OFR BRIEF SERIES
OFFICE OF FINANCIAL RESEARCH

21-01 | July 8, 2021

Who Participates in Cleared Repo?

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The U.S. repo market, which is split among four markets, links a wide range of banks and nonbanks who lend and borrow short-term against securities pledged as collateral. This brief uses the OFR's collection of repo market data to highlight some basic facts about the two cleared repo markets. The broadness of cleared repo market participants underscores two increasingly important trends in U.S. financial markets. First, the rising importance of market-based finance among hedge funds and money market funds. Second, the global scope of U.S. financial markets, as a significant portion of net repo borrowing in cleared markets is by foreign banks. The diversity of institution types also means reference rates based on repo transactions represent a broad range of financial market participants.

The repo market links a wide range of financial market participants who lend and borrow short-term against securities pledged as collateral. The repo market provides a number of important financial services. It is a source of funding, a substitute for deposits, a means of financing securities portfolios, a mechanism for procuring valuable collateral, and a source of data for constructing the Secured Overnight Financing Rate (SOFR). Events in March 2020 highlighted the crucial role that well-functioning repo markets play in providing these services and ensuring financial stability.

Until recently, a lack of data kept some basic facts about the repo market hidden.[2] At present, it's really four markets, and combined, the overall market is large (see *Structure of the U.S. Repo Market*). One market handles uncleared tri-party transactions. Another market is for uncleared bilateral transactions. Tri-party transactions include a tri-party custodian who manages collateral on behalf of borrowers, while bilateral transactions do not. Two other markets have transactions cleared by a central counterparty who guarantees the trades. One market, the Fixed Income Clearing Corporation's GCF Repo Service (GCF), is a tri-party service. The other market, the Fixed Income Clearing Corporation's DVP Repo Service (DVP), is a bilateral service.[3] While the uncleared tri-party market has been studied extensively, less is known about the GCF and DVP services, and little is known about the breadth of participants in DVP. Since the cleared markets play a growing role, establishing some basic facts about these markets aids in understanding the structure of the overall repo market and its exposure to risk.

This brief presents the first analysis of the classes of institutions involved in cleared repo markets. We build on the OFR's collection of repo market data. In October of 2019, the OFR began collecting DVP data. In November of 2019, we began collecting data from

GCF. This collection was undertaken, in part, to better assess risks to financial stability surrounding the repo market. However, it was also undertaken to support calculation of the SOFR, the Alternative Reference Rates Committee's preferred alternative to U.S. Dollar Libor for use in certain new U.S. Dollar derivatives and other financial contracts.[4] The OFR has also released aggregates from our collection to the public through the U.S. Repo Markets Data Release. By exploring the structure of DVP and GCF markets, we hope to clarify how different classes of institutions contribute to the aggregates displayed in the U.S. Repo Markets Data Release and the SOFR, and how these markets differ from the more widely known uncleared tri-party market.

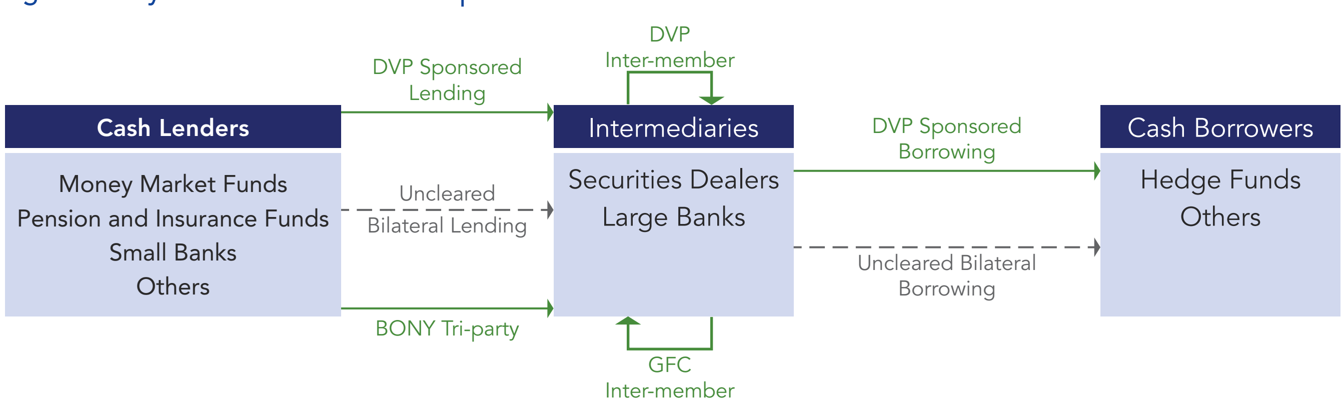
Some basic facts can be gleaned from the OFR's examination of data on cleared repo markets over 2020:

1. Traditional domestic bank branches make up only a fraction of repo borrowing and lending in the substantially larger DVP market but play a greater role in GCF.
2. A large volume of repo market transactions is devoted to transferring assets and cash between nonbank participants.
3. Money market funds and mutual funds make up a substantial portion of repo lending.
4. Hedge funds and foreign banks make up a substantial portion of repo borrowing.
5. Rates even within individual repo markets can differ in ways which create a wedge between the rate at which institutions like money market funds lend and the rate at which other institutions like hedge funds borrow.
6. Dealers play an important role as intermediaries, spanning different repo markets in which different participants borrow and lend, and allowing the exchange of cash and securities between these diverse participants.

Structure of the U.S. Repo Market

The four individual repo markets that make up the overall market span the various possible combinations for cleared vs. uncleared transactions and bilateral vs. tri-party services (see **Figures 1** and **2**). Each market attracts a particular clientele based on its features. **Figure 1** is necessarily stylized to give a sense of the broad structure of the market. As an example of how the figure is stylized, the Centrally Cleared Institutional Tri-party Service (CCIT), which allows certain non-members to participate in GCF for cash lending, is among the aspects of U.S. repo markets not pictured. Additionally, intermediaries may be net borrowers or lenders, to the extent that cash or securities are not passed through to the ultimate borrowers or lenders in this diagram. Other cash lenders in this figure might include government sponsored enterprises, exchange traded funds, mutual funds and hedge funds. Other cash borrowers might include smaller banks and dealers. Our results in *Actors in Cleared Repo Markets* present a more detailed picture of the cleared portion of this diagram.

Figure 1. Stylized View of the U.S. Repo Market



Note: Arrows denote the flow of cash, from cash lenders to cash borrowers. Gray dashed arrows denote market segments for which data is not currently collected.
Sources: Office of Financial Research

Bank of New York Mellon Tri-party

Transaction volumes across all collateral in this repo market averaged $1.1 trillion per day in 2020.[5] Bank of New York Mellon (BONY) serves as the tri-party custodian and provides collateral management services, but does not serve as a central counterparty. Borrowers and lenders know their counterparties, which is essential given the lack of a central counterparty. A broad variety of collateral is traded, including corporate debt and even some equity and private label collateral debt obligations. In tri-party, lenders and borrowers agree on a bundle of acceptable Treasuries as collateral for the trade. At the end of the day, BONY allocates the borrower's available collateral among trades. The lender does not know the exact collateral they are pledged, which can make it difficult to rehypothecate collateral. Rehypothecation refers to taking collateral received from lending on one transaction and using it again as collateral against borrowing in another transaction. Further details on the tri-party market are provided in Copeland, Martin, and Walker (2010).[6]

FICC GCF Repo Service

Transaction volumes in GCF averaged $126 billion per day in 2020. The service has both a tri-party custodian providing collateral management services and a central counterparty. The Fixed Income Clearing Corporation (FICC) is the central counterparty. All transactions take place through inter-dealer brokers (IDBs), who anonymize the identities of lenders and borrowers.[7] IDBs also provide transparent information about rates, which increases the competitiveness of the brokered segment, as argued in Copeland et al. (2021).[8] GCF is limited to collateral that can be transferred over Fedwire, a real-time settlement system set up by the Federal Reserve. The three types of collateral that can be transferred over Fedwire are Treasuries, agency securities, and agency MBS. Lenders and borrowers agree to generic CUSIPs that describe fixed bundles of collateral (in contrast to the ad-hoc bundles agreed upon in tri-party). Further details on the GCF service are provided in Agueci et al. (2014).[9]

