t}$/Total Rev Repo$_{D,t-5}$ (%)							
	Aff.	0.09	-0.00	2.53	-0.90	0.99	7790
	Aff. DI	0.03	0.00	1.28	-0.16	0.21	7790
	Unaff.	0.22	0.10	5.38	-2.87	3.20	7790
	All	0.31	0.23	5.86	-3.04	3.52	7790

Panel C. Control Variables

Variable	Mean	Median	STD	P25	P75	Count
$CDS_{D,t}$ (bps)	65.70	58.56	21.85	51.11	76.98	9030
$SOFR_t$ (bps)	240.77	216.00	200.59	9.00	455.00	1767
Log(System Liquidity)$_t$ (Log $bil)	8.09	8.19	0.46	7.60	8.54	1769
Log(Bill)$_t$ (Log $bil)	8.19	8.21	0.35	7.78	8.46	1769
Log(Coupon)$_t$ (Log $bil)	9.49	9.46	0.17	9.33	9.65	1769
ΔLog(System Liquidity)$_t$*1000	2.67	1.88	28.24	-11.06	14.34	1817
ΔLog(Bill)$_t$*1000	2.32	0.00	19.17	-6.66	8.64	1811
ΔLog(Coupon)$_t$*1000	1.92	0.53	5.65	-0.04	4.20	1817

Table 2: The Affiliation Premium: Evidence from Aggregate Daily Repo Spreads

This table shows unbalanced regression results for repo rate spreads to interest on reserves balances (IORB). Repo rates are calculated daily (t) as a volume-weighted average for each dealer (D) with two lender types (L): those affiliated with the same BHC as the corresponding dealer (**Affiliated Lender**) and those unaffiliated (external lenders). We control for a set of variables that may affect the repo spreads: the aggregate daily repo volume by each dealer, dealer-affiliated domestic DI's daily total reserves ($\ln(Reserves)_{D,t}$) and their BHC's CDS spreads ($CDS_{D,t}$); the sum of system-wide DI reserve balances at the Fed and ON RRP take-up ($\ln(\text{System liquidity})_t$), Treasury Bill and coupon supply, and the benchmark interest rate of the overnight secured cash borrowing cost ($SOFR_t$). We also include the end-of-quarter dummy that equals to one if a date is a quarter-end plus and minus two business days, and the zero-lower-bound dummy for dates when the federal funds target rate is at the zero lower bound. The data sample is from February 2018 to March 2025. Standard errors are clustered by Dealer*Year-Month. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	VWA Repo Spread to $\text{IORB}_{D,L,t}$				
	(1)	(2)	(3)	(4)	(5)
$\text{Affiliated Lender}_{D,L,t}$	4.32***	4.15***	4.77***	4.66***	4.65***
	(11.99)	(11.50)	(13.98)	(13.57)	(12.79)
$\text{Repo Volume}_{D,L,t}$		-0.00	0.06***	0.03***	0.04***
		(-0.40)	(6.48)	(3.78)	(4.56)
$\ln(\text{Reserves})_{D,t}$		-10.71***	-1.88***	-3.88***	-2.63***
		(-13.64)	(-3.03)	(-5.79)	(-5.70)
$\text{CDS}_{D,t}$		-0.10***	-0.02**	0.02*	0.01
		(-5.49)	(-2.08)	(1.66)	(0.45)
$\ln(\text{System Liquidity})_t$			-12.94***	-15.75***	
			(-19.00)	(-18.06)	
Quarter-end				2.57***	
				(4.96)	
ZLB				10.97***	
				(5.22)	
$\ln(\text{Bill Supply})_t$				-2.56	
				(-1.35)	
$\ln(\text{Coupon Supply})_t$				5.61**	
				(2.00)	
SOFR_t				0.02***	
				(3.58)	
Observations	16495	16088	16088	16061	16088
AdjustedR^2	0.026	0.202	0.280	0.310	0.121
Dealer FE	Y	Y	Y	Y	Y
Calender Day FE	N	N	N	N	Y

Table 3: The Affiliation Premium: Evidence from Transaction-Level Repo Spreads

This table shows regression results for repo rate spreads to interest on reserves balances (IORB) at the transaction level. The primary independent variable, **Affiliated Lender**$_{D,L,t,s}$ indicates whether a repo transaction between dealer D and its cash lender L in transaction s in Day t is an internal repo trade and takes the value of zero if the trade is with external lenders. We control for a set of variables that may affect the repo spreads: trade size for a given transaction (Transaction Size$_{D,L,t,s}$); dealer-affiliated DI's daily total reserves ($\ln(Reserves)_{D,t}$) and their BHC's CDS spreads ($CDS_{D,t}$); the sum of system-wide DI reserve balances at the Fed and ON RRP take-up (ln(System liquidity)$_t$), Treasury Bill and coupon supply, and the benchmark interest rate of the overnight secured cash borrowing cost ($SOFR_t$). We also include the end-of-quarter dummy that equals to one if a date is a quarter-end plus and minus two business days, and the zero-lower-bound dummy for dates when the federal funds target rate is at the zero lower bound. The data sample is from February 2018 to March 2025. Standard errors are clustered by Dealer*Year-Month. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	Trade Repo Spread to IORB$_{D,L,t,s}$				
	(1)	(2)	(3)	(4)	(5)
Affiliated Lender$_{D,L,t,s}$	2.76***	2.21***	1.53***	1.70***	1.57***
	(9.24)	(7.96)	(6.17)	(7.15)	(7.34)
Transaction Size$_{D,L,t,s}$		0.15***	0.34***	0.32***	0.35***
		(4.09)	(10.93)	(11.28)	(13.81)
ln(Reserves)$_{D,t}$		-7.58***	-0.55	-2.40***	-1.11***
		(-8.79)	(-1.04)	(-3.73)	(-3.92)
CDS$_{D,t}$		-0.10***	-0.03***	0.01	-0.00
		(-5.91)	(-3.12)	(0.82)	(-0.02)
ln(System Liquidity)$_t$			-11.68***	-14.35***	
			(-16.34)	(-15.00)	
Quarter-end				2.07***	
				(4.37)	
ZLB				10.12***	
				(3.82)	
ln(Bill Supply)$_t$				-3.69	
				(-1.62)	
ln(Coupon Supply)$_t$				8.39***	
				(3.14)	
SOFR$_t$				0.01**	
				(2.03)	
Observations	690993	668159	668159	666935	668159
Adjusted R^2	0.002	0.102	0.170	0.189	0.010
Dealer FE	Y	Y	Y	Y	Y
Calender Day FE	N	N	N	N	Y

