

# Why Is So Much Repo Not Centrally Cleared?

## Lessons from a Pilot Survey of Non-centrally Cleared Repo Data

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The Office of Financial Research (OFR) conducted a pilot collection of data on non-centrally cleared bilateral repurchase agreement (NCCBR) trades spanning nine dealers over three reporting dates in June 2022. Using data from this pilot collection, we document basic facts about volumes, rates, counterparty types, collateral, and haircuts in this relatively opaque segment of the repurchase (repo) market. We find that on three dimensions—rates, counterparty types, and collateral—pilot participants’ activity in the NCCBR segment roughly mirrors their activity in the centrally cleared bilateral segment, the DVP Repo Service of the Fixed Income Clearing Corporation (FICC). However, we find that haircuts in NCCBR materially differ from those in tri-party repo, with over 70% of Treasury repo in NCCBR transacted with zero haircut. Our findings suggest that differences in haircut, margining, and netting are primary factors that drive dealers’ use of NCCBR over other segments of the repo market.

### 1. Introduction

The repurchase agreement (repo) market is an integral component of the U.S. financial system, providing trillions of dollars of funding every day and facilitating trading in U.S. Treasuries and other securities. The repo market allows participants to borrow cash against securities pledged as collateral, with an obligation to repurchase those securities in the future.<sup>3</sup> The U.S. repo market can be divided into four major segments (see **Figure 1**), depending on two factors: (1) whether the trades are settled bilaterally or through a tri-party

custodian and (2) whether the trades are centrally or non-centrally cleared through the Fixed Income Clearing Corporation (FICC). This brief focuses on NCCBR, which is the only segment of the market that contains neither a central counterparty nor a tri-party custodian.<sup>4</sup>

Despite the increased repo market transparency provided by transaction-level datasets, such as the OFR’s Centrally Cleared Repo Data Collection<sup>5</sup> and the Federal Reserve’s collection of non-centrally cleared tri-party repo, regulators’ understanding of

Figure 1. The Four Main Segments of the U.S. Repo Market

		Settlement	
		Tri-Party	Bilateral
Clearing	Centrally Cleared	<p><b>FICC GCF Repo (GCF)</b></p> <ul style="list-style-type: none"> <li>Centrally cleared by FICC</li> <li>Settled on BONY’s Tri-party platform</li> <li>Transaction-level data collected from FICC by the OFR’s Centrally Cleared Repo Data Collection</li> <li>General collateral repo only</li> </ul>	<p><b>FICC DVP Service (DVP)</b></p> <ul style="list-style-type: none"> <li>Centrally cleared by FICC</li> <li>No central custodian</li> <li>Transaction-level data collected from FICC by the OFR’s Centrally Cleared Repo Data Collection</li> <li>Specific collateral repo possible</li> </ul>
	Non-Centrally Cleared	<p><b>Bank of New York Mellon (BONY) Tri-party</b></p> <ul style="list-style-type: none"> <li>No central counterparty</li> <li>Settled on BONY’s Tri-party platform</li> <li>Transaction-level data collected from BONY by the Federal Reserve’s tri-party repo collection</li> <li>General collateral repo only</li> </ul>	<p><b>Non-Centrally Cleared Bilateral Repo (NCCBR)</b></p> <ul style="list-style-type: none"> <li>No central counterparty</li> <li>No central custodian</li> <li>OFR pilot collection from June 2022</li> <li>Specific collateral repo possible</li> </ul>

Source: Office of Financial Research

NCCBR has been limited. Even the traders who conduct business in this market every day may have little direct visibility into the competitive landscape. This opacity persists despite the fact that the estimated size of primary-dealer activity in the NCCBR segment exceeds \$2 trillion outstanding.<sup>6</sup> This makes the NCCBR segment the largest of the four segments of the repo market in terms of gross repo exposure by primary dealers.

This brief uses the OFR’s pilot collection of NCCBR data to answer an obvious question raised by the trillions of dollars outstanding in NCCBR: why are volumes so high in this segment? Central clearing, as provided in the U.S. repo market by FICC, provides two main benefits to repo market participants: First, it can significantly reduce counterparty risk. Second, it allows a dealer to net their repo positions with one counterparty against reverse repo positions with another counterparty for the purpose of calculating certain regulatory ratios, thus reducing the balance sheet costs of participating in repo.

This balance sheet netting (the second benefit) is possible because accounting rules allow the netting of

two trades with the same end date and counterparty, and because the legal counterparty to both sides of a cleared repo transaction is FICC. The advantages afforded by central clearing make the large volumes in non-centrally cleared bilateral repo something of a puzzle.

To answer this question, we assemble the most comprehensive and granular view of the repo market to date by combining the OFR’s NCCBR pilot data, the OFR’s centrally cleared repo data, and the Federal Reserve’s tri-party repo data. We document novel facts about volumes, rates, counterparty types, collateral, haircuts, and netting for NCCBR trades, and we also compare NCCBR trades to trades in other segments of the market. These contract terms capture the most consequential determinants of market participants’ considerations of where and how to conduct their repo transactions. With this comprehensive snapshot of the repo market in hand, we then consider what drives non-centrally cleared repo volumes.

We show that a primary driver of NCCBR volumes is likely a unique feature of haircuts (the discounts on the value of assets pledged as collateral) and margining

available in the NCCBR segment: haircuts in NCCBR differ dramatically from what is possible through other repo segments. For Treasury repo in NCCBR, 74% of all volume is transacted at zero haircut—a material departure from non-centrally cleared tri-party repo, where the median haircut on Treasury collateral has held consistently at 2% for over a decade.<sup>7</sup> Our findings, as well as outreach to market participants, suggest that the prevalence of zero-haircut Treasury repo is in part due to the use of netted packages, in which a dealer will conduct both a repo and a reverse repo with the same counterparty and the same tenor (usually short-term or overnight), but over different pieces of Treasury collateral. In effect, these netted packages facilitate trades of one Treasury against another, a strategy popular with relative-value hedge funds. Our data confirm that netted packages are prevalent in zero-haircut repo because over 70% of repo with hedge funds occurring at a zero haircut do net. For the remaining zero-haircut trades, while it is possible that no additional margin associated with the trades is collected, haircuts may reflect cross-product or portfolio-level margining where margin is collected on other trades linked to the repo transaction.

The prevalence of netted transactions within NCCBR, both among zero-haircut trades and more broadly, may reflect a deeper driver of volumes in this market. Since netted packages allow repo and reverse-repo to offset with the same counterparty, the balance sheet benefits of moving these trades to FICC are limited. We estimate that over 60% of all Treasury trades in the NCCBR market are naturally netted—that is, they match repo and reverse-repo with the same counterparty and tenor. Therefore, novating these trades to FICC would offer little additional balance sheet-netting benefit to the dealer, while NCCBR allows for greater flexibility in contract terms, such as haircuts and margining. Nevertheless, we show that substantial balance sheet netting benefits could still result from moving into FICC the set of trades in NCCBR that are not naturally netted.