FICC DVP Service

FICC DVP is by far the larger of the two cleared markets, with $1.0 trillion in transactions cleared every day. FICC serves as the central counterparty, but there is no tri-party custodian providing collateral management services. Like GCF, DVP allows trades using Treasury and agency collateral that can be transferred over Fedwire, but unlike GCF, agency mortgage-backed securities (MBS) collateral is also excluded. In practice, nearly all transactions in DVP use Treasury collateral. Counterparties generally know the exact type of collateral pledged and have direct access to the underlying security. This makes it easier for lenders to rehypothecate collateral. Also, transactions can occur at rates specific to the collateral offered. When this collateral is in particular demand — for instance, in order to short a Treasury — these specific collateral transactions can occur at rates below

Figure 2. Attributes of the Four U.S. Repo Markets

	BONY Tri-party	FICC GCF Repo Tri-party Service	FICC DVP Bilateral Service	Uncleared Bilateral
Cleared by a central counterparty		✓	✓	
Collateral managed by a tri-party custodian	✓	✓		
Trades anonymized by an inter-dealer broker		✓	Both	
Lenders know the specific collateral pledged			Both	✓
Limited to Fedwire eligible collateral (Treasuries and agencies)		✓	✓	

Sources: Office of Financial Research

the rate for general collateral. When its rate is below that for general collateral, the specific collateral is known as being "on special."[10]

DVP is composed of four distinct segments, each with its own rules about which counterparties are allowed, how much information about these counterparties is revealed, and how the clearing fund for the transactions is collected. We refer to these four segments as the brokered market, the unbrokered market, sponsored borrowing, and sponsored lending. Since DVP has only been covered in sparing detail in previous research, and the different segments involve very different participants, we describe each of these segments below. The first two segments involve transactions between direct clearing members of DVP, mostly larger dealers and banks. The other two segments involve transactions with entities who are not direct clearing members of FICC.

Brokered Market

In this segment of DVP, members transact through IDBs. IDBs mask the identities of both parties to the transaction so that borrowers and lenders don't know their counterparties. IDBs also provide transparent screens allowing clearing members easy access to pricing information. Some trades take place at general collateral rates, but settlement uses the specific collateral listed.

Unbrokered Market

Direct clearing members also transact without an IDB sitting between buyers and sellers. Counterparties know each other. There is less pricing transparency, but many trades occur between affiliates.

Sponsored Borrowing and Lending

These two segments allow "sponsoring" clearing members to bring "sponsored" counterparties into DVP. This sponsorship arrangement allows dealers to transact with a more diverse set of borrowers and lenders than would otherwise be available. Sponsored counterparties include hedge funds, money market funds, other asset managers, and smaller banks. Because these sponsored counterparties are not direct clearing members, the portion of the clearing fund allocated to these trades is the responsibility of their sponsors. Sponsoring members accept the risk because they can net the borrowing from sponsored lenders against lending to sponsored borrowers. Netting is allowed since the nominal counterparty on both sides of the trade is FICC.

Few sponsored entities participate in both borrowing and lending on any given day. As a result, we can treat these two parts of the market as separate segments, one with direct clearing members borrowing from sponsored members, and the other with direct clearing members lending to sponsored members.

Uncleared Bilateral

The final of the four repo markets is the uncleared bilateral market. While there are no direct collections of data on this market, we know that at a minimum this market represents the primary source of borrowing for hedge funds, who borrowed around $1.4 trillion in repo markets as of the Q1 2020 according to the SEC's Private Fund Statistics. There is no central counterparty or tri-party custodian to handle collateral management for these trades. Instead, transactions occur on an over-the-counter basis among many different dealers. Transactions in this market are likely to take place using specific collateral, and there are no IDBs to mask identities of the counterparties in trades.