Table 4: The Affiliation Premium and Balance Sheet Cost (5-Day Changes)

This table shows regressions results of the 5-day change in the dealer-level affiliation premium against the change in dealer-level balance sheet cost proxy, CMTR. We calculate the affiliation premium for each dealer each day using the difference of the aggregated daily repo spreads across two types of cash lenders: affiliated versus unaffiliated. We also consider the intersection of $\Delta CMTR$ with the dummy variables indicating the SLR exepmtion period (April 1, 2020 through March 31, 2021) or the end-of-quarter period. We control for the change of dealer-affiliated DI's daily total reserves and their BHC's five-day lagged CDS spreads; the change of system-wide DI reserve balances at the Fed, the change of Treasury Bill and coupon supply, and the five-day lagged benchmark interest rate of the overnight secured cash borrowing cost. The data sample is from February 2018 to March 2025. Standard errors are Driscoll-Kraay with 12 lags. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	Δ Affiliation Premium$_{D,t}$						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ΔCMTR$_{D,t}$	0.62***	0.52***	0.53***	0.53***	0.51***	0.51***	0.51**
	(4.74)	(4.22)	(4.19)	(4.19)	(3.32)	(3.33)	(2.54)
SLR Exemption			-0.29*	-0.31*	-0.29	-0.16	
			(-1.72)	(-1.70)	(-1.56)	(-0.86)	
SLR Exemption$\times\Delta$CMTR$_{D,t}$			-0.49***	-0.49***	-0.47***	-0.49***	
			(-3.79)	(-3.73)	(-3.14)	(-3.30)	
Δln(Reserves)$_{D,t}$				2.32*	2.42*	2.03	1.85
				(1.66)	(1.69)	(1.31)	(0.81)
CDS$_{D,t-5}$				-0.00	-0.00	-0.00	-0.01
				(-0.04)	(-0.15)	(-0.08)	(-0.42)
Quarter-end					0.32	0.17	
					(0.73)	(0.38)	
ZLB					-0.01	-0.10	
					(-0.05)	(-0.25)	
Quarter-end$\times\Delta$CMTR$_{D,t}$					0.08	0.08	
					(0.54)	(0.54)	
Δln(System Liquidity)$_t$						11.57	
						(1.46)	
Δln(Bill Supply)$_t$						2.29	
						(0.26)	
Δln(Coupon Supply)$_t$						59.85*	
						(1.77)	
SOFR$_{t-5}$						0.00	
						(0.27)	
Observations	6690	6549	6549	6391	6391	6367	6290
Adjusted R^2	0.222	0.379	0.382	0.381	0.382	0.383	0.353
Dealer FE	Y	Y	Y	Y	Y	Y	Y
Day FE	N	N	N	N	N	N	Y
ΔDependent Variable$_{D,t-5}$	N	Y	Y	Y	Y	Y	Y

Table 5: The Average Affiliation Premium and Market-Wide Balance Sheet Cost (5-Day Changes)

This table shows regressions results of the 5-day change in the average affiliation premium across dealers against the change in market-wide balance sheet cost proxy, the *GCF-TGCR* spread. We calculate the affiliation premium for each dealer each day using the difference of the aggregated daily repo spreads across two types of cash lenders: affiliated versus unaffiliated. The we take the average across dealers for the dependent variable. We consider the intersection of ΔGCF-TGCR with the dummy variables indicating the SLR exepmtion period (April 1, 2020 through March 31, 2021) or the end-of-quarter period. We control for the average dealer-affiliated BHC's five-day lagged CDS spreads across dealers; the change of system-wide DI reserve balances at the Fed, the change of Treasury Bill and coupon supply, and the five-day lagged benchmark interest rate of the overnight secured cash borrowing cost. The data sample is from February 2018 to March 2025. Standard errors are Driscoll-Kraay with 12 lags. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	Δ Average Affiliation Premium$_t$					
	(1)	(2)	(3)	(4)	(5)	(6)
ΔGCF-TGCR$_t$	0.19***	0.14***	0.14***	0.14***	0.09**	0.09**
	(4.47)	(3.51)	(3.51)	(3.45)	(2.41)	(2.40)
SLR Exemption			-0.30	-0.25	-0.38*	-0.37
			(-1.48)	(-1.22)	(-1.65)	(-1.58)
SLR Exemption$\times\Delta$GCF-TGCR$_t$			-0.12	-0.13	-0.16*	-0.16**
			(-1.40)	(-1.48)	(-1.87)	(-1.96)
Δln(System Liquidity)$_t$				-4.94	-6.21	-0.06
				(-0.77)	(-0.85)	(-0.01)
Avg. CDS$_{t-5}$				0.00	0.00	0.00
				(0.20)	(0.13)	(0.32)
Quarter-end					2.48***	2.33***
					(3.74)	(3.46)
ZLB					0.19	0.14
					(0.60)	(0.26)
Quarter-end$\times\Delta$GCF-TGCR$_t$					0.11***	0.12***
					(3.10)	(3.16)
Δln(Bill Supply)$_t$						8.58
						(0.92)
Δln(Coupon Supply)$_t$						90.21***
						(2.98)
SOFR$_{t-5}$						-0.00
						(-0.08)
Observations	1762	1757	1757	1720	1720	1716
Adjusted R^2	0.121	0.313	0.313	0.313	0.337	0.341
ΔDependent Variable$_{t-5}$	N	Y	Y	Y	Y	Y