Beyond haircuts and netting, secondary drivers of NCCBR volumes include the greater varieties of collateral and maturities available in this segment. FICC-cleared repo only allows for Fedwire-eligible securities to be used as repo collateral, so participants seeking to transact specific-collateral

repo on non-Fedwire securities must use NCCBR to facilitate these trades.<sup>8</sup> Additionally, the majority of FICC-cleared bilateral repo trades are overnight, so participants seeking longer-tenor trades may also have to transact in a non-centrally cleared venue.

That being said, while NCCBR does allow for greater varieties of collateral and maturities, we find that non-Fedwire collateral comprises only a small portion of NCCBR volumes. Empirically, 93.4% of NCCBR volume is collateralized by FICC-eligible securities, and 63.4% of NCCBR volume is term repo (maturity greater than one day). Similarly, rates in NCCBR are broadly comparable to FICC bilateral rates for the same collateral and tenor. However, many dealer-to-customer trades in FICC-cleared bilateral repo are limited to overnight transactions, so customers seeking longer-tenor trades may have to transact in a non-centrally cleared venue.

In sum, we show that haircuts and netting are the primary drivers of NCCBR volumes. Conversely, we show that rates, counterparty types, and collateral probably do not drive NCCBR use. Broadly speaking, our work suggests that counterparty risk and relationships are more important in the determination of repo haircuts and less important in the determination of rates than has previously been suggested. Our results carry additional importance in light of the U.S. Securities and Exchange Commission's (SEC's) proposed changes to the structure of the Treasury repo market. These changes would make it mandatory for all direct clearing members of the FICC to conduct all Treasury repo through FICC, with few exceptions.<sup>9</sup> Given that most of the dealers who intermediate repo are FICC clearing members, the SEC's proposal would dramatically decrease volumes in NCCBR. Understanding why so much activity is currently transacted in this segment of the market can therefore inform broader discussion about the potential effects of the proposed changes in market structure.

## 2. Background

The OFR performed an NCCBR pilot data collection in response to the Statement on Nonbank Financial Intermediation from the Financial Stability Oversight Council (the Council), which recommended that the OFR “consider ways to obtain better data on the

uncleared bilateral repurchase agreement market.”<sup>10</sup> The pilot collection captured three days in June 2022: June 15, June 22, and June 30. These dates were picked to show repo activity on “normal” days (June 22) and also on “abnormal” days such as a quarter end (June 30) and a Treasury settlement day (June 15), thereby giving a comprehensive view of what activity in this segment looks like across a variety of market environments. This brief draws on data collected on the first day (June 15), but preliminary results are similar across the other sample days.

The OFR secured the voluntary participation of nine dealers for this pilot. These dealers include primary dealers and nonprimary dealers, bank-affiliated and non-bank-affiliated dealers, and purely domestic dealers and dealers who are affiliates of foreign institutions. Each voluntary participant submitted transaction-level details on all outstanding non-centrally cleared bilateral trades conducted in the United States. Details include terms of the transactions such as rate, tenor, collateral, haircut, the timing of the transactions, and (where available) information on counterparties.

As part of this process, the OFR also conducted extensive outreach with several types of stakeholders: regulators, industry associations, data aggregators, platform providers, and market participants.<sup>11</sup> In addition to the data collected through the pilot, this brief draws on these conversations and subsequent queries to pilot participants about the nature of specific features of their repo trades.

These conversations revealed substantial differences between centrally cleared and non-centrally cleared markets, in terms of transparency and data standards. In the centrally cleared market, trades between dealers who are direct clearing members of FICC are usually conducted via transparent screens that provide live pricing information. Sponsored trades (i.e., trades between FICC members and customers who are not clearing members of FICC) may be less transparent and more dependent on relationships.<sup>12</sup> However, for all centrally cleared segments of the repo market, FICC provides a centralized system that tracks positions and details of trades. This centralized system provides the source for the OFR’s cleared repo collection and standardizes the comparison of data across different participants.

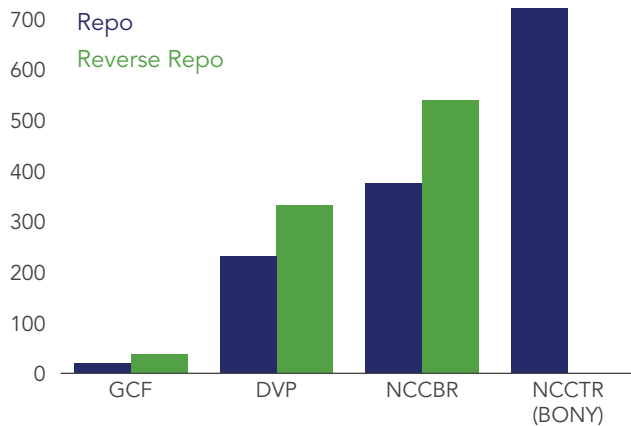
Conversely, in NCCBR, there is no central data repository, and consequently, both the content of and the storage methods used with data are heterogeneous across the many dealers that intermediate the market. While some trades in the NCCBR market are conducted through request-for-quote systems that provide recordkeeping services to dealers as well as a measure of price transparency, many trades in this market are still conducted over the phone or via chat, leaving decisions on how trades are recorded to the internal data management of the individual dealers. The OFR’s outreach surrounding the pilot was key to identifying a set of fields and definitions that allow comparison across many different dealers, though even with this carefully negotiated set of fields, certain details of how trades are recorded may still differ. The imposition of consistent data standards across dealers is therefore a large and underemphasized benefit of central clearing for regulators, who must necessarily look across different firms when analyzing market conditions or responding to a crisis.

### 3. Participation in NCCBR

Previous work has concluded that NCCBR is the largest of the four segments of the repo market.<sup>13</sup> To begin this section, we affirm this conclusion by showing pilot participants’ outstanding exposures across all four segments of the U.S. repo market on June 15 (see **Figure 2**). Like most dealers, all nine of these pilot participants are FICC members, which enables them to lend and borrow in FICC’s centrally cleared repo platforms: the bilateral DVP service and the tri-party GCF service. Additionally, many borrow in tri-party from banks and money market funds.

The NCCBR pilot captures \$373 billion in repo and \$536 billion in reverse repo by surveyed dealers, which is higher than the participants’ total volumes outstanding in the cleared repo segments, both for their repo and reverse-repo exposures (see **Figure 2**). Moreover, while pilot participants borrowed \$718 billion from the tri-party repo segment—a larger amount than they borrowed in NCCBR—their gross volume in tri-party is still smaller than their participation in NCCBR. To illustrate pilot participants’ importance across these segments, the nine dealers make up 17% of tri-party repo, 12% of DVP repo, and 21% of GCF repo. While

**Figure 2. Outstanding Volume by Repo Market Segment for Pilot Participants (\$ billions)**



Note: Volumes are for the nine pilot participants on June 15, 2022.

