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US Rates

US Treasury repo primer: 2023 update

Primer

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Repo is the lifeblood of the financial system

A repurchase agreement (or repo) is the sale of a security with a commitment by the seller to buy back the security at a specified price on a pre-determined date. A repo is essentially a collateralized loan but faces different treatment under bankruptcy. When the repo expires, the borrowed funds are returned to the lender (plus interest) and the borrower is given the collateral back. The interest rate is imbedded in the repo price of the cash borrower. Firms use repo to invest or borrow cash against collateral.

We outline the basics of a repo transaction, the market size and its players, sponsored repo, Fed repo facilities, and specials. It builds off our prior repo primer (see US Treasury repo primer) and complements our Fed plumbing primer (see Fed policy plumbing).

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US Treasury Repo Basics

A repurchase agreement (or repo) is the sale of a security with a commitment by the seller to buy back the security at a specified price on a pre-determined date. In other words, a repurchase agreement is a collateralized loan. When the repo expires, the borrowed funds are returned to the lender (plus interest) and the borrower is given the collateral back. The interest rate is imbedded in the repo price for the cash borrower.

Firms engage in repo transactions to temporarily invest or borrow cash against collateral. Repos are widely used by financial institutions to invest or borrow cash for short periods of time. We discuss the market players and how they use repo in more detail below. A glossary with all acronyms is included in the Appendix II.

The tenor of most repo trades is very short, with most of the activity taking place at the overnight tenor. Term repo trades can and do occur regularly out to 2 years.

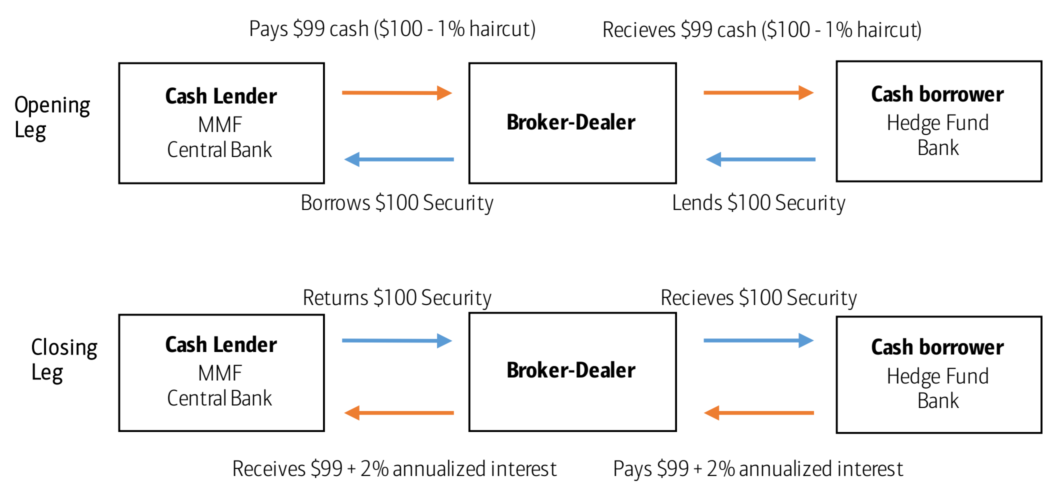
Repo rates tend to increase when there is less cash available to finance or there is more collateral that needs to be financed. Conversely, repo rates tend to decline when there is more cash used to finance or there is less collateral that needs to be financed.

Key terms:

- Repo: cash is borrowed, collateral is lent, cash borrower desires low rate (paying interest)
- Reverse repo: cash lent, collateral borrowed, cash lender desires high rate (receiving interest)

Below in Exhibit 1 is an example of a repurchase agreement on $100 of bonds at a rate of 2% with a haircut of 1%. In this example, the cash borrower is engaging in a "repo" and the cash lender is engaging in a "reverse repo." According to data from the New York Fed, the median tri-party UST haircut is currently around 2%, but we assume a US Treasury haircut of 1% for illustrative purposes in the schematic below.

Exhibit 1: Example of a repo agreement
Repo on $100 of bonds with a rate of 2% annualized interest and a haircut of 1%



Source: BofA Global Research

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In this example the cash lender purchases/borrows bonds that have a cash value of $100 and simultaneously pays/lends the cash equal to the value of the bonds minus a haircut. A haircut, which is paid by the cash borrower, is the initial margin on a repo transaction, typically expressed as a percentage of the market price. The size of a haircut typically depends on the type of collateral being borrowed but may also depend on the counterparty's credit quality depending on the segment.

The haircut protects the cash investor in case the collateral provider defaults. The haircut also provides a buffer against fluctuations in the value of the securities posted as collateral as well as loss in value associated with the quick liquidation of securities. At the end of the term, the cash lender sells the bonds back to the cash borrower and receives their initial cash value plus the amount of interest accrued at the repo rate.

Interest is calculated as:

Interest = dirty price * repo rate * day count

The dirty price is the current price of the bond including accrued interest over the term and the day count is equal to the number of days passed during the term of the trade divided by 360. In the example above, assuming the bond has a dirty price of $100, the interest received by the cash lender would be $0.165 = $99 * 2% * (30/360) for a 30-day repo transaction.

Treatment under bankruptcy

Repo is treated differently than a collateralized loan under bankruptcy. This difference in treatment is due to the importance of repo for the orderly functioning of financial markets. Repo transactions may therefore be terminated and liquidated even through a bankruptcy filing of the cash borrower. This ensures that a repo can unwind by the agreed upon terms despite the occurrence of a bankruptcy of the securities seller.

Types of transactions

- **Classic repo (as outlined above)**: Sale of a security with a commitment by the seller to buy back the security at a specified price on a pre-determined date at a set interest rate. From the perspective of the party that is purchasing the collateral and selling it back at a later date, it is known as a reverse repo.

- **Sell / buy-back**: The collateral is outright sold and outright repurchased on a forward date. The forward price includes any accrued interest on the collateral. This involves two separate transactions whereas a classic repo is technically only one transaction.

- **Securities lending**: Used to temporarily acquire a security typically for settlement or delivery purposes. Parties in a securities lending transaction swap specific securities and there is typically a premium paid by one party to borrow a specific security. These transactions can be collateralized with securities or cash and are governed by different types of legal agreements.

Segments of the repo market

There are three segments of the repo market: the tri-party market, the GCF market (a subset of tri-party) and the bilateral market (cleared through FICC DVP & uncleared) (Exhibit 2, Exhibit 3). We describe each segment in detail below but we generally simplify each segment into the following way:

Tri-party = customers (typically MMF) lend cash to dealers

GCF (general collateral financing) = inter-dealer tri-party repo market

Bilateral = dealer lends cash to customers (typically leveraged / hedge funds)

Exhibit 2: Key attributes of repo market segments

Bilateral is the largest segment of repo while the GCF rate tends to be the most volatile

	Tri-party	Bilateral	GCF
Cash lenders	MMFs, securities lenders, asset managers	Broker-dealers, asset managers, hedge funds	Broker-dealers
Cash borrowers	Broker-dealers	leveraged / hedge funds	Broker-dealers
Average volume '18-'23 ($bn)	$392	$574	$20
Average spread to SOFR '18-'23 (bps)	-2	1	4
Securities delivered by (EST/EDT)	3:30pm	11am	5:00pm
Source	Data from BNY Mellon	Data from FICC DVP	Data from DTCC

Source: BofA Global Research, Haver Analytics, Note: Bilateral data backed out from SOFR data

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Exhibit 3: Additional attributes of repo market segments

Tri-party and GCF both use BNYM as a custodian, bilateral can be cleared through FICC DVP or uncleared

	Tri-party	Bilateral	GCF
Cleared by a central counterparty	No	One-third of market cleared through FICC DVP	FICC GCF
Collateral managed by a tri-party custodian	BNYM	No	BNYM
Trades anonymized by an inter-dealer broker	No	Yes, in FICC DVP	Yes
Lenders know the specific collateral pledged	No	Yes, in cleared and uncleared	No
Limited to Fedwire eligible collateral	No	Yes, in FICC DVP	Yes

Source: Office of Financial Research

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Tri-party repo: customer cash lending to dealers

All tri-party repo transactions are bilaterally negotiated but settle on a third-party account (Exhibit 3). This third-party account manages the exchange of collateral/cash and holds collateral. This custodian is not to be confused with a central clearing counterparty, which would help to facilitate the transaction and would anonymize the counterparties. Transactions are almost always GC (general collateral), meaning the investor does not have a preference for a specific security. The cash investor only specifies that the generic security underlying the transaction belongs to a general asset class, such as US Treasuries, agency debt, or investment grade corporate bonds.