Table 6: The Affiliation Premium by Affiliate Type: DI versus Others

This table shows unbalanced regression results for repo rate spreads to interest on reserves balances (IORB). Repo rates are calculated daily (t) as a volume-weighted average for each dealer (D) with three lender types (L): DIs affiliated with the same BHC as the corresponding dealer (**DI Affiliated Lender**), non-DIs affiliated with the same BHC (**Other Affiliated Lender**), and those unaffiliated (external lenders). We control for a set of variables that may affect the repo spreads: the aggregate daily repo volume by each dealer, dealer-affiliated domestic DI's daily total reserves ($\ln(Reserves)_{D,t}$) and their BHC's CDS spreads ($CDS_{D,t}$); the sum of system-wide DI reserve balances at the Fed and ON RRP take-up ($\ln(\text{System liquidity})_t$), Treasury Bill and coupon supply, and the benchmark interest rate of the overnight secured cash borrowing cost ($SOFR_t$). We also include the end-of-quarter dummy that equals to one if a date is a quarter-end plus and minus two business days, and the zero-lower-bound dummy for dates when the federal funds target rate is at the zero lower bound. The data sample is from February 2018 to March 2025. Standard errors are clustered by Dealer*Year-Month. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	VWA Repo Spread to IORB$_{D,L,t}$					
	(1)	(2)	(3)	(4)	(5)	(6)
Affiliated Lender$_{D,L,t}$	4.32***					
	(11.99)					
DI Affiliated Lender$_{D,L,t}$		7.19***	6.12***	6.50***	6.25***	6.27***
		(15.53)	(15.88)	(17.69)	(17.50)	(17.14)
Other Affiliated Lender$_{D,L,t}$		1.62***	1.94***	3.10***	2.88***	2.99***
		(4.06)	(4.38)	(7.37)	(6.58)	(6.54)
Repo Volume$_{D,t}$			0.01*	0.06***	0.04***	0.05***
			(1.65)	(7.65)	(5.82)	(6.32)
ln(Reserves)$_{D,t}$			-9.88***	-1.82***	-3.58***	-2.30***
			(-13.53)	(-3.24)	(-6.03)	(-5.18)
CDS$_{D,t}$			-0.09***	-0.02**	0.02*	-0.04
			(-5.23)	(-2.06)	(1.67)	(-1.45)
ln(System Liquidity)$_t$				-11.77***	-15.37***	
				(-17.55)	(-16.48)	
Quarter-end					2.53***	
					(5.24)	
ZLB					10.68***	
					(5.38)	
ln(Bill Supply)$_t$					-2.62	
					(-1.49)	
ln(Coupon Supply)$_t$					8.63***	
					(2.73)	
SOFR$_t$					0.01***	
					(3.32)	
Observations	16495	20990	20456	20456	20423	20456
Adjusted R^2	0.026	0.044	0.192	0.261	0.291	0.101
Dealer FE	Y	Y	Y	Y	Y	Y
Day FE	N	N	N	N	N	Y

Table 7: DI Affiliated Premium and Balance Sheet Costs (5-Day Changes)

This table shows regressions results of the 5-day change in the dealer-level DI affiliation premium against the change in dealer-level balance sheet cost proxy, CMTR. We calculate the DI affiliated premium for each dealer each day using the difference of the aggregated daily repo spreads across two types of cash lenders: affiliated DI versus unaffiliated. We also consider the intersection of $\Delta CMTR$ with the dummy variables indicating the SLR exepmtion period (April 1, 2020 through March 31, 2021) or the end-of-quarter period. We control for the change of dealer-affiliated DI's daily total reserves and their BHC's five-day lagged CDS spreads; the change of system-wide DI reserve balances at the Fed, the change of Treasury Bill and coupon supply, and the five-day lagged benchmark interest rate of the overnight secured cash borrowing cost. The data sample is from February 2018 to March 2025. Standard errors are Driscoll-Kraay with 12 lags. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	Δ DI Affiliated Premium$_{D,t}$						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Δ CMTR$_{D,t}$	0.46***	0.37***	0.38***	0.38***	0.35***	0.35***	0.40***
	(5.75)	(4.97)	(5.14)	(5.07)	(4.58)	(4.54)	(2.97)
SLR Exemption			0.03	0.02	0.08	0.09	
			(0.21)	(0.15)	(0.37)	(0.44)	
SLR Exemption $\times$ Δ CMTR$_{D,t}$			-0.37***	-0.37***	-0.35***	-0.35***	
			(-4.78)	(-4.72)	(-4.37)	(-4.51)	
Δ ln(Reserves)$_{D,t}$				-0.26	-0.23	-0.29	0.17
				(-0.49)	(-0.47)	(-0.54)	(0.17)
CDS$_{D,t-5}$				-0.00	-0.00	-0.00	-0.04
				(-0.90)	(-1.01)	(-1.05)	(-1.07)
Quarter-end					0.04	0.00	
					(0.07)	(0.00)	
ZLB					-0.05	0.02	
					(-0.29)	(0.14)	
Quarter-end $\times$ Δ CMTR$_{D,t}$					0.08	0.08	
					(0.51)	(0.52)	
Δ ln(System Liquidity)$_t$						1.78	
						(0.42)	
Δ ln(Bill Supply)$_t$						1.76	
						(0.68)	
Δ ln(Coupon Supply)$_t$						18.06	
						(1.16)	
SOFR$_{t-5}$						0.00	
						(0.72)	
Observations	4093	3942	3942	3845	3845	3833	3701
Adjusted R^2	0.235	0.434	0.444	0.446	0.448	0.449	0.304
Dealer FE	Y	Y	Y	Y	Y	Y	Y
Day FE	N	N	N	N	N	N	Y
Δ Dependent Variable$_{D,t-5}$	N	Y	Y	Y	Y	Y	Y