Sources: 2022 OFR NCCBR Pilot Collection, OFR Cleared Repo Collection, Federal Reserve Tri-party Repo Collection, Office of Financial Research

the total size of the non-centrally cleared repo market segment is unknown, assuming it is roughly \$2 trillion would mean that these pilot participants make up 40% of the estimated NCCBR segment.

Having examined the importance of NCCBR pilot dealers, we next examine the types of counterparties these dealers trade with through NCCBR (see **Figure 3**). Counterparty information was provided to the OFR by a subset of dealers, so the percentages provided in this table are the share of each counterparty type in all repo and reverse-repo trades by this subset of dealers. The results show that hedge funds are dealers' largest counterparties for both borrowing and lending in NCCBR. This highlights the importance of this segment as a source of hedge fund leverage, as has been speculated previously.<sup>14</sup> A small share of transactions are with broker-dealers and banks. Finally, a decent share of transactions occur with other counterparties, such as REITs, pension funds, sovereign wealth funds, and insurance companies.

Notably, most of these counterparties are FICC-eligible and active users of cleared repo, either as direct clearing members or, more commonly, as sponsored members. This is especially common among the large and sophisticated relative-value hedge funds that make up the lion's share of NCCBR transactions where counterparties can be identified. Therefore, while counterparties who do not have access to FICC may

**Figure 3. Percent of Pilot Trade Volume by Counterparty Type**

Counterparty Type	Percent of Market Segment		
	Reverse Repo	Repo	Total
Hedge Fund	54.8	76.6	62.7
Broker-Dealer	6.8	6.6	6.5
Bank	8.8	2.5	6.7
Other	29.6	14.4	24.1

Note: All repo and reverse-repo numbers are classified from the dealers' perspective. Of note, not all pilot participants submitted counterparty data. Percentages sum to 100 in each column.

Sources: 2022 OFR NCCBR Pilot Collection, Office of Financial Research

rely on NCCBR for their repo transactions, lack of access to FICC cannot explain the large volumes in NCCBR. Instead, most of the volumes in the NCCBR pilot are between two counterparties who both have access to FICC. Due to the fact that FICC eligibility cannot explain the large volumes observed in this segment, we must look at other features of NCCBR transactions that make them more attractive to these participants than centrally cleared transactions.

## 4. Collateral and Rates in NCCBR

One way in which FICC DVP trades and NCCBR might differ is through the type of collateral available, given that FICC DVP is limited to Treasury and non-mortgage-backed agency securities, while NCCBR, in principle, allows for any security to serve as collateral. However, we find that most NCCBR trades feature the same types of collateral as in centrally cleared segments. In this section, we show the total volume of the pilot participants broken out by collateral type (see **Figure 4**). Private-label MBS/ABS trades, corporate-debt trades, and other types of collateral do trade in NCCBR, reflecting the wider variety of collateral available for use.<sup>15</sup> In particular, private-label MBS and ABS make up around 3% of all NCCBR volume. The share of these transactions in NCCBR is of interest because NCCBR is the only venue in which dealers can lend against these collateral

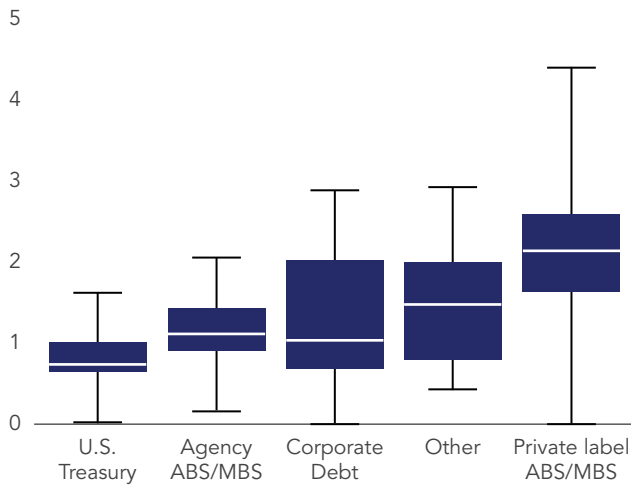
Figure 4. Volume and Rates for NCCBR Volume by Collateral Class

Collateral Class	Reverse Repo			Repo		
	Volume (\$ billions)	Haircut (Percent)	Interest Rate (Percent)	Volume (\$ billions)	Haircut (Percent)	Interest Rate (Percent)
U.S. Treasuries	453.3	0.1	0.89	349.6	0.1	0.71
Agency MBS/ABS	48.8	5.3	1.17	7.9	3.7	1.02
Private MBS/ABS	14.8	26.6	2.32			
Corporate Debt	8.5	9.6	1.76	7.7	-0.2	0.61
Other	10.7	13.0	1.60	6.3	5.6	1.19

Note: All repo and reverse-repo numbers are classified from the dealers' perspective. Shaded table cells represent data that does not meet disclosure requirements.

Sources: 2022 OFR NCCBR Pilot Collection, Office of Financial Research

Figure 5. NCCBR Interest Rates by Collateral Class (percent per annum)



Note: Rates are for all outstanding agreements in each collateral class. Blue boxes denote the inter-quartile range for each collateral class, with solid lines inside these boxes denoting the median. The highest and lowest horizontal lines denote percentiles 3 and 97 of the rate distribution.

Sources: 2022 OFR NCCBR Pilot Collection, Office of Financial Research

types within the U.S., though borrowing against this collateral is conducted by dealers through the tri-party segment.

However, we find that 95.8% of outstanding repo and 93.7% of outstanding reverse repo in NCCBR are collateralized by Fedwire-eligible securities. On a collateral basis, therefore, many of these trades

could be conducted through FICC. This, again, eliminates a potential driver for high NCCBR volumes because most of the trades conducted in NCCBR are collateralized by securities eligible to be used as collateral in FICC. Meanwhile, 93.1% of NCCBR repo and 84.5% of NCCBR reverse repo are collateralized by Treasury securities and thus would be subject to changes in requirements for the central clearing of Treasury transactions.

Broadly, weighted average rates in NCCBR reverse-repo are increasing with the riskiness of the underlying collateral, with the lowest average rates being charged for Treasuries, followed by agency MBS and ABS, then corporate debt, and then agency debt (see Figure 4). However, these average rates mask substantial heterogeneity among transactions (see Figure 5). While most Treasuries trade at rates below most agency MBS and ABS and in turn below private-label ABS/MBS, corporate debt in particular shows substantial variation between the bottom and top quartiles.

Next, to more closely compare rates in NCCBR to rates in centrally cleared bilateral, we examine the distribution of rates on overnight Treasury transactions in NCCBR and those in FICC DVP (see Figure 6). This analysis controls for the effects of both tenor and collateral on interest rates (in contrast to Figure 5). We compare these rates in NCCBR to rates in the interdealer brokered segment of FICC DVP and to

rates across all trades in FICC DVP, including brokered interdealer trades, sponsored trades, and unbrokered interdealer trades.