Actors in Cleared Repo Markets

The two cleared repo markets together are comparable in size to the uncleared tri-party market, with an average $1.1 trillion in transactions clearing through FICC per day during 2020 compared to $1.3 trillion in uncleared tri-party. However, these cleared markets involve a much wider group of counterparties than uncleared tri-party, which is primarily a market where large dealers and banks borrow from money market funds.

There are several major categories of participants in these cleared repo markets, including primary dealers, non-primary dealers, domestic banks, money market funds, and hedge funds.[11] We classify each participant based on its name as well as its legal entity identifier or other information, when available. Participants we have failed to classify are included in the "other" category. The other category also includes various other participant types whose participation in cleared markets is smaller, such as asset managers other than money market funds and government-sponsored enterprises (GSEs).

DVP Service

We begin by examining the average percent of daily volumes in DVP made up by these different classes of investor (see **Figure 3**).[12] Dealers account for the majority of DVP transactions at 53% of lending and 54% of borrowing. They are followed by banks, with 27% of lending and 36% of borrowing. Dealer and domestic bank positions are largely balanced in the aggregate with large cash borrowing offset by large cash lending. This highlights the role that dealers and domestic banks play as intermediaries as well as their reasons for transacting in DVP. A bilateral market allows for collateral reuse and specific collateral demand. The DVP market allows dealers to secure particularly valuable collateral from other large intermediaries without adding much net cash to the market.

On a netted basis, money markets are the primary lenders, or suppliers of cash (11%), while foreign banks and hedge funds are the primary borrowers, or suppliers of collateral (-10% and -7%). Since sponsored participants are limited to overnight repo, restricting attention to overnight trades sheds even more light on these roles. Based solely on overnight trades, money market funds supply 16% of cash, on net. Hedge funds are the largest supplier of collateral (-11%), followed by non-primary dealers (-8%) and foreign banks (-4%). For money market funds, repo is a crucial source of short-term returns for their cash. For foreign banks and hedge funds, DVP repo allows them to fund portfolio holdings of specific Treasury securities.

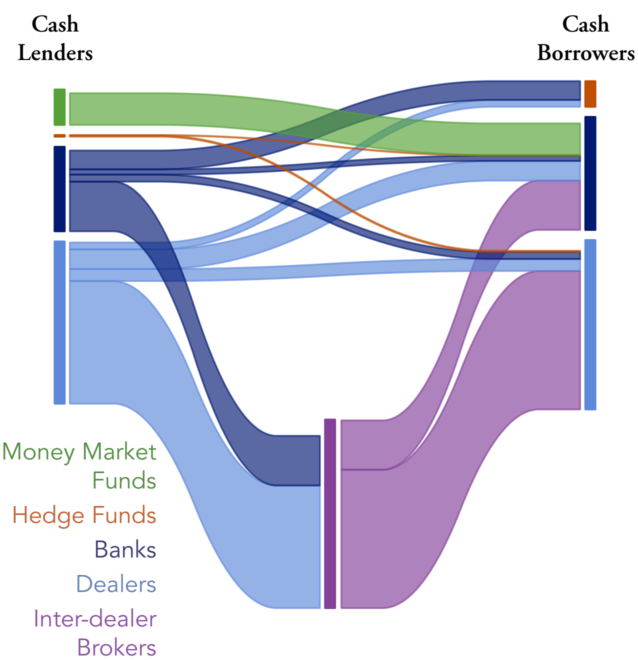
These percentages indicate the breadth of participation in DVP, but the data also allows us to better understand the bilateral linkages between these actors (see **Figure 4**). The four segments in DVP emerge from this plot of the average pair-wise flows between agents. Dealers and banks primarily borrow and lend through inter-dealer brokers and make up a large share of the market. These transactions are counterparty-blind, so institutions match incidentally on collateral and term rather than seek to transact with a specific counterparty. Meanwhile,

Figure 3. DVP Positions by Participant Type (percent)