Bank of New York Mellon (BNYM) is currently the only tri-party custodian. JP Morgan previously acted as a custodian for tri-party repo but stopped acting in this capacity in summer 2016. As a clearing bank, BNYM does not broker the trade or negotiate terms, their role is limited to the clearance and settlement of those trades. Market participants may prefer tri-party repo as it reduces back-office operations but comes with a fee.

Securities posted as collateral for tri-party repo cannot be repledged outside the tri-party platform to protect the collateral from settlement fails on the closing leg of the repo. This results in the tri-party rate trading lower on average than bilateral (we use the Fed's TGCR or tri-party general collateral rate). Additionally, outsourcing to a custodian is typically less costly than operations being managed in house and settled with a central clearing counterparty which may charge a small fee.

GCF: inter-dealer repo trading

GCF repo is a subset of tri-party repo, in which repo transactions are anonymous through interdealer brokers and FICC acts as central counterparty. GCF was introduced by FICC in 1998 and was originally designed to be used among securities dealers, providing a cost-effective way to exchange securities and cash amongst themselves.

Both GCF and tri-party repo are settled on the tri-party repo settlement platform. Transactions are still settled on BNYM books and are GC but only institutions deemed eligible by FICC can negotiate GCF repo trades. The value of securities posted as collateral is equal to the amount of cash lent because there are no haircuts (margin requirement) in this segment of the market. Instead, the FICC sets eligibility thresholds, and requires that institutions post collateral. FICC also sets permitted collateral.

GCF repos are negotiated through interdealer brokers on a blind basis, meaning dealers tell an inter-dealer broker (IDB) the terms under which they are willing to borrow or lend cash and the IDB in turn tries to broker a trade, while maintaining each dealer's anonymity. The IDB then submits the trade to FICC which acts as a central counterparty and as a result dealers do not face direct counterparty risk from each other.

GCF rates have historically been more volatile than cleared bilateral and tri-party GC repo. The vol is driven by the smaller market activity & any particular dealer need to borrow cash or lend collateral. GCF pricing is driven by dealer intermediation costs in facilitating transactions for institutional investors. GCF data is published by DTCC and included in the Fed's BGCR (Broad General Collateral Rate) & SOFR rates.

Bilateral: dealers lend cash to customers

The bilateral repo market is typically used to acquire specific securities. Two parties agree to specific terms determining the type of security, principal, interest rate, haircut and maturity. Transactions can be centrally cleared by the FICC's delivery versus payment service (DVP) or non-cleared. According to dealer data uncleared repo makes up about 66% of the market & FICC cleared bilateral accounts for the remaining 34%.

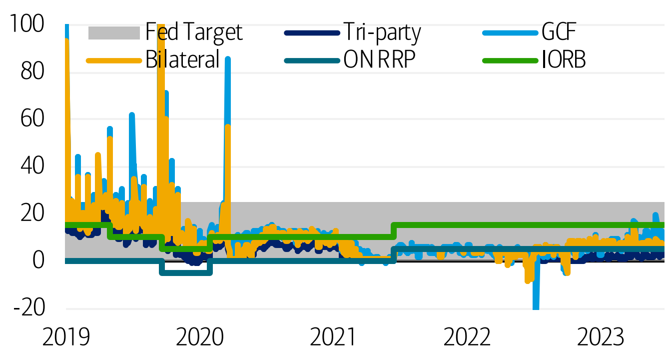
The securities lender in a bilateral repo delivers its securities or agrees which specific security will be delivered by 11am. The earlier timing of settlement in bilateral repo can be seen as more attractive relative to GC repo by some participants because unlike GC repo, the cash investor can repledge the borrowed security. However, this exposes the securities lender to the possibility of settlement failure on the closing leg of the repo.

There is not robust data for the rate on all Treasury bilateral repo transactions but this it is possible to back out overnight Treasury cleared bilateral from the Fed's TGCR, BGCR, & SOFR data. Bilateral repo has traditionally traded higher than tri-party repo due to higher risk of counterparty failure & higher settlement / operational costs.

Elevated specials activity can put downward pressure on bilateral repo as securities borrowers / cash lenders are willing to accept a lower rate for a specific security. The Fed tries to exclude specials from SOFR transactions by removing the bottom 25th percentile of trades, but it is impossible to remove all specials trades from the data. Specials activity is discussed in greater detail later in this primer.

Exhibit 4: Overnight UST repo rates relative to Fed's target range (bps)

GCF trades highest in the range, followed by bilateral, then tri-party



Source: Federal Reserve, Bloomberg, DTCC, Haver Analytics

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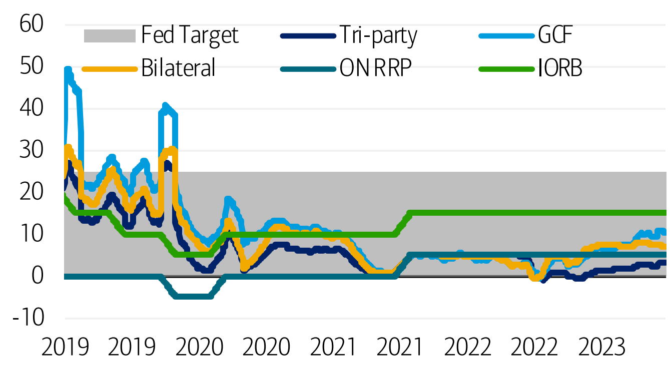
Exhibit 5: 30day MA of UST repo rates relative to target range (bps)

The 30-day moving avg shows a clearer picture of where these rates trade



Source: Federal Reserve, Bloomberg, DTCC, Haver Analytics

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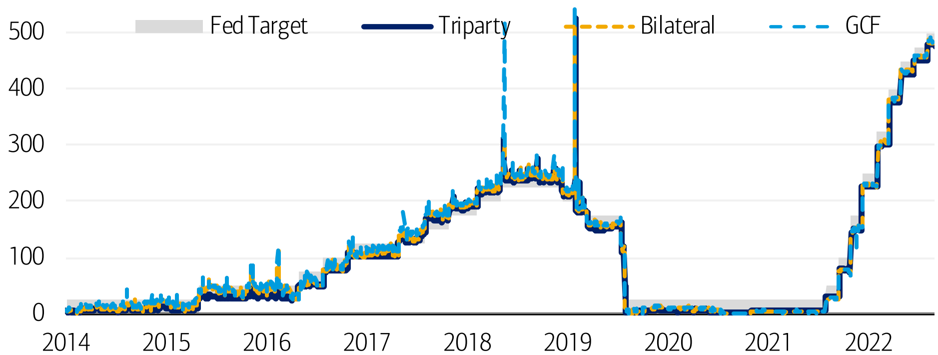
Bottom line for the repo segments: each segment of the Treasury repo market has slightly different rates & characteristics. Most Treasury overnight repo rates trade in or close to the Fed's target range (Exhibit 4). The tri-party rate has on average traded lowest in the range. Bilateral repo, which we estimate from SOFR components, tends to trade higher in the range unless there is greater demand to acquire a specific security. GCF is the most volatile but historically trades highest in the range (Exhibit 5, Exhibit 6).

Exhibit 6: Overnight UST repo rates in the Fed target range (bps)
Bilateral repo rate is estimated from SOFR components



Source: Federal Reserve, Bloomberg

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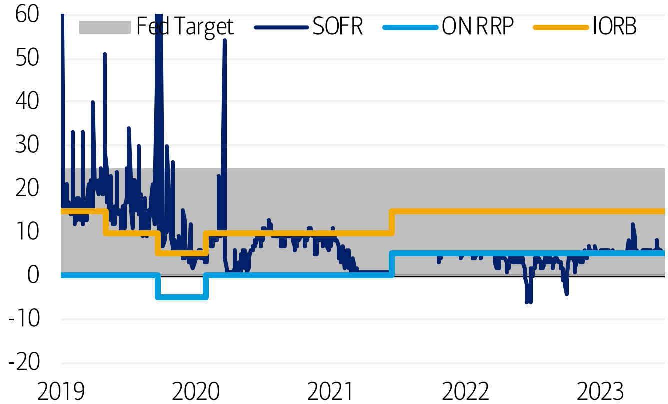
SOFR (Secured Overnight Financing Rate)

On April 3 '18, the NY Fed began publishing SOFR. SOFR is a broad overnight Treasury repo rate calculated as a volume weighted median of tri-party, GCF, and cleared bilateral repo data (Exhibit 7). SOFR does not include repo activity with the Fed, nor uncleared bilateral transactions, but does include sponsored FICC repo (discussed in greater detail below). The SOFR rate and volume are released daily at 8 AM and references the prior day's trades. SOFR volumes have recently been between $1.3-$1.6tn (Exhibit 8).