Brokered interdealer trades are blind-brokered trades between large FICC members (such as brokers, dealers, banks, and some GSEs) and are organized on screens that provide essentially instantaneous pricing. These trades, therefore, reflect negligible counterparty risk and substantial transparency. Meanwhile, the full FICC DVP distribution also reflects bilaterally negotiated trades with sponsored entities, which tend to be smaller and do not fully protect the dealer against counterparty risk.<sup>16</sup>

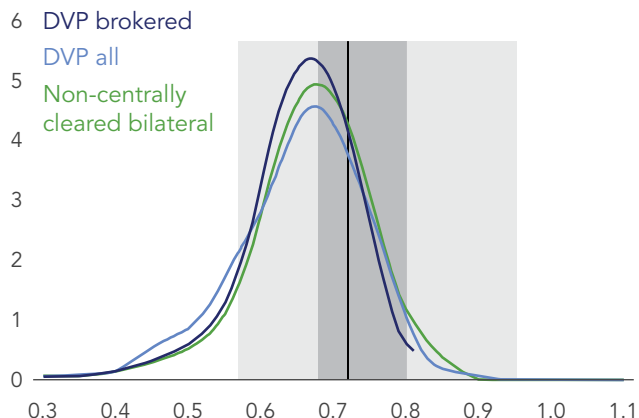
Despite the differences between NCCBR trades and DVP trades, the distribution of rates in each of these market segments is quite similar to that of the other (see **Figure 6**). Both fall below broad general collateral rates (BGCR). While NCCBR may have some transaction volume occurring at the extreme of the rate distribution figure, median rates in the two segments are approximately the same, though DVP brokered rates fall slightly below NCCBR, possibly reflecting the importance of special collateral transactions in this segment. Meanwhile, DVP brokered features no smaller borrowers who may have credit risk, which may explain the lower-right tail of the distribution of rates.

The fact that the rates of the two segments are roughly comparable suggests that customers are not attracted to DVP based on more favorable rates. We have also seen that collateral is broadly similar between the two segments. Therefore, we next examine haircuts and tenor, where there are much larger differences between centrally cleared and non-centrally cleared bilateral repo segments.

## 5. Haircuts in NCCBR

One difference between the centrally cleared repo segment and the NCCBR segment is how margining is handled. For transactions that are centrally cleared, margins are calculated on the portfolio level using a proprietary value-at-risk framework developed by FICC. For NCCBR transactions, as for non-centrally cleared tri-party repo transactions, haircuts on each individual transaction determine margins collected

**Figure 6. Distribution of Overnight Treasury Repo Rates in Percent in NCCBR and FICC DVP (density)**



Note: Black line denotes the median of the Broad General Collateral Rate (BGCR), which is derived from trades in FICC GCF and tri-party markets, darker shaded region denotes the inter-quartile range, lighter shaded region denotes percentiles 1-99.

Sources: 2022 OFR NCCBR Pilot Collection, OFR Cleared Repo Collection, Office of Financial Research

for that transaction (though other margin may be collected from that counterparty by the dealer across positions outside of repo). Haircuts therefore act as an important determinant of the attractiveness of a repo transaction because they pin down how much leverage can be taken on an individual trade.

We begin this section by reviewing average haircuts and rates across collateral types in the NCCBR segment (see **Figure 7**). Similar to rates, haircuts are generally increasing with the riskiness of collateral. Across collateral classes, haircuts tend to be lower for repo than for reverse repo. When dealers are borrowing from a customer, they demand relatively more collateral be delivered than when they lend to the same customer. In fact, haircuts on Treasury repo where dealers are borrowing from hedge fund customers are usually negative or zero, while haircuts where dealers are lending to hedge funds are usually zero or positive. This may reflect the relative credit risk of dealers and hedge funds. The data we show here suggests that protection against the counterparty may play a larger role in the magnitude and sign of haircuts in NCCBR than in other markets like tri-party repo, where, for instance, haircuts on Treasury transactions are almost universally 2% and have been for several years. Meanwhile, median tri-party haircuts were between 2% and 3% on agency collateral, between 6%

Figure 7. Rates and Haircuts Across Collateral Classes in NCCBR

Collateral Class	Reverse Repo			Repo		
	Volume (\$ billions)	Haircut (Percent)	Interest Rate (Percent)	Volume (\$ billions)	Haircut (Percent)	Interest Rate (Percent)
U.S. Treasuries	453.3	0.1	0.89	349.6	0.1	0.71
Agency MBS/ABS	48.8	5.3	1.17	7.9	3.7	1.02
Private MBS/ABS	14.8	26.6	2.32			
Corporate Debt	8.5	9.6	1.76	7.7	-0.2	0.61
Other	10.7	13.0	1.60	6.3	5.6	1.19

Note: All repo and reverse-repo numbers are classified from the dealers’ perspective. Shaded table cells represent data that does not meet disclosure requirements.

Sources: 2022 OFR NCCBR Pilot Collection, Office of Financial Research

Figure 8. Rates and Haircuts Across Collateral Classes in NCCBR

Collateral Class	Haircut Distribution					
	Haircut (Percent):	<-2	-2 to 0	0	0 to 2	>2
Treasuries	Volume (\$ billions)	21.6	40.6	593.9	108.9	38.0
	Percent of Total	2.7	5.1	74.0	13.6	4.7
	Haircut (Percent):		<0	0	0 to 5	>5
Non-Treasuries	Volume (\$ billions)		2.0	26.2	34.9	43.7
	Percent of Total		1.8	24.6	32.7	40.9

Note: Shaded table cells represent data that does not meet disclosure requirements.

Sources: 2022 OFR NCCBR Pilot Collection, Office of Financial Research

and 8% on private-label MBS and ABS, and between 5% and 9% on corporate debt. Therefore, for repo transactions, haircuts are generally below what dealers deliver to money market funds and banks in tri-party, while for reverse-repo transactions, haircuts are generally higher (except for Treasuries).

Next, we explore the distribution of haircuts on NCCBR Treasury transactions (see **Figure 8**). For almost 75% of Treasury volume, haircuts are zero.<sup>17</sup> Conversations with market participants indicate that many zero-haircut trades may represent netted packages, in which customers approach dealers with one piece of Treasury collateral per repo trade, matched with a reverse-repo

trade against another piece of collateral. In effect, these trades allow the customer to temporarily swap one Treasury for another. The customer ends up with a long exposure to the Treasury they have lent to the dealer via reverse repo and a short exposure to the Treasury they have borrowed from the dealer via repo. The customer will profit if the relative appreciation of the Treasury they borrow over the treasury they lend is higher than the difference between the reverse-repo and repo rates, between which dealers usually charge a spread (as shown in **Figure 8**). These types of netted packages are reportedly extremely popular for relative-value hedge funds, whose specialty tends to be trading



one similar security against another and profiting off the difference in prices, which is exactly what a netted package enables. Moreover, because differences in prices among Treasuries tend to be small, a large trade size is necessary to make a profit. This makes low haircuts on these trades important because they allow for greater leverage and therefore a greater size of trade. For more details on the importance of haircuts and netted packages for Treasury market liquidity and resiliency, see the Box Topic titled, “Consequences of Haircuts in NCCBR for Treasury Markets.”