Table 8: Overnight Reverse Repo Sensitivity to Affiliated vs Unaffiliated Repo – Level

This table shows regressions results of 5-day changes in overnight reverse repo. D is the specific dealer. CDS are specific to each borrowing dealer. The data sample ranges from 2018 to 2025 and is limited to the five broker-dealers in our sample. Regressions are run with and without dealer and day fixed effects. Standard errors are Driscoll-Kraay with 12 lags. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	Δ All		Δ Aff.		Δ Unaff.	
	(1)	(2)	(3)	(4)	(5)	(6)
ΔON Aff. $\text{Repo}_{D,t}$	0.55***	0.56***	0.19***	0.17***	0.36***	0.39***
	(14.90)	(16.32)	(7.57)	(7.79)	(11.55)	(12.93)
ΔON Unaff. $\text{Repo}_{D,t}$		0.41***		0.09***		0.32***
		(14.42)		(5.73)		(12.61)
$\text{CDS}_{D,t-5}$	-0.00	-0.01	-0.03	-0.04	0.03	0.03
	(-0.00)	(-0.22)	(-1.29)	(-1.42)	(0.99)	(0.84)
Observations	8610	8585	8610	8585	8610	8585
Adjusted R^2	0.129	0.389	0.062	0.226	0.077	0.309
Dealer FE	Y	Y	Y	Y	Y	Y
Day FE	Y	Y	Y	Y	Y	Y
ΔDependent $\text{Variable}_{D,t-5}$	N	Y	N	Y	N	Y

Table 9: Overnight Reverse Repo Sensitivity to Affiliated vs Unaffiliated Repo – Ratio

This table shows regressions results of 5-day changes in overnight (ON) reverse repo relative to the prior period total reverse repo (overnight + term). D is the specific dealer. CDS are specific to each borrowing dealer. The data sample ranges from 2018 to 2025 and is limited to the five broker-dealers in our sample. Regressions are run with and without dealer and day fixed effects. Standard errors are Driscoll-Kraay with 12 lags. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	Δ All/Total		Δ Aff./Total		Δ Unaff./Total	
	(1)	(2)	(3)	(4)	(5)	(6)
ΔON Aff. $\text{Repo}_{D,t}/\text{Total}_{D,t-5}$	0.60***	0.64***	0.14***	0.14***	0.46***	0.50***
	(19.52)	(21.11)	(7.86)	(7.88)	(17.16)	(18.55)
ΔON Unaff. $\text{Repo}_{D,t}/\text{Total}_{D,t-5}$		0.48***		0.08***		0.40***
		(18.17)		(5.82)		(17.68)
$\text{CDS}_{D,t-5}$	-0.00	-0.00	-0.00	-0.00	0.00	0.00
	(-0.42)	(-0.45)	(-1.23)	(-1.20)	(0.52)	(0.48)
Observations	8610	8585	8610	8585	8610	8585
Adjusted R^2	0.148	0.386	0.039	0.173	0.111	0.329
Dealer FE	Y	Y	Y	Y	Y	Y
Day FE	Y	Y	Y	Y	Y	Y
ΔDependent $\text{Variable}_{D,t-5}$	N	Y	N	Y	N	Y

Table 10: DI Repo Usage for Reverse Repo

Panel A shows regressions results of 5-day changes in overnight reverse repo. Panel B shows regressions results of 5-day changes in overnight (ON) reverse repo relative to the prior period total reverse repo (overnight + term). D is the specific dealer. CDS are specific to each borrowing dealer. The data sample ranges from 2018 to 2025 and is limited to the five broker-dealers in our sample. Regressions are run with and without dealer and day fixed effects. Standard errors are Driscoll-Kraay with 12 lags. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Changes in Levels

	Δ All		Δ Aff.		Δ Unaff.	
	(1)	(2)	(3)	(4)	(5)	(6)
ΔON Aff. DI Repo$_{D,t}$	0.42***	0.45***	0.15***	0.14***	0.26***	0.30***
	(7.40)	(10.62)	(5.55)	(5.97)	(5.75)	(8.38)
ΔON Aff. Non-DI Repo$_{D,t}$		0.61***		0.18***		0.43***
		(13.78)		(6.60)		(11.40)
ΔON Unaff. Repo$_{D,t}$		0.41***		0.09***		0.32***
		(15.19)		(5.82)		(13.20)
CDS$_{D,t-5}$	0.00	-0.01	-0.03	-0.04	0.03	0.03
	(0.08)	(-0.23)	(-1.26)	(-1.42)	(1.00)	(0.83)
Observations	8610	8585	8610	8585	8610	8585
Adjusted R^2	0.028	0.391	0.016	0.227	0.015	0.312
Dealer FE	Y	Y	Y	Y	Y	Y
Day FE	Y	Y	Y	Y	Y	Y
ΔDependent Variable$_{D,t-5}$	N	Y	N	Y	N	Y