SOFR is designed to limit the impact of specials activity in the published repo rate. Recall, repo specials occur when a cash lender agrees to receive a lower interest rate in exchange for specific collateral. The difference between the GC repo rate & specific collateral repo rate is the degree of specialness. SOFR aims filter out specials activity by removing transactions with rates below the 25th volume-weighted percentile. However, in certain market periods, it is possible that more than the 25th volume-weighted percentile can trade with a degree of specialness. This has the effect of dragging both the bi-lateral repo & SOFR rate lower. We discuss specials in more detail below.

The NY Fed also publishes the Tri-Party General Collateral Rate (TGCR) and Broad General Collateral Rate (BGCR). TGCR includes overnight specific-counterparty tri-party general collateral repo transactions secured by Treasury securities and cleared through BNYM. BGCR includes all TGCR trades as well as GCF Repo trades collected by DTCC.

Exhibit 7: SOFR relative to the Fed's target range (bps)
SOFR has been low in the range due to an abundance of cash



Source: BofA Global Research, Haver Analytics, Bloomberg

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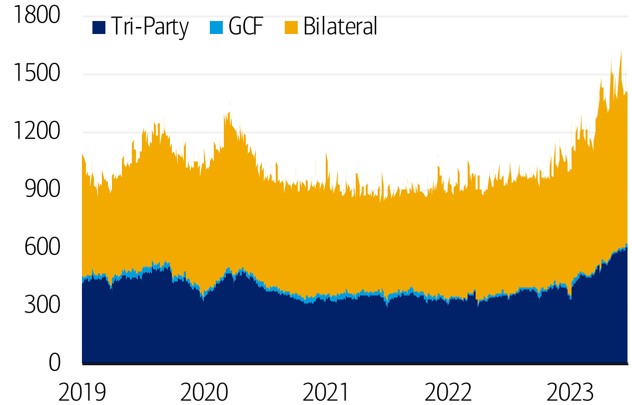
Exhibit 8: Breakdown of SOFR volumes ($bn)
Bilateral repo volumes make up a majority of SOFR



Source: Federal Reserve

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SOFR rate & SOFR/FF basis: driven by cash & collateral

We generally think repo & SOFR rates are a function of the relative balance of cash to be invested in repo & collateral to be financed in repo. When cash > collateral SOFR trades low in relation to the Fed's target range; when collateral > cash repo trades high. Tri-party repo & SOFR are largely anchored around ON RRP when cash > collateral.

Any easy way to see the cash / collateral balance is use of the Fed's overnight reverse repo (ON RRP) facility. When Fed ON RRP use is high ($500b or more), money market mutual funds have excess cash in need of investment. If ON RRP use is high, we believe tri-party repo & SOFR are likely to stay relatively well-anchored to ON RRP.

In periods where cash overwhelms collateral & SOFR trades low in the Fed target range, fed funds (FF) typically trades above SOFR. FF trades higher than SOFR due to very technical dynamics involving Federal Home Loan Bank overnight lending & foreign bank unsecured borrowing (FF dynamics explained with more detail in Fed policy plumbing).

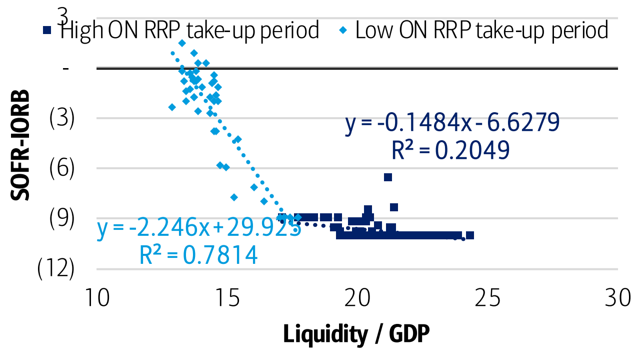
We see two regimes for SOFR & the SOFR/FF basis: with large ON RRP use & without.

Large ON RRP balances ($500b+): will allow for limited upward pressure on SOFR & tri-party repo. Tri-party repo is unlikely to rise meaningfully above ON RRP with elevated ON RRP balances, since MMF should move cash out of the Fed for ON RRP +1bp. SOFR will be anchored by tri-party repo; SOFR to tri-party spread may be limited to 4-5bps. With SOFR anchored near ON RRP, there will be scope for fed funds to rise vs SOFR.

Low ON RRP use (<$500b): once ON RRP balances fall closer to zero we see scope for more rapid SOFR/FF tightening, led by higher SOFR rates. We are unsure exactly when this inflection point occurs but we assume it is after ON RRP balances fall below $500b. Our most aggressive ON RRP decline assumptions don't see this until 2H '24.

Our forecasts also show the possibility for FF to increase vs SOFR. This SOFR/FF widening is based on historical observations that showed a slower pace of decline in FF vs SOFR. We do not have high conviction in the FF increase vs SOFR because: (1) FF can be sticky & slow to adjust (2) EFFR has recently set lower. We can see a case for EFFR to set higher while SOFR remains stuck near ON RRP.

Exhibit 9: SOFR-IORB spread (bps) vs Liquidity to GDP (%)
SOFR will start to move up quickly once liquidity has sufficiently drained



Source: BofA Global Research, Bloomberg

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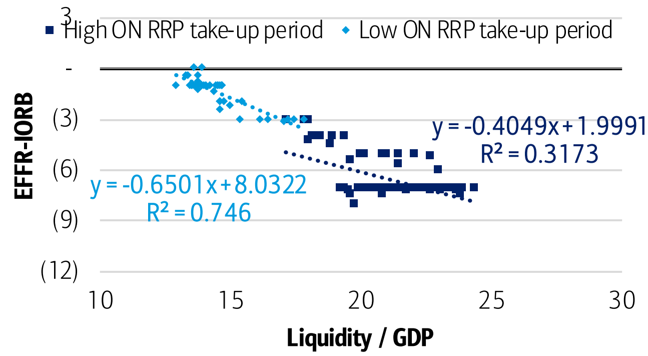
Exhibit 10: EFFR-IORB spread (bps) vs Liquidity to GDP (%)
EFFR could start to move up before SOFR lifts off of ON RRP



Source: BofA Global Research, Bloomberg

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Exhibit 11: SOFR & EFFR spread to IORB forecast (bps)
SOFR and EFFR are likely to move slowly upward until cash has been sufficiently drained

Date	SOFR-IORB	EFFR-IORB	FF-SOFR
Sep-2023	-9	-5	4
Dec-2023	-8	-4	4
Mar-2024	-7	-4	3
Jun-2024	-8	-4	4

Source: BofA Global Research, Bloomberg

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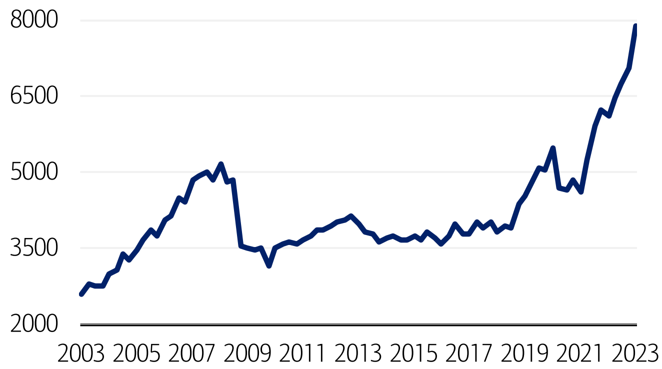
Market size and players

Overall repo activity across collateral types and tenors is currently difficult to quantify given insufficient data on bilateral repo. However, the Fed's Z1 data estimates the overall size of repo to be around $6tn (Exhibit 12). There are many sources for data on the repo market, which we summarize in Exhibit 13.