## 6. Netting in NCCBR

To find what proportion of zero-haircut volumes are likely to represent netted packages, we estimate total netting conducted by dealers. For a dealer to net repo and reverse repo, the two trades must have the same end date and counterparty.<sup>18</sup> Over each customer, *i*, dealer, *j*, and end date, *t*, we estimate the amount of netted repo and reverse repo as:

$$Netted = \sum_i \sum_j \sum_t \min(Repo Volume_{i,j,t}, Reverse Repo Volume_{i,j,t}),$$

which gives us the total amount of volume that can be netted between repo and reverse repo.<sup>19</sup> The amount that is currently not netted is then:

$$Non-netted Repo = \sum_i \sum_j \sum_t Repo Volume_{i,j,t} - Netted$$

$$Non-netted Reverse Repo = \sum_i \sum_j \sum_t Reverse Repo Volume_{i,j,t} - Netted$$

We calculate the total netted and non-netted repo and reverse repo for all Treasury trades and for Treasury trades for customers who receive only zero haircuts (trades by these customers make up the substantial majority of zero-haircut trades).

To identify unique customers, we use the internal customer identifiers provided to us by dealers. This may bias the amount of netting downward because, if internal identifiers are assigned on a trading-desk basis rather than a legal-ownership basis, the estimated amount of netting will understate the total possible netting. However, we believe this situation to be unlikely.

Next, we examine the total amounts that are netted and non-netted across our pilot dealers (see **Figure 9**). Among gross zero-haircut trades, nearly half of the volume (47.3%) is indeed netted, which is consistent with the reports by dealers that netted packages explain a large share of zero-haircut trades. However, a majority of volume with zero haircuts (52.7%) does not net in the NCCBR pilot data. Some of these trades are dealers trading with other financial institutions of a similar credit risk, where, given the relationship between haircuts and counterparty risk, zero haircuts may emerge because the two institutions have a similar risk of default.

Next, we restrict our attention to trades between pilot participants and hedge funds, in which dealers may be expected to demand more protection for non-netted trades (see **Figure 10**). We estimate that 70% of hedge fund repo borrowing and 57% of hedge fund

**Figure 9. Volumes in NCCBR by Netting and Trade Direction (\$ billions)**

	All Treasury Trades		Zero-Haircut Treasury Trades	
	Reverse Repo	Repo	Reverse Repo	Repo
Netted	190.0	190.0	135.5	135.5
Non-netted	254.1	146.6	179.0	123.3

Note: All repo and reverse-repo numbers are classified from the dealers’ perspective.

Sources: 2022 OFR NCCBR Pilot Collection, Office of Financial Research

**Figure 10. Trades with Hedge Funds in NCCBR by Netting and Trade Direction (Percent of Total Volume by Trade Direction)**

	All Treasury Trades		Zero-Haircut Treasury Trades	
	Reverse Repo	Repo	Reverse Repo	Repo
Netted	60	68	57	70
Non-netted	40	32	43	30

Note: This table only includes hedge fund trades in which the counterparty can be identified to be unique. All repo and reverse-repo numbers are classified from the dealers’ perspective.

Sources: 2022 OFR NCCBR Pilot Collection, Office of Financial Research

repo lending at zero haircut are netted, suggesting that among these trades, netted packages play a large role in driving zero haircuts.

However, according to our estimates, 30% of zero-haircut repo with hedge funds and 43% of zero-haircut reverse repo with hedge funds are not netted. One possibility is that these trades are part of larger packages in which dealers maintain zero exposure to their counterparties—such as through other products like futures, swaps, or other derivatives; or through transactions in other sections of the consolidated dealer that we do not observe. Many dealers may use cross-product or portfolio-level margining, in which margin may be collected on other trades or on the portfolio level that is associated with a repo trade but not observable through our collection. Another possibility is that customer identifiers provided to us by dealers do not completely capture netting sets (e.g., if margining is handled across different asset managers within the same fund complex). Finally, these non-netted zero-haircut trades may represent unhedged exposures to counterparties that the dealers have chosen not to require margin for (e.g., if Treasuries are considered safe assets by the firm and the default of the counterparty is considered to be unlikely). Regardless, the reasons for these zero haircuts on non-netted trades merit more examination, and it may be important to obtain more data on margining practices within large dealers.

The requirement for trades that net to have the same counterparty creates a natural role for centrally cleared repo. When trades are placed through FICC, either through sponsored repo or through trades between direct clearing members, the dealer's nominal counterparty on all trades becomes FICC. This allows dealers to net a centrally cleared repo with one counterparty, such as a money market fund, against a centrally cleared reverse repo with a different counterparty, such as a hedge fund. The ability to net these trades lowers dealers' balance sheet costs for providing repo and reverse repo to customers. This netting benefit has been touted as one of the largest benefits of expanded central clearing in the repo market. However, netting benefits from moving NCCBR to FICC only exist if trades do not already net in this market segment. For trades where dealer repo and reverse repo with a single customer already match, moving to FICC would maintain the netting benefit, but it would not offer any

additional netting benefits because the counterparties on repo and reverse repo are already identical.

Next, we examine all Treasury trades to determine how many trades for our pilot dealers are already netted (see the left panel of **Figure 9**). The non-netted amounts come to \$400 billion out of the total \$780.7 billion in outstanding Treasury trades. Therefore, natural netting reduces balance sheet sizes by 48.7%; on the other hand, FICC netting could reduce balance sheets by an additional 35% (or greater if NCCBR trades could be netted against FICC trades). These results suggest that while many existing NCCBR trades already net, there could be substantial benefits to increased netting of NCCBR trades (even without central clearing), were those trades to be moved to FICC (as would likely be required under the proposed SEC rule).

## Consequences of Haircuts in NCCBR for Treasury Markets

In this box, we dive deeper into the issue of zero haircuts on netted packages, and we also consider the likely effects of possible regulatory actions such as a mandated minimum haircut. Low haircuts in Treasury repo markets have been noted as a concern in the past, with the Group of Thirty report on the U.S. Treasury Market observing that “competitive pressures [in recent years have been] driving haircuts down (sometimes to zero).” This concern was echoed by some market participants in our outreach.

However, many market contacts report that zero haircuts are considered reasonable on these trades because they feel dealers face very little risk. In particular, these trades involve reduced credit risk because repo and reverse repo are matched, so that in effect, no cash needs to change hands. Dealers also have no related balance sheet costs because they are able to net the repo exposure to one counterparty against the reverse-repo exposure to that same counterparty. On the other hand, dealers may face basis risk because they could lose on the difference between prices of the two pieces of collateral moving against them. That is certainly possible, given that dealers are taking the opposite side of the relative-value trades they facilitate for their clients. In the event of default, the dealer might not receive back the collateral on the repo with the customer and might be left with the Treasury delivered

to them as collateral on the reverse repo. However, most netted packages appear to be for relatively short tenors, so dealers may feel that large moves in relative prices of Treasuries are unlikely in such a short period.