Panel B. Changes in Ratios

	Δ All/Total		Δ Aff./Total		Δ Unaff./Total	
	(1)	(2)	(3)	(4)	(5)	(6)
ΔON Aff. DI Aff. Repo$_{D,t}$/Total$_{D,t-5}$	0.50***	0.61***	0.16***	0.16***	0.34***	0.44***
	(7.24)	(12.76)	(4.54)	(5.20)	(5.89)	(10.59)
ΔON Aff. Non-DI Aff. Repo$_{D,t}$/Total$_{D,t-5}$		0.65***		0.13***		0.52***
		(17.88)		(6.10)		(16.95)
ΔON Unaff. Repo$_{D,t}$/Total$_{D,t-5}$		0.48***		0.08***		0.40***
		(18.11)		(5.84)		(17.65)
CDS$_{D,t-5}$	-0.00	-0.00	-0.00	-0.00	0.00	0.00
	(-0.22)	(-0.45)	(-1.17)	(-1.20)	(0.62)	(0.48)
Observations	8610	8585	8610	8585	8610	8585
Adjusted R^2	0.027	0.387	0.013	0.173	0.016	0.330
Dealer FE	Y	Y	Y	Y	Y	Y
Day FE	Y	Y	Y	Y	Y	Y
ΔDependent Variable$_{D,t-5}$	N	Y	N	Y	N	Y

Online Appendix

Figure A.1: Dealer Total Repo Volumes by Counterparty Type

Panel A shows dealers' total aggregated overnight, Treasury repo volume broken down by the cash lender type. Panel B shows dealers' total aggregated overnight, Treasury reverse repo transactions, broken down by the cash borrower type. All volumes are at a daily frequency using FR 2052a data. Volumes shown include activity by the five dealers in our sample. Dealers' trading counterparties are aggregated to depository institutions affiliated with the dealer's BHC (Affiliated DI), other lenders affiliated with the dealer's BHC (Affiliated Other), and other entities that are not affiliated with the dealer's BHC (Unaffiliated Other). The sample period is from February 2018 to March 2025.