The Federal Reserve's FR 2004 data is a source of information on US primary dealer market making activity. This form includes total repo and reverse repo activity by collateral class and maturity. As of 2022, the data now includes information breaking the data out by tri-party & GCF, uncleared bilateral, and FICC DVP bilateral. A repo trade between primary dealers shows up twice in this data, once as a repo and again as a reverse repo, representing both legs of the rate. Thus, summing up the repo and reverse repo numbers would result in double counting and inflate total activity in the US repo market. This data only covers activities of primary dealers which make up a large portion of the repo market, relying solely on this data would result in underestimating the total size of the repo market.

In summary, there is no perfect source that is inclusive of all segments of the repo market but SOFR provides a nice view into the various repo markets for O/N UST repo.

Exhibit 12: Total repo and Fed funds activity
Includes all collateral types and all tenors



Source: Federal Reserve

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Exhibit 13: Repo data sources
Sources for repo data included throughout primer

Type	Source	Link
All repo & all collateral types	Federal Reserve	https://www.federalreserve.gov/releases/z1/
Tri-party repo	NY Fed	https://www.newyorkfed.org/data-and-statistics/data-visualization/tri-party-repo#interactive/volume
GCF repo	NY Fed	https://www.newyorkfed.org/data-and-statistics/data-visualization/tri-party-repo#interactive/gcfrepos
Primary dealer repo	NY Fed	https://www.newyorkfed.org/markets/counterparties/primary-dealers-statistics
SOFR	NY Fed	https://apps.newyorkfed.org/markets/autorates/SOFR
MMF repo	OFR	https://www.financialresearch.gov/money-market-funds/us-mmfs-investments-in-the-repo-market/
FICC Sponsored Repo	DTCC	https://www.dtcc.com/charts/membership
Fed Repo /RRP	NY Fed	https://apps.newyorkfed.org/markets/autorates/temp

Source: Federal Reserve, OFR, DTCC

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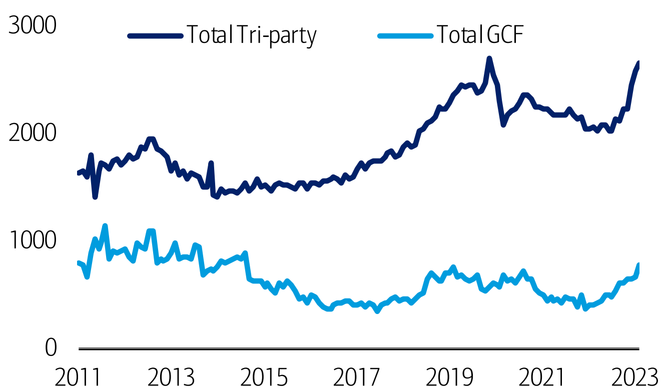
Segments & tenor

Across collateral types & tenors, total tri-party repo activity is currently at $2.7tn and total GCF repo activity is currently at $775bn (Exhibit 14). Bilateral repo has been a more opaque and difficult to quantify segment. Recently, however, primary dealer data on repo transactions has begun to include transactions broken down by segments. Using this as an estimate we can see that uncleared repo is about two-thirds of the overall size of the bilateral market in both repo and reverse repo transactions. We cannot sum up reverse repo and repo to get an accurate idea of the size of the overall market as this would result in some double counting.

Primary dealer data provides a breakout of overnight versus term repo across collateral types. This data includes GCF agreements, bilateral agreements, tri-party agreements and hold-in-custody agreements. In this segment of the market, overnight agreements make up around 72% of repo activity and 56% of reverse repo (Exhibit 16, Exhibit 17).

The overnight segment of the repo market plays a pivotal role in the normal functioning of the US financial system by supporting liquidity of key fixed income markets and being an important source of short-term funding. In the tri-party repo market, the overnight segment accounts for $1tn in daily transactions and makes up the largest segment across all collateral types.

Exhibit 14: Total tri-party & GCF repo
Volume, $bn



Source: New York Federal Reserve

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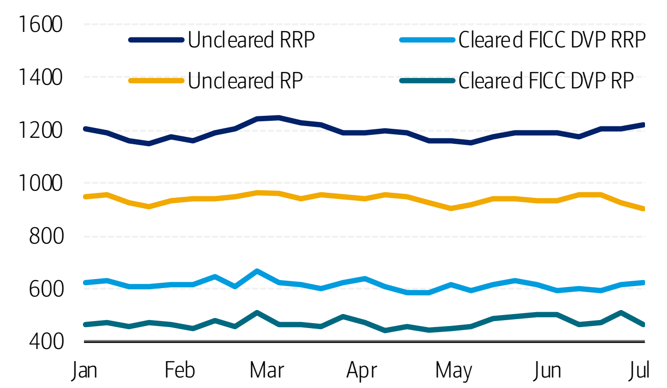
Exhibit 15: Primary dealer bilateral repo volumes ($bn)
Data is only available starting 1/5/22, data is across all collateral



Source: New York Federal Reserve

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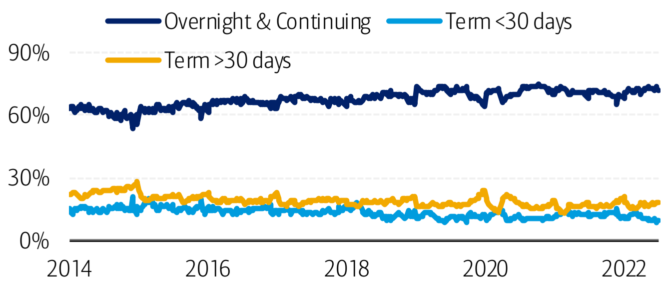
Exhibit 16: Primary dealer repo by tenor (% of total)
Includes all collateral types



Source: New York Federal Reserve

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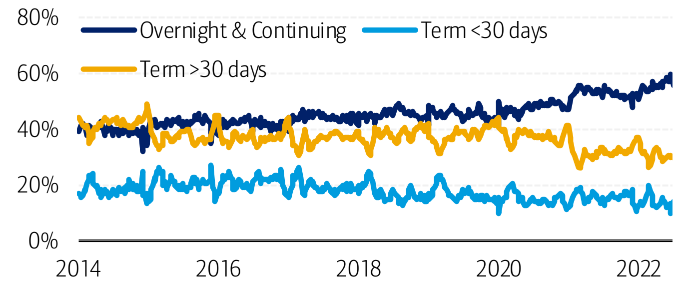
Exhibit 17: Primary dealer reverse repo by tenor (% of total)
Includes all collateral types



Source: New York Federal Reserve

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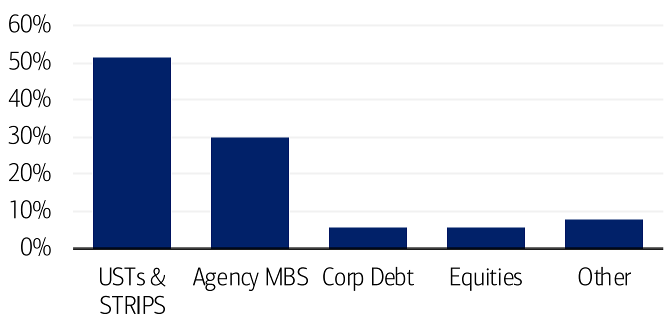
Collateral types

In the triparty market, repo collateralized by Treasuries is just over 50% of volumes and increased substantially between 2015-2017 (Exhibit 18, Exhibit 20). According to FRBNY data, Agency MBS is only 26% of tri-party volumes but 59% in GCF market (Exhibit 19). GC or general collateral repo recall does not require a specific security but rather the cash borrower needs to provide a security based on a specified asset class.