Participant Type	Lending	Borrowing	Net
Primary Dealers	38.22	34.39	3.83
Non-primary Dealers	14.61	19.75	-5.14
Domestic Banks	14.98	13.07	1.91
Foreign Banks	12.37	22.90	-10.53
Money Market Funds	11.34	0.00	11.34
Hedge Funds	0.55	8.10	-7.55
Other	7.93	1.79	6.14

Note: Average percent of daily volume in all repo transactions in the DVP repo service. Net column is aggregate lending minus borrowing for each participant class. Data is for 2020.
Sources: OFR Cleared Repo Collection, Office of Financial Research

Figure 4. Pairwise Repo Transaction Flows Between DVP Participants



Note: Paths denote transactions between a given cash lender type (on the right) and cash borrower type (on the left). Transactions which go through inter-dealer brokers are displayed as ending in the middle of the figure for lenders using inter-dealer brokers and beginning in the middle of the figure for borrowers using inter-dealer brokers. Color of the paths denote the lender type, while size of the path denotes average daily transaction volume in all DVP repo transactions in 2020. Some links have been excluded due to disclosure edits.
Sources: OFR Cleared Repo Collection, Office of Financial Research

unbrokered transactions between direct clearing members make up a relatively small share of bilateral trades, connecting (for instance) foreign banks and primary dealers.

There is not necessarily a close relationship between the sponsored markets and the inter-member segments of the market. Hedge funds and money market funds borrow and lend through banks and primary dealers acting as sponsors. Domestic banks are the primary sponsors, but most of their cash borrowing from the money market is either passed on to hedge funds or to the inter-dealer market.

Average rates and quantities across the different segments of the DVP market provide more detail about these relationships (see **Figure 5**). Inter-member trades through the brokers make up 57% of daily transactions, while sponsored borrowing and lending account for another 33%. Based on the information provided in both **Figures 3** and **5** it is clear that money market funds do most of the sponsored lending, while hedge funds do the majority of sponsored borrowing. Unbrokered trades between clearing members are relatively uncommon, making up the remaining 10% of volume.

It is also clear there are spreads between rates across these segments of the market, meaning that intermediation between these market segments is not perfect (see **Figure 5**). On average, sponsored borrowers trade at rates more than 10 basis points higher than the rate for sponsored lenders. Rates for inter-member trades are somewhere between these two rates. Special collateral transactions have not been removed from the daily weighted average: excluding these specials would raise the inter-member brokered rate relative to the sponsored borrower rate, since special collateral activity was concentrated in the inter-member brokered segment during 2020. When considered as a spread over the federal funds target midpoint, sponsored lenders were paid on an average day 8 basis points below the midpoint, rates on inter-member brokered and unbrokered trades were on average 6 and 4 basis points below the midpoint, and sponsored borrowers paid on average 3 basis points above the midpoint. While these spreads may not seem large, it is important to keep in mind that these trades are all overnight loans collateralized with Treasuries.

GCF Repo Service

In contrast to DVP, GCF is primarily an inter-bank or inter-dealer market. Agents have greater flexibility in terms compared to DVP, although the participants involved in GCF are much less diverse (see **Figure 6**). All transactions are general collateral rather than specific-security settlement. More agency collateral is used in GCF than in DVP, where agency borrowing is practically non-existent. Agency collateral in GCF is largely agency MBS, which is not allowed in DVP. Term repo is also more popular in GCF.

Figure 5. Volumes and Rates in DVP by Segment (percent)

Segment	Percent of Daily Volume	Average Overnight Rate
Inter-member Brokered	56.86	0.35
Inter-member Unbrokered	9.74	0.37
Sponsored Lender	19.92	0.33
Sponsored Borrower	13.48	0.44

Note: The first column shows the average over 2020 of the percent of daily volume each DVP segment makes up in all repo transactions in the DVP repo service. The second column takes the average over 2020 of the daily weighted average rate on overnight Treasury repo in each segment.
Sources: OFR Cleared Repo Collection, Office of Financial Research

Figure 6. GCF Positions by Participant Type (percent)