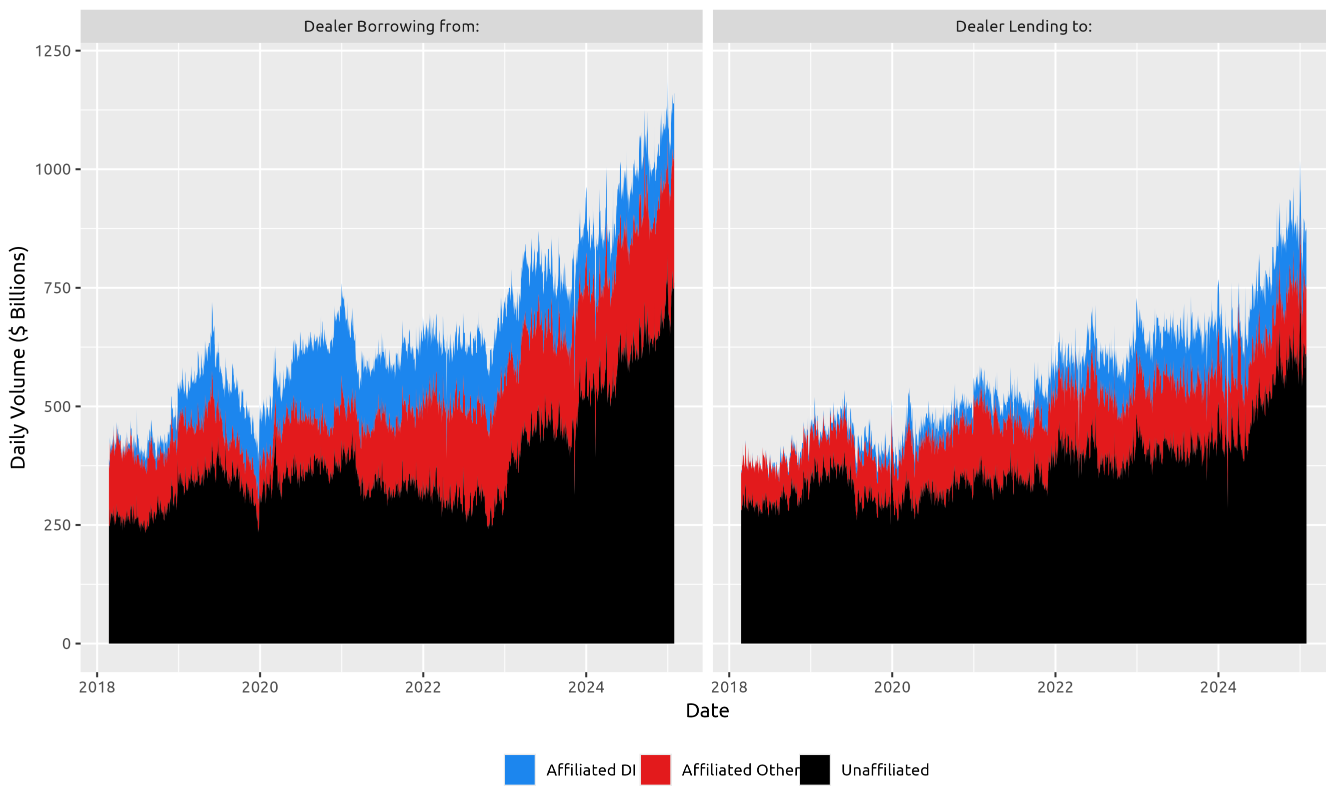


Figure A.2: DI Premiums around Quarter-End

This figure plots the average of daily DI affiliated premiums (affiliated rate minus unaffiliated rate) around quarter-ends using the tri-party data collected by the Federal Reserve Bank of New York. Each day within +/- two business days of quarter-end, we construct a volume-weighted average repo rate across two types of overnight tri-party repo transactions: those with the affiliated DI counterparties and those with unaffiliated counterparties for the five dealers in our sample. We then calculate the spread between these two daily volume-weighted average repo rates as the premium. We then take the mean DI affiliated premium at each day relative to quarter-end in our sample and plot the mean and +/- one standard deviation for each day relative to quarter-end (t). The sample period is from February 2018 to March 2025.