Exhibit 18: Tri-party repo breakdown by collateral type (% total)
Data as of 6/9/2023; UST is 51% of repo transactions



Source: New York Federal Reserve

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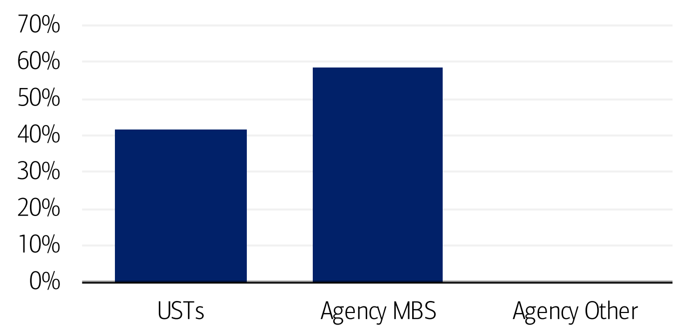
Exhibit 19: GCF repo breakdown by collateral type (% total)
Data as of 6/9/23, UST is 41% of repo transactions



Source: New York Federal Reserve

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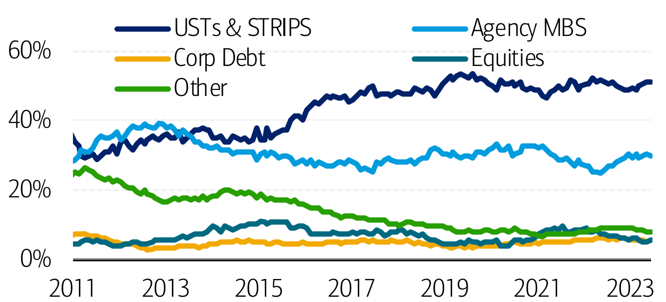
Exhibit 20: Tri-party repo breakdown by collateral type (% total)
USTs make up largest share of tri-party repo



Source: New York Federal Reserve

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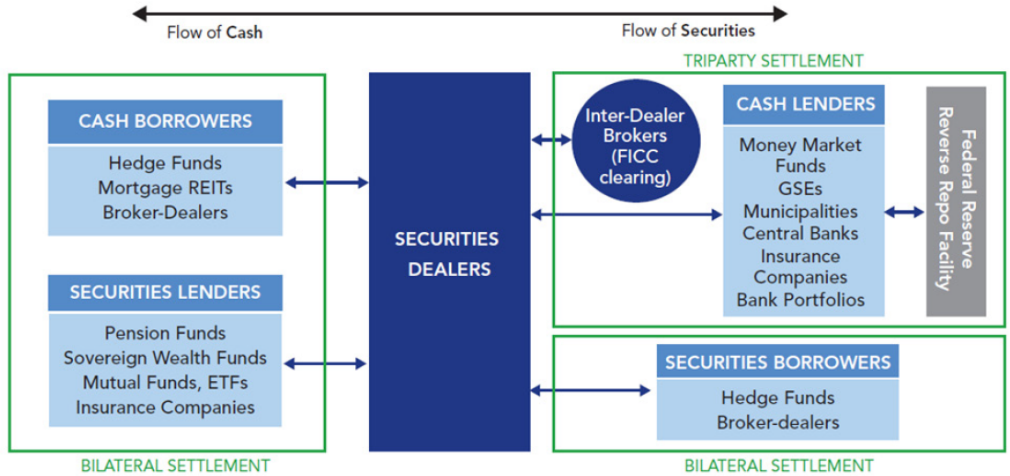
Market participants

Participants in the repo market are typically divided into cash borrowers and cash lenders. Within overnight repo, most cash lenders participate to earn interest income at very short maturities. Alternatively, cash borrowers use this segment to obtain short-term financing for their securities inventories and their own secured lending at a low cost. OFR produces a detailed schematic on repo participants (Exhibit 21).

Exhibit 21: Key repo participants
Included in OFR 2015 paper, Reference Guide to U.S. Repo and Securities Lending Markets



Source: OFR analysis

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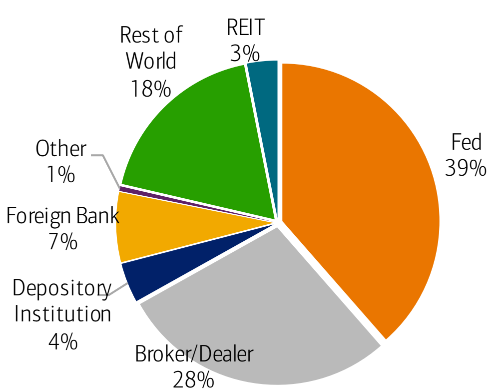
Federal Reserve flow of funds data provides a high level look at participants in the repo market, across collateral types. Based on this data, the biggest cash borrowers include the Federal Reserve, broker-dealers, and "rest of the world" or ROTW. ROTW includes foreign entities & categories that are not otherwise easily defined, including hedge funds. We use the ROTW characterization as a proxy for levered fund activity. These three types of institutions made up 84% of cash borrowing at end 1Q22 (Exhibit 22).

The largest cash lenders are broker-dealers, ROTW and money market mutual funds (MMFs, Exhibit 23). MMF repo activity increased from around 10% of the market in 2006 to 39% today. Part of the large increase in MMF repo activity has been driven by the extreme richening of the US front-end that has displaced MMF investors out of bills / other money markets and into the Fed's ON RRP facility. Other cash lenders include, but are not limited to, asset managers, clearinghouses, commercial banks, securities lenders, municipalities, GSEs, and the Fed.

Exhibit 22: UST repo market cash borrowers as of 1Q23 (% total)
Broker-dealers and foreign entities are largest cash borrowers



Source: Federal Reserve

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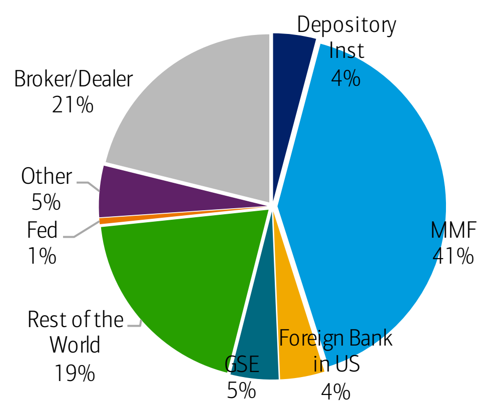
Exhibit 23: UST repo market cash lenders as of 1Q23 (% total)
Broker-dealers, foreign entities and MMFs are largest cash lenders



Source: Federal Reserve

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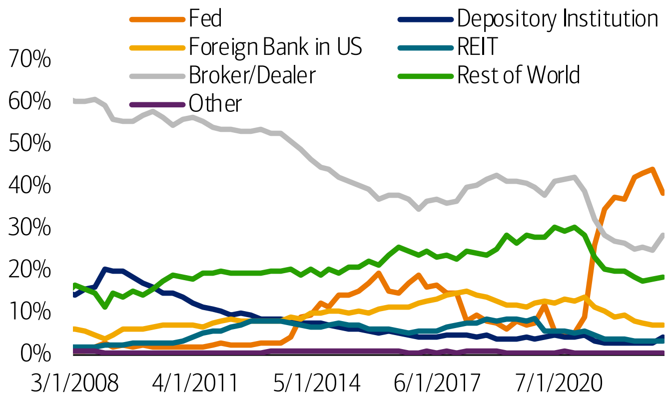
Exhibit 24: UST repo market cash borrowers (% total)
The Fed has surpassed B/Ds as largest cash borrower



Source: Federal Reserve

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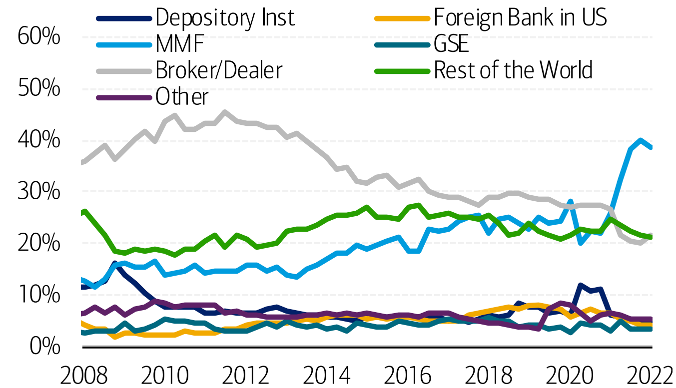
Exhibit 25: UST repo market cash lenders (% total)
MMFs have become the largest cash lender



Source: Federal Reserve

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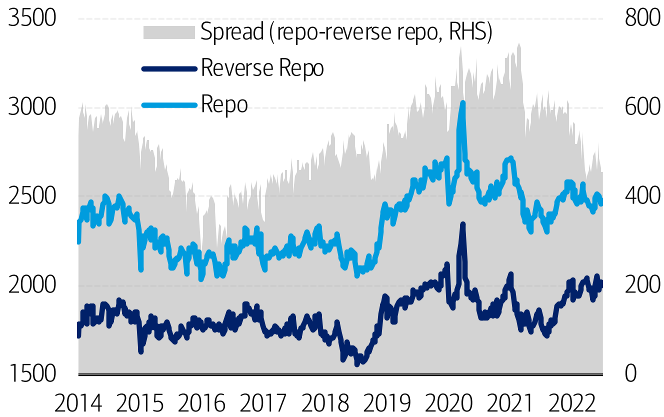
Cash borrowers:

- **The Federal Reserve** uses their reverse repo facility to "borrow" or temporarily drain cash from the financial system. While this is called a "reverse repo" from the private sector's perspective, from the Fed's perspective it is a repo meaning they are borrowing cash and lending a security in the opening leg of the transaction.