The low haircuts available to customers through noncentrally cleared bilateral repo present an extremely attractive offer for customers relative to FICC DVP, which charges minimum margins assessed on a portfolio basis. Transitioning these trades to centrally cleared repo under FICC’s current rules would therefore result in higher total margins on customer positions. While higher haircuts would better protect these dealers against the possibility of an extreme move in Treasury prices, the risks that dealers take on through these trades should also be counterweighed against the liquidity and price discovery benefits provided by hedge funds through their relative-value trading.

To examine the potential consequences of imposing higher haircuts on Treasury trades, as well as the consequences for the economics of a netted package, we consider a simple example of trading two Treasuries, A and B, funded through a netted package (see **Figure B.1**). For now, we assume that there are no haircuts in the transaction. The customer buys Treasury A today, funding this purchase through borrowing against the

Figure B.1. Example Economics of a Netted-Package Relative-Value Trade with No Haircut

Transactions		Cash Flow Today	Cash Flow Tomorrow
Cash Market	Buy Treasury A	$-P_{A,t}$	
	Sell Treasury A		$P_{A,t+1}$
Repo Market	Borrow against Treasury A	$P_{A,t}$	$-[1+r_A] \times P_{A,t}$
	Lend against Treasury B	$-P_{B,t} \times q_B = -P_{B,t} \times (P_{A,t}/P_{B,t})$	$[1+r_B] \times P_{B,t} \times q_B = [1+r_B] \times P_{B,t} \times (P_{A,t}/P_{B,t})$
Cash Market	Sell Treasury B	$P_{B,t} \times q_B = P_{B,t} \times (P_{A,t}/P_{B,t})$	
	Buy Treasury B		$-P_{B,t+1} \times q_B = -P_{B,t+1} \times (P_{A,t}/P_{B,t})$
Total		0	$[(P_{A,t+1}/P_{A,t} - P_{B,t+1}/P_{B,t}) - (r_A - r_B)] \times P_{A,t}$

Source: Office of Financial Research

Treasury in the repo market. Then the customer borrows Treasury B through lending in repo and sells it. Cash flows today for this transaction are zero. Tomorrow, the customer repays its repo borrowing and receives Treasury A in return, which it sells. It then buys Treasury B with the proceeds and delivers Treasury B to the repo lender in return for cash. The profits tomorrow on this trade are positive whenever the relative appreciation of Treasury A over Treasury B is greater than the difference between the repo rate paid on borrowing against Treasury A and the repo rate received by the customer on lending against Treasury B. In effect, this imposes a requirement that the difference in yields between two equivalent Treasuries today must be less than the difference between the two repo rates:

$$y_A - y_B \leq r_A - r_B$$

This condition directly relates repo spreads to the difference in yields between equivalent Treasuries, providing a direct link from repo markets to price efficiency in cash Treasury markets.

Next, we consider what happens when a haircut is charged (see **Figure B.2**). To protect itself against default on borrowing against Treasury A, the dealer charges the customer a positive haircut,  $h$ . To protect

itself against failure to deliver Treasury B, the dealer charges the customer a negative haircut that we assume is also equal to  $h$ . As a result, the customer can no longer fund its repo and reverse-repo positions from the previous example without a cash outlay today to cover the two haircuts it now faces. Instead, it must cover these haircuts with its own equity. This equity would be transferred to the dealer and would provide for greater protection against a sudden change in relative price between Treasury A and Treasury B.

In particular, in the event of default with no haircut, we assume the dealer has given up  $P_{A,t}/P_{B,t}$  in Treasury B and  $P_{A,t}$  in cash. It now holds Treasury A, which was delivered as collateral on its loan, and  $P_{A,t}$  in cash. Therefore, its (economic) losses in default with no haircut are:

$$\frac{P_{B,t+1}}{P_{B,t}} - \frac{P_{A,t+1}}{P_{A,t}}$$

which, in the event that the trade has moved against the customer enough to cause a default, are likely to be positive. With a haircut  $h$ , the dealer has now only given up  $(1-h)P_{A,t}$  and now holds  $(1+h)P_{A,t}$  in cash. This means that in the event of default, its losses are:

$$\frac{P_{B,t+1}}{P_{B,t}} - \frac{P_{A,t+1}}{P_{A,t}} - 2hP_{A,t}$$

**Figure B.2. Example Economics of a Netted-Package Relative-Value Trade with Haircuts**

Transactions		Cash Flow Today	Cash Flow Tomorrow
Cash Market	Buy Treasury A	$-P_{A,t}$	
	Sell Treasury A		$P_{A,t+1}$
Repo Market	Borrow against Treasury A	$P_{A,t}$	$-[1+r_A] \times P_{A,t}$
	Lend against Treasury B	$-P_{B,t} \times q_B = -P_{B,t} \times (P_{A,t}/P_{B,t})$	$[1+r_B] \times P_{B,t} \times q_B = [1+r_B] \times P_{B,t} \times (P_{A,t}/P_{B,t})$
Cash Market	Sell Treasury B	$P_{B,t} \times q_B = P_{B,t} \times (P_{A,t}/P_{B,t})$	
	Buy Treasury B		$-P_{B,t+1} \times q_B = -P_{B,t+1} \times (P_{A,t}/P_{B,t})$
Equity	Borrow to fund haircuts	$2 \times h \times P_{A,t}$	$-r_E \times 2 \times h \times P_{A,t}$
Total		0	$[(P_{A,t+1}/P_{A,t} - P_{B,t+1}/P_{B,t}) - (r_A - r_B)] \times P_{A,t}$

Source: Office of Financial Research

which reflects the additional cushion provided by the haircuts on the repo and reverse repo. This haircut reduces the likelihood that the relative depreciation would cause a loss.

At the same time, the additional haircut could also widen the disconnect between the prices of the two equivalent Treasuries in our previous example. With positive haircuts, the condition on yields between two equivalent Treasuries becomes:

$$y_A - y_B \leq r_A - r_B + h(r_E - r_A) + h(r_E - r_B),$$

where  $r_E$  is the required return on the customer's equity. We can generally assume that this required return will be higher than either the repo or the reverse-repo rate because the equity provision would be uncollateralized. Therefore, greater differences in yields between equivalent Treasuries can result from higher haircuts.

While this example is simple, it follows a long literature on the relationship between margins and arbitrage that suggests that while higher margins protect dealers from losses caused by default, they can also lead to greater mispricing between equivalent assets. These two examples therefore illustrate how in setting a minimum margin for Treasuries, policy makers must weigh the benefits of protecting dealers from sudden moves in Treasury prices against the costs of decreasing price efficiency and liquidity in the Treasury market. These examples also suggest how the cash Treasury market might be affected by transitioning noncentrally cleared repo positions to FICC, where similar minimum margin requirements might be imposed on netted packages through charges on the sponsor of hedge fund trades.