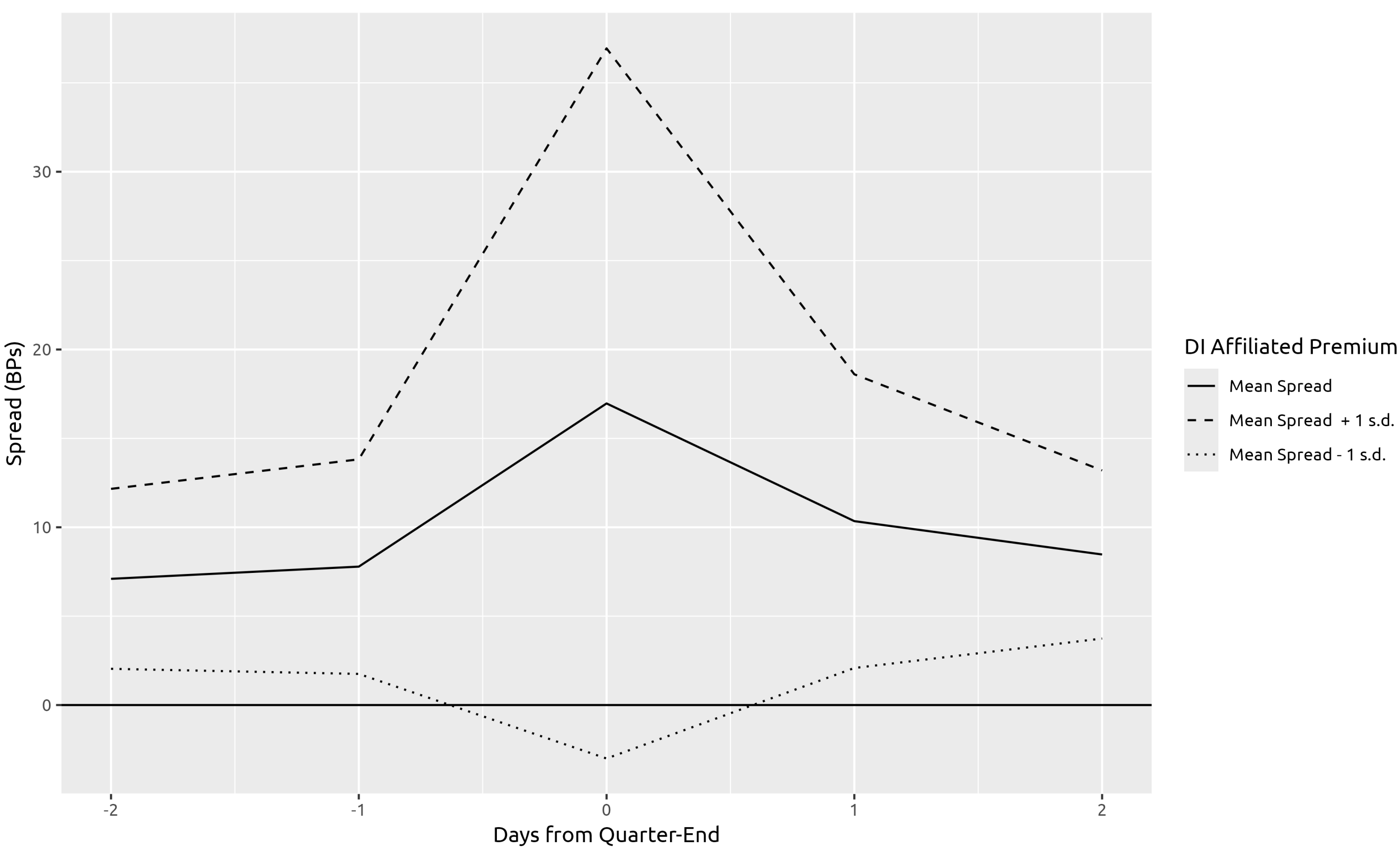


Table A.1: Variable Descriptions and Sources

Variable	Description	Source
Tri-party Repo Rates/Volumes	Rates/volumes from tri-party Treasury-collateralized transactions	BNYM/FRBNY
FR 2052a Repo Volumes	Aggregate repo volumes from Treasury-collateralized repo across all segments	Federal Reserve
IORB	Interest rate on reserve balances	Federal Reserve
TGCR	Tri-party general collateral rate	FRBNY
SOFR	Secured overnight financing rate	FRBNY
GCF	General Collateral Financing rate on Treasury transactions	DTCC
Aff. Premium	VWA borrowing rate with affiliates in tri-party minus VWA borrowing rate with non-affiliates in tri-party	Authors' Calc.
DI Aff. Premium	VWA borrowing rate with domestic DI affiliates in tri-party minus VWA borrowing rate with non-affiliates in tri-party	Authors' Calc.
CMTR	Cross market Tresaury repo spread	Chabot et al.
CDS	Credit default swap rates	Bloomberg
Reserves	Reserve balances of depository institutions	Federal Reserve
ON RRP	Aggregate ON RRP take-up	FRBNY
System Liquidity	Reserve balances of depository institutions plus aggregate ON RRP take-up	Authors' Calc.
Bill Supply	Treasury bills outstanding to the public	Treasury Dept.
Coupon Supply	Treasury coupons outstanding to the public	Treasury Dept.

Table A.2: The Affiliation Premium and Balance Sheet Costs (Level)

This table shows unbalanced regressions results of affiliated premiums (spread between affiliated rate and unaffiliated rate) against the CMTR. D is the specific dealer. CDS and SOFR are in basis points. Premiums, CMTR, and CDS are specific to each dealer. Reserve balances are specific to domestic DIs affiliated with the dealer. System liquidity is the sum of system-wide DI reserve balances at the Fed and ON RRP take-up. Bill and coupon supply are the measured as marketable debt issued to the public (SOMA plus non-SOMA). Quarter-end indicates if the date was a quarter-end +/- 2 business days. ZLB is when the target federal funds rate was at the zero lower bound. The SLR exemption period is April 1, 2020 through March 31, 2021. The data sample ranges from 2018 to 2025 and is limited to the five broker-dealers in our sample. Regressions are run with and without dealer and day fixed effects. Standard errors are clustered by Dealer*Year*Month. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	Affiliated Premium$_{D,t}$					
	(1)	(2)	(3)	(4)	(5)	(6)
CMTR$_{D,t}$	0.58***	0.59***	0.59***	0.60***	0.62***	0.63***
	(8.15)	(8.07)	(8.14)	(5.82)	(5.37)	(4.70)
SLR Exemption		1.53**	1.83**	1.27	1.84*	
		(2.01)	(2.55)	(1.48)	(1.70)	
SLR Exemption × CMTR$_{B,D}$		-0.20	-0.25	-0.25	-0.21	
		(-1.26)	(-1.65)	(-1.60)	(-1.29)	
ln(Reserves)$_{D,t}$			0.83	0.65	-0.22	-0.10
			(1.21)	(0.93)	(-0.33)	(-0.11)
CDS$_{D,t}$			0.02*	0.03*	0.02	-0.10*
			(1.91)	(1.97)	(1.00)	(-1.66)
Quarter-end				0.24	0.29	
				(0.33)	(0.37)	
ZLB				0.82	1.08	
				(0.65)	(0.71)	
Quarter-end × CMTR$_{D,t}$				0.01	0.00	
				(0.11)	(0.02)	
ln(System Liquidity)$_t$					0.79	
					(0.55)	
ln(Bill Supply)$_t$					-0.52	
					(-0.25)	
ln(Coupon Supply)$_t$					4.03	
					(0.97)	
SOFR$_t$					-0.00	
					(-0.28)	
Observations	6946	6946	6755	6755	6743	6666
Adjusted R^2	0.291	0.292	0.298	0.299	0.301	0.225
Dealer FE	Y	Y	Y	Y	Y	Y
Day FE	N	N	N	N	N	Y

Table A.3: The Average Affiliation Premium and Market-Wide Balance Sheet Costs (Level)

This table shows unbalanced regressions results of the average affiliated premium (spread between volume weighted average affiliated rate and volume weighted average unaffiliated rate) against the GCF-TGCR spread. CDS and SOFR are in basis points. Premiums and CDS the average of the dealers in the sample. System liquidity is the sum of system-wide DI reserve balances at the Fed and ON RRP take-up. Bill and coupon supply are the measured as marketable debt issued to the public (SOMA plus non-SOMA). Quarter-end indicates if the date was a quarter-end +/- 2 business days. ZLB is when the target federal funds rate was at the zero lower bound. The SLR exemption period is April 1, 2020 through March 31, 2021. The data sample ranges from 2018 to 2025 and is limited to the five broker-dealers in our sample. Standard errors are clustered by Year*Month. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	Avg. Affiliated Premium$_t$				
	(1)	(2)	(3)	(4)	(5)
GCF-TGCR$_t$	0.26***	0.26***	0.23***	0.16	0.09
	(5.00)	(4.98)	(4.75)	(1.62)	(1.21)
SLR Exemption		-2.56***	-0.97	1.76**	2.07**
		(-3.55)	(-1.25)	(2.24)	(2.23)
SLR Exemption × GCF-TGCR$_t$		0.27**	0.00	0.20	0.14
		(2.20)	(0.01)	(1.23)	(1.02)
ln(System Liquidity)$_t$			-2.33***	-0.97	-3.59***
			(-3.31)	(-1.14)	(-3.17)
Avg. CDS$_t$			0.05***	0.03*	0.04***
			(4.91)	(1.93)	(3.50)
Quarter-end				2.48***	2.06***
				(3.01)	(2.88)
ZLB				-4.72***	0.43
				(-4.61)	(0.39)
Quarter-end × GCF-TGCR$_t$				0.06	0.12*
				(0.66)	(1.74)
ln(Bill Supply)$_t$					-2.17
					(-1.25)
ln(Coupon Supply)$_t$					4.53
					(1.14)
SOFR$_t$					0.01***
					(4.82)
Observations	1764	1764	1722	1722	1719
Adjusted R^2	0.197	0.204	0.263	0.341	0.385