  Fed ON RRP is a monetary policy tool to help support money market rates when there is an abundance of cash. The Fed is currently the largest cash borrower in the system. Operations are typically overnight, however the Fed has done term operations in the past. We review Fed facilities in more detail below.

- **Broker-dealers** are a very large part of the overall repo market, engaging in both repo and reverse repo transactions. They typically act as intermediaries or acquire funding for clients. Clients include buy and hold asset managers such as pension, mutual, and insurance funds as well as short sellers such as hedge funds. On net, dealers are cash borrowers. According to NY Fed data on primary dealers, dealers fund $2.5tn in repo vs $2tn in reverse repos, for a net position of $458bn (Exhibit 26). The size of PD Treasury repo book ex TIPS has not changed meaningfully since 2019 (Exhibit 27).

Exhibit 26: Primary dealer repo vs reverse repo positions ($bn)
This is inclusive of all collateral types



Source: BofA Global Research, NY Fed

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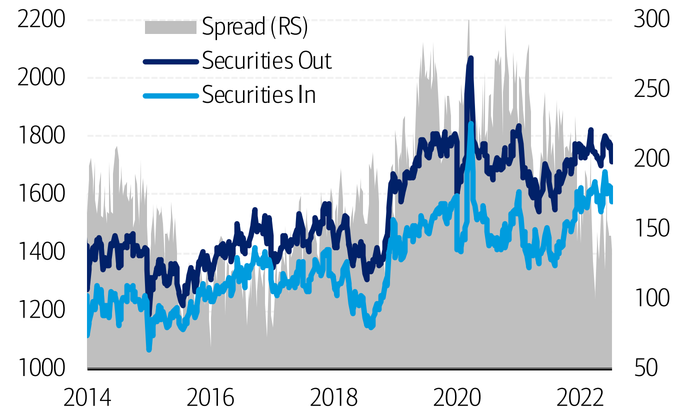
Exhibit 27: Primary dealer UST (ex TIPS) financing positions ($bn)
Dealers are net funders.



Source: BofA Global Research, NY Fed

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- **Rest of the world (ROTW)** encompasses all entities not in the U.S. that engage in transactions in U.S. markets as well as categories that are not easily defined. Leveraged / hedge funds are likely a very large portion of the "rest of the world" category. ROTW makes up a large portion of both cash borrowers and cash lenders.

  Hedge funds often use repo for leverage purposes. For example, hedge funds might trade lower-risk curve, butterfly, spread or basis positions that move only small amounts compared to outright duration positions. By using repo, the amount of capital needed for these kinds of trades can be very small - depending on haircuts – which allows returns on capital to be much higher.

- **Foreign banks in the US** differ from US depository institutions because foreign banks are not allowed to offer deposits and lack access to a stable source of USD. Foreign banks can raise a meaningful amount of USD by borrowing in repo.

- **REITs** or Real Estate Investment Trusts, use repo as their primary financing tool. In a repo, the REIT pledges mortgage securities as collateral in exchange for cash.

- **Depository institutions** can borrow cheaply in repo using their large securities portfolios as collateral. However, given banks are currently flush with cash, they do not often need to go to the repo market to borrow cash. Banks are more typically lenders of cash which we discuss below.

- **Insurance companies and educational institutions** often hold collateral in their investment portfolios that can be used to obtain cash in the repo market. Cash can be reinvested to deliver incremental return on a portfolio of securities.

Cash lenders

- **Money market funds** are mutual funds that focus their investments in the front end of the curve. MMFs typically use repo markets to invest cash for a return. Alternative investments for MMFs include T-bills and commercial paper. As of Q1 '22, MMFs accounted for 39% of the total repo assets. MMFs are cash lenders in the repo market, they do not act as borrowers.

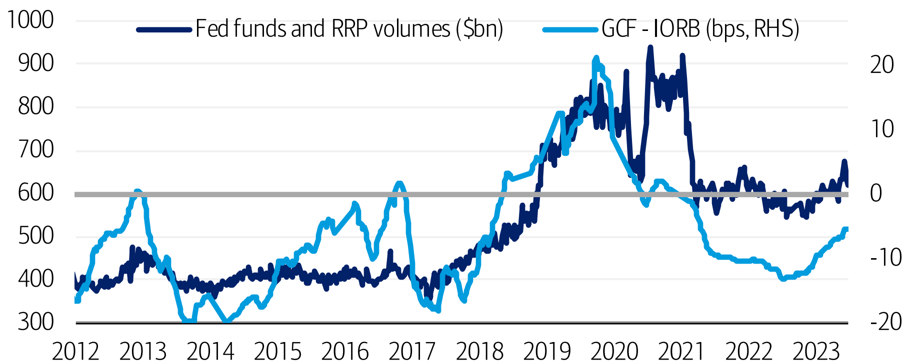
  The role of MMFs in repo has increased over the last 20 years because of growth of AUM in government MMFs which are required to invest 99.5% of their assets in cash, US gov securities or repos collateralized by cash and govt securities. Given these restrictions, gov't MMFs typically invest a larger share of their assets in repos than prime MMFs. In recent years, MMFs have been displaced from owning other money market securities because they are so rich.

MMFs have historically conducted repo investments with securities dealers and primary dealers, though have more recently increased their take-up at the Fed's ON RRP. Non-dealer counterparties include insurance companies, educational institutions, GSEs, and the Fed.

- **Broker dealers** see above
- **Rest of the world** see above
- **US depository institutions** can leave cash with the Fed to earn IORB. For this reason, they will typically not lend cash in the repo market unless repo rates are sufficiently above IORB. In this way, large US depository institutions can help to contain repo rates – as funding becomes more expensive, banks will likely become more willing to lend. As shown in Exhibit 28, bank lending in repo typically increases when repo rates are above interest on reserves, or the spread is positive, as represented when the light blue line is above the gray line.

Exhibit 28: Bank lending in FF & reverse repos vs GCF-IORB spread (NSA)

When the spread is positive (light blue line > gray line), bank cash lending increases



Source: BofA Global Research, Bloomberg, Haver Analytics

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- **GSEs:** or Government sponsored enterprises, use repo to lend excess cash to earn interest income. GSEs such as Fannie Mae and Freddie Mac will invest cash at the Fed's ON RRP during their "float" period. The GSE float period refers to the time ahead of their monthly principal and interest payments where they build up cash reserves. This float period is typically concentrated around the 3rd week of month.
- **Foreign banks in the US** are typically borrowers of cash in the repo market, however, they also lend cash through reverse repo operations. Foreign banks are less constrained than domestic banks because they do not have to pay FDIC insurance premiums, nor do they have as stringent liquidity requirements, therefore they can lend cash in repo markets more freely.
- **The Federal Reserve** is also a player in the repo market. Historically the Fed has used repo and reverse repo transactions (open market operations or OMOs) with primary dealers as a tool for monetary policy implementation. The Fed stopped repo operations after expanding their balance sheet. However, due to repo market volatility in 2019 from the reduction of the Fed's balance sheet, the Fed recently reintroduced a permanent standing repo facility (or SRF) which allows banks and PDs to borrow cash from the Fed. While this facility is a repo from the counterparty's perspective, it's actually a reverse repo (lending cash) from the Fed's perspective. We review Fed repo facilities in more detail below.

Repo & dealer balance sheets

Repo market availability & funding levels are highly dependent on dealer balance sheets. Dealers are essential to the intermediation of cash in repo transactions as they sit between cash lenders (i.e. MMF) & cash borrowers (i.e. hedge funds). Frictions that prevent dealers from engaging in the repo market can have a direct impact on repo availability & repo financing levels. Below we discuss some of these frictions, their impact, & measures some have taken to move around these frictions.

The largest repo market friction is banking regulation, especially the leverage ratio. The leverage ratio & supplementary leverage ratio (SLR) for the largest banks serves to limit the amount of balance sheet dealers can allocate to repo market making. The current US leverage ratio measures the amount of capital banks are required to hold against their total non-risk weighted assets. The measurement against non-risk weighted assets is especially important for the UST repo market; the risk taken from lending cash collateralized by UST securities is quite low (USTs can be easily sold if necessary) but has a meaningful impact for leverage ratio purposes. Recall, Basel rules have a minimum 3% leverage ratio requirement for large banks while US rules require 5% (tier 1 capital / total assets). The largest banks have additional supplementary leverage requirements.