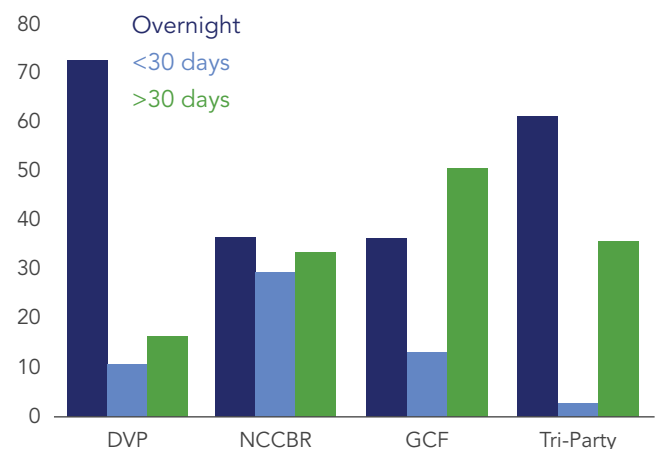
## 7. Tenor of NCCBR Trades

While the favorable treatment of haircuts and netting may explain the attractiveness of NCCBR for Treasury trades, the greater flexibility afforded by NCCBR over FICC DVP in terms of the tenor offered may play an additional role for non-Treasury trades. The vast majority of trades are overnight in the centrally cleared bilateral segment. Overnight trades are especially popular within sponsored repo, since money market funds invest at short tenors, which means dealers must lend to sponsored borrowers at short tenors to receive the netting benefit of sponsored repo. While GCF provides another route to engage in term repo, volumes in this service remain small.

NCCBR is therefore one of the few segments in which longer-tenor repo trades can be made by counterparties, and this is reflected in the share of longer-tenor trades in NCCBR pilot volumes (see **Figure 11**). In contrast to DVP, in which over 70% of outstanding volume is overnight; in NCCBR, less than 40% of outstanding volume is overnight, with the remainder split between trades with less than 30 days to maturity and trades with greater than 30 days to maturity. On average, this means that NCCBR repo features far longer-tenor trades than in either of the centrally cleared segments.

The greater flexibility of this market segment may be most useful outside of Treasury trades, in which repo agreements are more frequently of a longer tenor.

**Figure 11. Percent of Volume by Tenor**



Sources: 2022 OFR NCCBR Pilot Collection, OFR Cleared Repo Collection, Federal Reserve Tri-party Repo Collection, Office of Financial Research

Even in NCCBR, overnight trades are almost exclusively Treasuries; it is among longer-tenor trades that we observe a larger share of non-Treasury collateral participation (see **Figure 12**). These longer-tenor trades with non-Treasury collateral may continue to take place in the NCCBR segment, even after the SEC’s proposed rule expanding central clearing in the Treasury market goes into effect. These trades against more exotic collateral may bear additional transformation risks that are relevant to financial stability, given the role of repo in the financial crisis of 2007-08.

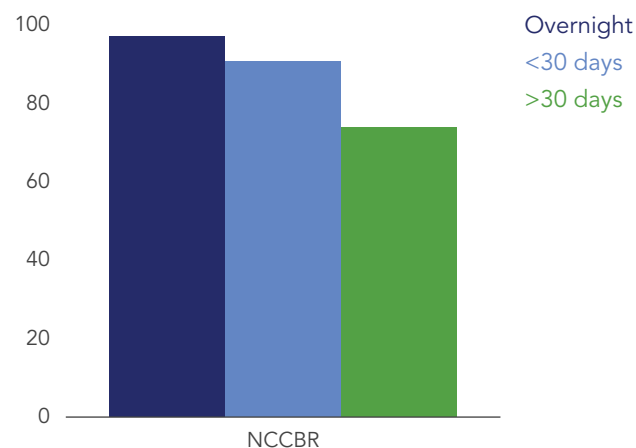
## 8. Conclusion

The OFR’s pilot collection provides us with a unique window into the non-centrally cleared bilateral repo market segment. In this brief, we examine the unique features of this segment of the market that make it attractive as a venue for repo trades. While rates and collateral usage are quite similar to those in the centrally cleared bilateral market segment, NCCBR offers more flexibility in terms of tenor and haircuts than is available in centrally cleared repo. NCCBR is particularly popular for netted trades with customers. The combined evidence of our pilot and our outreach to dealers and other market participants suggests NCCBR offers benefits in terms of the flexibility of terms and margining. These benefits make NCCBR especially advantageous for trades that would receive no netting benefit from being novated to FICC. Meanwhile, longer tenor trades appear to be popular, especially in combination with the wider diversity of collateral allowed in the NCCBR market segment.

Going forward, the OFR plans to follow its pilot collection with a permanent collection of data from this segment of the market. This collection will provide valuable insights into the shifting rates and exposures in the NCCBR segment in the future. In particular, proposed rules expanding the centrally cleared segment may lead to volumes moving out of NCCBR, and reforms to the Treasury market may make relative-value trades less attractive, while expanded issuance of Treasuries may increase volumes going through the repo market generally. Meanwhile, trades collateralized with more exotic collateral may again become more popular, driving further demand for NCCBR. The OFR’s collection of data on the NCCBR market segment would allow regulators to

evaluate the expansion of this activity going forward and provide transparency into potential financial-stability risks building up in this key funding market.

**Figure 12. Percent of Total NCCBR Pilot Tenor Volume Collateralized by Treasuries**



Sources: 2022 OFR NCCBR Pilot Collection, Office of Financial Research

# Endnotes

1 Samuel J. Hempel, Economist, Federal Reserve Board ([sam.hempel@frb.gov](mailto:sam.hempel@frb.gov)); R. Jay Kahn, Senior Economist, Federal Reserve Board ([jay.kahn@frb.gov](mailto:jay.kahn@frb.gov)); Robert Mann, Research Economist, Office of Financial Research ([robert.mann@ofr.treasury.gov](mailto:robert.mann@ofr.treasury.gov)); and Mark E. Paddrik, Associate Director, Office of Financial Research ([mark.paddrik@ofr.treasury.gov](mailto:mark.paddrik@ofr.treasury.gov)). This work was initiated while Hempel and Kahn were employed by the Office of Financial Research. The views expressed in this brief are those of the authors and do not necessarily indicate concurrence by the Office of Financial Research, the U.S. Department of the Treasury, the Federal Reserve Board of Governors, or the Federal Reserve System. We thank Ron Alquist, Matthew McCormick, and Alexandra Somers for their comments and suggestions. Any errors are the sole responsibility of the authors.