Table A.4: The Average DI Affiliation Premium and Market-Wide Balance Sheet Costs (5-Day Changes)

This table shows unbalanced regressions results of the 5-day change in the average DI affiliated premium (spread between DI affiliated rate and unaffiliated rate) against the GCF-TGCR spread. CDS and SOFR are in basis points. Premiums and CDS the average of the dealers. System liquidity is the sum of system-wide DI reserve balances at the Fed and ON RRP take-up. Bill and coupon supply are the measured as marketable debt issued to the public (SOMA plus non-SOMA). Quarter-end indicates if the date was a quarter-end +/- 2 business days. ZLB is when the target federal funds rate was at the zero lower bound. The SLR exemption period is April 1, 2020 through March 31, 2021. The data sample ranges from 2018 to 2025 and is limited to the five broker-dealers in our sample. Standard errors are Driscoll-Kraay with 12 lags. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	Δ Avg. DI Affiliated Premium$_t$					
	(1)	(2)	(3)	(4)	(5)	(6)
Δ GCF-TGCR $_t$	0.25***	0.20***	0.20***	0.20***	0.17***	0.17***
	(24.90)	(11.61)	(11.65)	(11.63)	(7.03)	(6.97)
SLR Exemption			-0.11	-0.01	-0.13	-0.17
			(-0.59)	(-0.07)	(-0.57)	(-0.68)
SLR Exemption $\times$ Δ GCF-TGCR $_t$			-0.16*	-0.18**	-0.20**	-0.21**
			(-1.87)	(-2.14)	(-2.39)	(-2.36)
Δ ln(System Liquidity)$_t$				-13.17**	-14.39**	-11.56*
				(-2.51)	(-2.47)	(-1.71)
Avg. CDS$_{t-5}$				0.00	-0.00	0.00
				(0.03)	(-0.02)	(0.02)
Quarter-end					1.77***	1.72***
					(3.34)	(3.20)
ZLB					0.16	0.17
					(0.63)	(0.39)
Quarter-end $\times$ Δ GCF-TGCR$_t$					0.05*	0.05*
					(1.85)	(1.87)
Δ ln(Bill Supply)$_t$						6.67
						(0.79)
Δ ln(Coupon Supply)$_t$						38.94
						(1.29)
SOFR$_{t-5}$						0.00
						(0.06)
Observations	1762	1757	1757	1720	1720	1716
Adjusted R^2	0.310	0.442	0.442	0.447	0.459	0.460
Δ Dependent Variable$_{t-5}$	N	Y	Y	Y	Y	Y

Table A.5: The Affiliation Premium: Evidence from Transaction-Level Repo Spreads with Haircuts

This table shows regression results for repo rate spreads to interest on reserves balances (IORB) at the transaction level. The primary independent variable, **Affiliated Lender**$_{D,L,t,s}$ indicates whether a repo transaction between dealer D and its cash lender L in transaction s in Day t is an internal repo trade and takes the value of zero if the trade is with external lenders. We control for a set of variables that may affect the repo spreads: trade size for a given transaction (Transaction Size$_{D,L,t,s}$); dealer-affiliated DI's daily total reserves ($\ln(Reserves)_{D,t}$) and their BHC's CDS spreads ($CDS_{D,t}$); the sum of system-wide DI reserve balances at the Fed and ON RRP take-up (ln(System liquidity)$_t$), Treasury Bill and coupon supply, and the benchmark interest rate of the overnight secured cash borrowing cost ($SOFR_t$). Haircuts are in percentage points. We also include the end-of-quarter dummy that equals to one if a date is a quarter-end plus and minus two business days, and the zero-lower-bound dummy for dates when the federal funds target rate is at the zero lower bound. The data sample is from February 2018 to March 2025. Standard errors are clustered by Dealer*Year-Month. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	Trade Repo Spread to IORB$_{D,L,t,s}$				
	(1)	(2)	(3)	(4)	(5)
Affiliated Lender$_{D,L,t,s}$	2.76***	2.02***	1.47***	1.61***	1.49***
	(9.21)	(7.55)	(6.06)	(6.89)	(7.07)
Transaction Size$_{D,L,t,s}$		0.12***	0.33***	0.30***	0.35***
		(2.80)	(9.26)	(9.33)	(11.72)
Haircut$_{D,L,t,s}$		-0.44**	-0.12	-0.17	-0.14
		(-2.26)	(-0.64)	(-0.94)	(-0.82)
ln(Reserves)$_{D,t}$		-7.60***	-0.57	-2.41***	-1.11***
		(-8.74)	(-1.06)	(-3.74)	(-3.91)
CDS$_{D,t}$		-0.10***	-0.03***	0.01	-0.00
		(-5.90)	(-3.14)	(0.83)	(-0.06)
ln(System Liquidity)$_t$			-11.71***	-14.45***	
			(-16.25)	(-14.95)	
Quarter-end				2.07***	
				(4.25)	
ZLB				10.26***	
				(3.84)	
ln(Bill Supply)$_t$				-3.79	
				(-1.64)	
ln(Coupon Supply)$_t$				8.74***	
				(3.23)	
SOFR$_t$				0.01**	
				(2.03)	
Observations	690874	662355	662355	661131	662355
Adjusted R^2	0.002	0.102	0.169	0.189	0.010
Dealer FE	Y	Y	Y	Y	Y
Calender Day FE	N	N	N	N	Y