Repo transactions increase the balance sheet size for dealers & banks when funding additional securities holdings. Repo therefore has an impact on the leverage ratio. The stylized dealer balance sheet below shows how repo transactions impact total dealer balance sheet size unless transactions are netted (Exhibit 29). To fund a new security holding a dealer will frequently borrow funds from a MMF & use that cash to purchase a security. Repos that increase dealer security holdings add to dealer balance sheet size & the associated leverage ratio capital requirement.

Exhibit 29: Stylized dealer balance sheet before and after funding $100 UST in repo($bn)

When a dealer funds a Treasury in repo it adds to their balance sheet

Assets		Liabilities	
Deposits	150	Repo	1,500
Repo	1,300	Bonds	200
Loans	850	Loans	1,300
Securities	300	Other	1,200
Other	1,600		

Assets			Liabilities		
Deposits		150	Repo	+100	1,600
Repo		1,300	Bonds		200
Loans		850	Loans		1,300
Securities	+100	400	Other		1,200
Other		1,600			

Source: BofA Global Research

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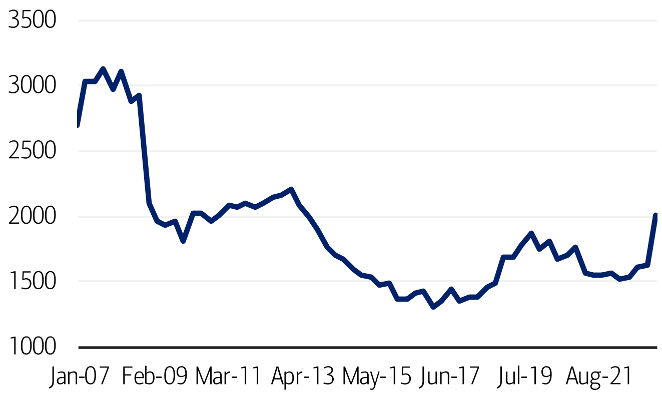
Dealer & bank balance sheet sizes also flow into the annual GSIB surcharge (GSIB = global systemically important banking institution). The GSIB surcharge is an additional capital requirement for the largest & most systemically important banking institutions. The GSIB surcharge for most banks is based on 5 key inputs: size, inter-connectedness, complexity, cross-jurisdictional activity, short-term wholesale funding. Repo impacts the GSIB surcharge via size & short-term wholesale funding. Repo activity can therefore add to capital requirements not only through leverage requirements but the GSIB surcharge. Repo transactions increase a bank's regulatory counterparty risk which is typically a large portion of a bank's risk-weighted exposures and can have capital implications.

Dealers can net a certain portion of their repo activity under limited circumstances. Dealer repo netting is permitted if there are offsetting borrow & lend transactions with the same counterparty, same settlement location, the same settlement date, & generally the same or similar collateral. Dealers & clients will often work to structure trades that can be efficiently netted to limit the net balance sheet impact of any particular trade. Even if dealer & client net exposures can be limited, many dealers will still restrict gross repo activity with any particular client for broader risk management purposes.

Since Basel III banking rules were designed & implemented there has been a sharp decline in dealer repo activity. In Q1 2008 total dealer & broker repo activity totaled $3.1tn but has declined today to around $2tn, according to Fed Flow of Funds data (Exhibit 30). Dealer & broker repo volumes have also fallen sharply in relation to the total size of financial markets. Dealer & broker repo volumes as a % of the total repo market have fallen from 60% in Q1 '08 to 27% today (Exhibit 31). The sharp decline in dealer & broker balance sheet & repo activity is one frequently cited reason for elevated market volatility & reduced liquidity, especially as total debt outstanding has grown.

Exhibit 30: Broker-dealer reverse repo activity ($bn)
In Q1 2008 total BD repo activity totaled $3.1tn but is now only $2tn



Source: BofA Global Research, Fed Z1

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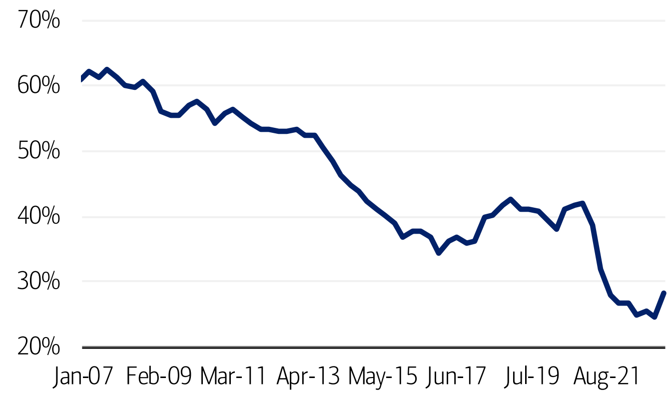
Exhibit 31: Broker-dealer reverse repo activity as % of total RRP
BDs make up a smaller portion of repo volumes, higher volatility



Source: BofA Global Research, Fed Z1

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Quarter & year end evidence dealer balance sheet pressure

On quarter and year ends we historically saw overnight repo rates rise due to a practice commonly referred to as "window-dressing". "Window-dressing" was a result of the snapshot of the leverage ratio on quarter end reporting dates for certain banks & dealers. The leverage ratio is a regulatory requirement for banks that measures the ratio of a bank's tier 1 capital (mainly common equity) to its balance sheet assets. If a bank's balance sheet increases, it may need to increase capital to meet this requirement.

Leverage ratio reporting differences lead to pronounced changes in behavior by some repo participants & had a large market impact. Years ago, many regions only required leverage ratio reporting on month- or quarter-end days. The single day snapshot allowed banks to keep leverage high throughout the quarter, only reducing balance sheet usage at period end. This behavior resulted in typical period end window dressing volatility. Over time, daily average leverage ratio reporting has become more common globally.

Dealers who do not use leverage ratio daily average reporting typically reflected a sharp reduction in intermediation activity on quarter ends. For example, if a hedge fund wanted to borrow cash on quarter end, a bank may not want to intermediate this trade, so the hedge fund would need to pay up for cash by asking other dealers for funds. This caused repo rates to increase. Quarter ends are also typically associated with large Treasury coupon settlements that push repo rates higher.

In June 2019 the Basel Committee on Banking Supervision announced revisions to leverage ratio disclosure requirements. The Committee agreed that internationally active banks must disclose their adjusted gross securities financing transaction assets based on both quarter end values and daily values as part of their Pillar 3 requirements. This has served to reduce some of the extreme spikes in repo levels around quarter end though the lasting impact will not be clear until there is a lower level of excess liquidity in the financial system. Some dealers are still likely to engage in window dressing activity around quarter ends for public reporting purposes.

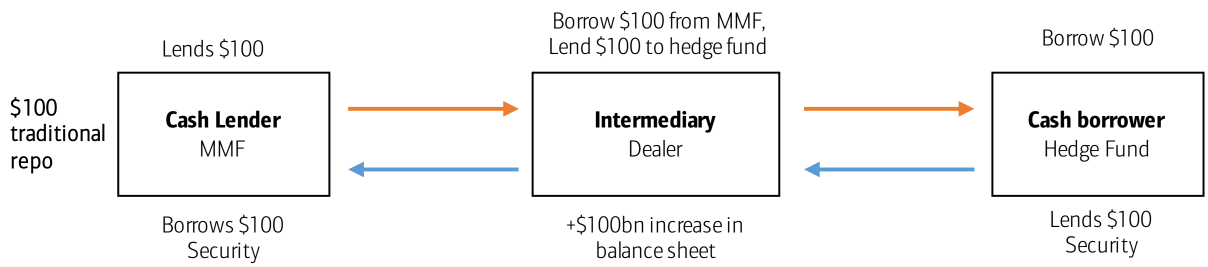
FICC sponsored repo: dealer workaround

Regulations that limit repo intermediation capacity have led to ways to enhance repo market activity outside of the traditional dealer channel. One way to increase repo capacity is through FICC (Fixed Income Clearing Corporation) sponsored repo, which has been in place since at least 2017. The FICC sponsored repo facility allows certain entities to lend & borrow cash into the FICC via their sponsoring member banks.