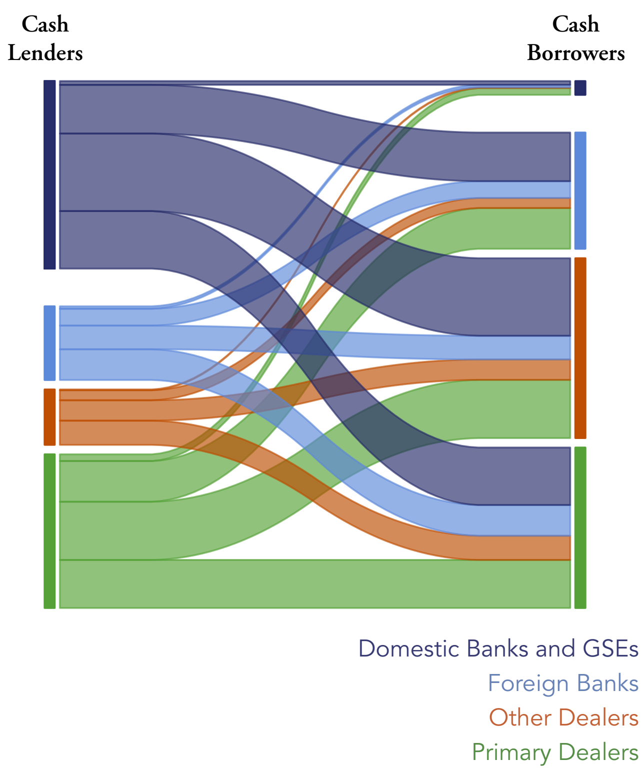
Participant Type	Lending	Borrowing	Net
Primary Dealers	32.70	33.81	-1.11
Non-primary Dealers	11.92	38.83	-26.91
Foreign Banks	15.82	24.49	-8.67
Domestic Banks and Government-sponsored Enterprises	39.57	3.17	36.40

Note: Average percent of daily volume in all repo transactions in the GCF repo service. Net column is aggregate lending minus borrowing for each participant class. Data is for 2020.
Sources: OFR Cleared Repo Collection, Office of Financial Research

Smaller cash lenders like money market funds are not present in this market, nor are hedge funds allowed to borrow in GCF.[13] As is the case with DVP, on a gross basis, primary dealers make up a disproportionate amount of activity, with 33% of gross lending and 34% of gross borrowing (see **Figure 6**). Similarly, foreign banks make up a sizeable proportion of borrowing and a smaller portion of lending. However, relative to DVP, domestic banks and GSEs[14] make up a much larger proportion of lending and smaller proportion of borrowing, and non-primary dealers make up a larger portion of borrowing. On a net basis, GCF is primarily domestic banks and GSEs lending to non-primary dealers and foreign banks.

GCF is almost exclusively blind-brokered. Nevertheless, the bilateral positions suggest which types of borrowers rely on which types of lenders (see **Figure 7**). We have excluded the intermediate flows to brokers. While in the aggregate, other dealers primarily rely on domestic banks and other participants for their cash needs, a sizable proportion of their funding comes directly from primary dealers. Primary dealers, in turn, rely on banks and other participants for their direct funding.

Figure 7. Pairwise Repo Transaction Flows Between GCF Participants



Note: Paths denote transactions between a given cash lender type (on the right) and cash borrower type (on the left). Color of the paths denote the lender type, while size of the path denotes average daily transaction volume in all GCF repo transactions in 2020.
Sources: OFR Cleared Repo Collection, Office of Financial Research

Conclusion

Cleared markets represent a large share of repo activity in the United States. These repo markets have a relatively diverse set of participants, with nonbank actors accounting for a substantial share of activity. The broadness of cleared repo market participants underscores two increasingly important trends in U.S. financial markets. First, the rising importance of market-based finance among nonbanks, as hedge funds and money market funds play key roles in cleared repo. Second, the global scope of U.S. financial markets, as a significant portion of net repo borrowing in cleared markets is by foreign banks. This diverse set of institutions means reference rates based on repo transactions represent a broad range of financial market participants.