2 The OFR Non-centrally Cleared Bilateral Pilot is a result of a lot of effort on the part of many different parties. We would like to thank the pilot participants for agreeing to share their data with the OFR. We would also like to thank Melissa Avstreich, Danylo Rakowsky, Kevin Kostka, Adam Cook, Laura Craig, David Vun Kannon, Valerie Wells, and the entire OFR staff who have been involved in the collection process.

3 For more details on the general structure of the repo market, see Baklanova, Viktoria, Adam Copeland, and Rebecca McCaughrin. "Reference Guide to U.S. Repo and Securities Lending Markets." Working Paper no. 15-17, Washington, D.C.: Office of Financial Research, September 2015. <https://www.financialresearch.gov/working-papers/2015/09/09/reference-guide-to-u-s-repo-and-securities-lending-markets/>, and Kahn, R. Jay, and Luke M. Olson. "Who Participates in Cleared Repo?" Brief no. 21-01, Washington, D.C.: Office of Financial Research, July 2021. <https://www.financialresearch.gov/briefs/2021/07/08/who-participates-in-cleared-repo/>.

4 The non-centrally cleared bilateral repo segment is often colloquially referred to as "uncleared bilateral" repo, for shorthand.

5 Office of Financial Research. Centrally Cleared Repo Data Collection. Washington, DC: OFR, February 2019. <https://www.financialresearch.gov/data/cleared-repo-data/>.

6 For more detail on this market size estimate, see a related blog post from the OFR: Hempel, Samuel J., R. Jay Kahn, Vy Nguyen, and Sharon Y. Ross. 2022. "Non-centrally Cleared Bilateral Repo." The OFR Blog. Office of Financial Research. August 24, 2022. <https://www.financialresearch.gov/the-ofr-blog/2022/08/24/non-centrally-cleared-bilateral-repo/>. These estimates are also consistent with evidence presented in an earlier analysis; see Infante, Sebastian, Lubomir Petrusek, Zack Saravay, and Mary Tian. 2022. "Insights from revised Form FR2004 into primary dealer securities financing and MBS activity." FEDS Notes. Board of Governors of the Federal Reserve System. August 5, 2022. <https://www.federalreserve.gov/econres/notes/feds-notes/insights-from-revised-form-fr2004-into>

[primary-dealer-securities-financing-and-mbs-activity-20220805.html](https://www.federalreserve.gov/econres/notes/feds-notes/insights-from-revised-form-fr2004-into-primary-dealer-securities-financing-and-mbs-activity-20220805.html).

7 See margin data from the Federal Reserve Bank of New York's Tri-Party/GCF Repo Statistics.

8 Non-centrally cleared tri-party repo, or tri-party for short, does allow the use of non-Fedwire collateral. However, tri-party only allows for general-collateral repo, not special-collateral repo. Thus, market participants seeking specific-security repo for non-Fedwire collateral are left with NCCBR as the only viable venue to transact.

9 The only exceptions to this proposal would be transactions in which the FICC member's counterparty is "a central bank, sovereign entity, international financial institution, or a natural person." See page 41 of the Proposed Rule in Securities and Exchange Commission. "SEC Proposes Rules to Improve Risk Management in Clearance and Settlement and to Facilitate Additional Central Clearing for the U.S. Treasury Market." Press Release, September 14, 2022: SEC. <https://www.sec.gov/news/press-release/2022-162>.

10 Financial Stability Oversight Council. "Financial Stability Oversight Council Statement on Nonbank Financial Intermediation February 4, 2022." Press Release, February 4, 2022: The Council. <https://home.treasury.gov/news/press-releases/jy0587>.

11 The lessons from this outreach were first discussed in Hempel, Samuel J., R. Jay Kahn, Vy Nguyen, and Sharon Y. Ross. 2022. "Non-centrally Cleared Bilateral Repo." The OFR Blog. Office of Financial Research. August 24, 2022. <https://www.financialresearch.gov/the-ofr-blog/2022/08/24/non-centrally-cleared-bilateral-repo/>.

12 For more details on sponsored trades, see Kahn, R. Jay, and Luke M. Olson. "Who Participates in Cleared Repo?" Brief no. 21-01, Washington, D.C.: Office of Financial Research, July 2021. <https://www.financialresearch.gov/briefs/2021/07/08/who-participates-in-cleared-repo/>.

13 See Infante, Sebastian, Lubomir Petrusek, Zack Saravay, and Mary Tian. 2022. "Insights from revised Form FR2004 into primary dealer securities financing and MBS activity." FEDS Notes. Board of Governors of the Federal Reserve System. August 5, 2022. <https://www.federalreserve.gov/econres/notes/feds-notes/insights-from-revised-form-fr2004-into-primary-dealer-securities-financing-and-mbs-activity-20220805.html> and Hempel, Samuel J., R. Jay Kahn, Vy Nguyen, and Sharon Y. Ross. 2022. "Non-centrally Cleared Bilateral Repo." The OFR Blog. Office of Financial Research. August 24, 2022. <https://www.financialresearch.gov/the-ofr-blog/2022/08/24/non-centrally-cleared-bilateral-repo/>.

14 See Barth, Daniel, and R. Jay Kahn. "Hedge Funds and the Treasury Cash-Futures Disconnect." Working Paper no. 21-01, Washington, D.C.: Office of Financial Research,

April 2021. <https://www.financialresearch.gov/working-papers/files/OFRwp-21-01-hedge-funds-and-the-treasury-cash-futures-disconnect.pdf>, and Hempel, Samuel J., R. Jay Kahn, Vy Nguyen, and Sharon Y. Ross. 2022. "Non-centrally Cleared Bilateral Repo." The OFR Blog, Office of Financial Research. August 24, 2022. <https://www.financialresearch.gov/the-ofr-blog/2022/08/24/non-centrally-cleared-bilateral-repo/>.

15 We do not observe any trades that are collateralized with equities in NCCBR. This reflects the popularity of securities lending as a method for lending and borrowing against equity collateral.

16 In sponsored repo, sponsors must make up the entirety of the clearing fund for the entities they sponsor. Should a sponsored member default, the sponsor who is their counterparty may not be entitled to protection from the clearing fund. Therefore, unlike in trades with full clearing members, where the costs of a default would be mutualized through the clearing fund, trading with a sponsored member can involve counterparty risk.

17 Most haircuts are at round values such as 2, 1.5, 0, or -2, but for disclosure purposes, we report haircuts as ranges, except those that are exactly zero.

18 For more details on repo netting rules, see Financial Accounting Standards Board. "Offsetting of Amounts Related to Certain Repurchase and Reverse Repurchase Agreements." Interpretation, Norwalk, CT: FASB Interpretation No. 41 (December 15, 1994). <https://www.fasb.org/page/PageContent?pagelId=/reference-library/superseded-standards/summary-of-interpretation-no-41.html&bcpath=fff>.

19 In order to run this analysis, transaction data need to have a valid counterparty identifier and end date. As a result, 3% of transactions are dropped from the dataset when these filters are performed, resulting in the numbers in this figure differing from those presented in Figure 8.