Repo markets in general, and cleared markets in particular, serve as a nexus between financial actors with different funding needs and objectives, such as money market funds and hedge funds, or domestic and foreign banks. These interactions take place in particular segments of the repo market, among which rates vary. Investigating the source of the disparities in rates among these segments represent a promising avenue for future research.

Endnotes

1 Jay Kahn, Research Economist, Office of Financial Research (robert.kahn@ofr.treasury.gov) and Luke Olson, Quantitative Analyst, Office of Financial Research (luke.olson@ofr.treasury.gov). The authors thank Adam Copeland, Katherine Gleason, Matthew McCormick, Mark Paddrik, and Sriram Rajan for their comments and assistance.

2 See Viktoria Baklanova, 2015. "Repo and Securities Lending: Improving Transparency with Better Data," Briefs 15-03, Office of Financial Research, US Department of the Treasury.

3 Throughout this brief we use "DVP" to refer specifically to the Fixed Income Clearing Fund's DVP Repo Service as opposed to delivery-versus-payment settlement of securities, a more general concept in securities markets.

4 See Office of Financial Research (OFR), 2020 Annual Report (Washington: OFR, Nov. 18, 2020), 103-105.

5 Transaction volumes in this section are from the OFR's U.S. Repo Markets Data Release. This release defines "transaction volumes" on a day as the volume of new term or overnight repo trades initiated on that day plus the volume of repo trades for which either party has an option to end the trade on that day, but chooses not to exercise that option.

6 Adam Copeland, Antoine Martin and Michael Walker, 2010. "The tri-party repo market before the 2010 reforms," Staff Reports 477, Federal Reserve Bank of New York.

7 An exception is that some transactions nominally in GCF take place through the CCIT service, which allows certain hedge funds who participate in BONY tri-party to lend to clearing members of FICC through GCF. These trades are the only trades on GCF which do not take place through an IDB.

8 See Adam Copeland, R. Jay Kahn, Antoine Martin, Matthew McCormick, Will Riordan, Kevin Clark, and Timothy Wessel, 2021. "How Competitive are U.S. Treasury Repo Markets?," Liberty Street Economics 20210218, Federal Reserve Bank of New York.

9 Paul Agueci, Leyla Alkan, Adam Copeland, Isaac Davis, Antoine Martin, Kate Pingitore, Caroline Prugar and Tyisha Rivas, 2014. "A primer on the GCF Repo® Service," Staff Reports 671, Federal Reserve Bank of New York.

10 See Darrell Duffie, 1996. "Special Repo Rates," Journal of Finance, American Finance Association, vol. 51(2), pages 493-526, June; Mark Fisher, 2002. "Special repo rates: an introduction," Economic Review, Federal Reserve Bank of Atlanta, vol. 87(Q2), pages 27-43; and Michael J. Fleming and Kenneth D. Garbade, 2004. "Repurchase agreements with negative interest rates," Current Issues in Economics and Finance, Federal Reserve Bank of New York, vol. 10(Apr).

11 Classification occurs at the level of the entity we see trading in the data, so that dealer subsidiaries of bank holding companies are classified as dealers rather than banks. Similarly, money market funds, hedge funds or mutual funds affiliated with a particular bank holding company are classified as money market funds, hedge funds, or "other" respectively. Classification of primary dealers relies on the list of primary dealers reported by the Federal Reserve Bank of New York. When bank branches serve as primary dealers, they are classified as primary dealers rather than banks.

12 We net inter-dealer brokers out of these statistics. Technically, trades going through inter-dealer brokers lead to two transactions: one from the cash-lender to the broker, and another from the broker to the cash-borrower. Since inter-dealer brokers generally run matched books, we remove them from our analysis.

13 Certain hedge funds are able to lend in GCF through the CCIT service, but we exclude this service from our analysis.

14 We have combined domestic bank and GSE participant types in GCF for disclosure purposes, though GSEs are included in the "Other" category in Figure 3.