Recall, FICC is a subsidiary of DTCC (Depository Trust Clearing Corporation) that provides real-time trade matching, clearing, risk management and netting for trades in US government debt issues, including repurchase agreements or repos. FICC essentially allows for central clearing & netting of repo transactions between its members.

FICC sponsored repo works by allowing: (1) a FICC member to sponsor a cash lender into the FICC clearing & settlement platform (2) the FICC member to sponsor a cash borrower into the facility (3) FICC sponsor repo exposure netting. This allows for FICC sponsoring members to match repo cash lenders & cash borrowers across the FICC platform in a netted & balance sheet neutral way for the sponsor. The FICC sponsor is also able to earn a fee for sponsorship of non-FICC members in the platform. For detail see Exhibit 32 & Exhibit 33

Exhibit 32: Traditional repo impact on dealer balance sheet
Dealer balance sheet typically grows with repo activity, which can have a regulatory impact



Source: BofA Global Research

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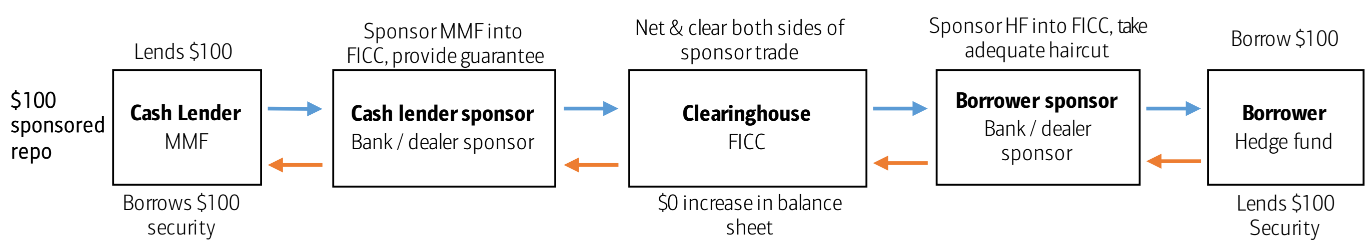
Exhibit 33: FICC sponsored repo impact on sponsor balance sheet
FICC sponsored repo can net sponsor balance sheet impact to zero by having clearinghouse net both sides of the repo trade



Source: BofA Global Research

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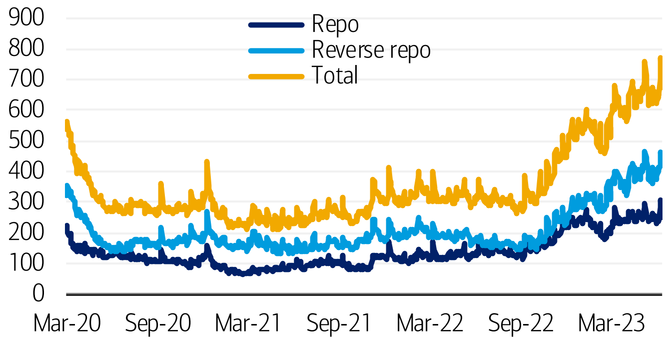
These sponsoring members can submit transactions on behalf of their sponsored clients into the bilateral and GC repo markets. Eligible collateral includes Treasuries, agency debt, and FRNs. Sponsoring members that intermediate both repo transaction legs are allowed to net down this balance sheet exposure through the FICC. Importantly, a sponsoring member is required to provide a guaranty to FICC with respect to all obligations of its sponsored members. This means that if a sponsored member does not satisfy any of its obligations, FICC can force the sponsor to fulfill these obligations.

The FICC provision for sponsoring member guarantee essentially allows participants on either side of the repo transaction only face the credit risk of the FICC and are less exposed to the possibility of a disorderly counterparty default.

More detail on the FICC sponsored repo parameters are discussed below:

Exhibit 34: FICC Sponsored repo and reverse repo activity
Total FICC sponsored activity is currently around $675bn



Source: DTCC

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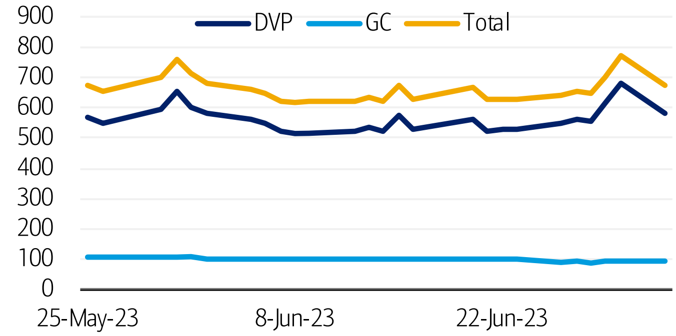
Exhibit 35: FICC Sponsored DVP and GC activity
87% of FICC sponsored repo is DVP



Source: DTCC

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Sponsoring member

The **sponsoring member** (dealer or custodial bank) facilitates funding. Mechanics are similar to a traditional repo transaction but the sponsoring member faces the FICC on the borrowing and lending side. This allows the sponsoring member to net down its repo position, as both sides of the transaction are with the same counterparty, utilize the same collateral and have the same underlying terms.

Sponsored member – cash lender

The **sponsored member cash lender** (i.e. MMF) provides the funding. The sponsored member should receive a higher rate on their cash lending because they are able to access a different segment of the repo market. The program essentially allows the cash lending sponsored members to invest directly into the FICC GCF interdealer repo market instead of the tri-party repo market. The sponsored member's counterparty exposure is limited to FICC and not the dealer or entity on the other side of the repo transaction.

Sponsored member – cash borrower

The **sponsored member cash borrower** (i.e. hedge fund) is the end recipient of the funding. The sponsored member cash borrower should view the program favorably since access to funding is expected to (1) increase with improved dealer balance sheet netting (2) be more stable around key balance sheet reporting dates. However, sponsored member performance must be guaranteed by the sponsoring member and this may increase the cost of funds or haircuts through the FICC model.

A detailed discussion of each participant in the sponsored repo program is below.

Sponsoring member tradeoffs

Sponsoring member eligibility

In this model a custodial bank or dealer sponsors their eligible clients into FICC. The sponsorship can be done across two category types. "Category 1" sponsoring members are typically well capitalized banks that are netting members of the FICC Government Securities Division (GSD) with at least $5bn in equity capital. "Category 2" sponsoring members can include dealer, futures commission, and foreign netting members that may have less capital than category 1 members; FICC retains the right to impose greater financial requirements on such dealers depending on the size of their overall activity.

Sponsoring members of the FICC include:

- State Street, Bank of New York Mellon, JP Morgan, Mizuho, Nomura, National Bank of Canada, SG Americas, Industrial and Commercial Bank of China, Natixis, Natwest Markets, Credit Suisse, Bank of America, BNP Paribas, Palafox, ED&F Man, and Morgan Stanley.

Sponsoring member trade dynamics

The sponsoring member participates in trades on behalf of its sponsored member and acts as processing agent, receiving reports and information on behalf of its sponsored member. Each sponsoring member maintains an account specific for the activity of its sponsored members. This is known as the Sponsoring Member Omnibus Account.

The Omnibus Account must be separate from a sponsoring member's other netting accounts with the FICC. The Omnibus Account faces a fund deposit requirement like any other account at the FICC. The main difference is that the deposit requirement includes VaR charges for all sponsored member trades. This charge is essentially based on the volatility of all unsettled positions.

Note that the sponsored member has the obligation to deliver the security in a trade. The sponsoring member must provide a guarantee of payment to the FICC, which can be invoked if the sponsored member does not fulfill its obligation.

Sponsoring member benefits & drawbacks

Benefit: the key benefit to the sponsoring member is the ability to net down balance sheet exposure and earning a marginal spread on the client facilitated activity. The netting benefit of the transaction can help banks and dealers reduce their overall balance sheet footprint while still providing additional repo capacity to their clients. The revenue generation from the sponsoring membership likely varies by firm but it is expected firms would likely capture a small spread or view the sponsorship program as a way to attract client volume in other higher revenue businesses (i.e. more futures clearing activity).

Drawback: the largest drawback for the sponsoring member is the performance guarantee that it must provide to FICC. The sponsor must guarantee performance of the sponsored entity, post additional capital on behalf of the sponsored entity (including VaR charges for sponsoring member positions), handle all settlement and operations of their sponsored entities and provide additional liquidity into the FICC Capped Contingency Liquidity Facility (CCLF). The CCLF is essentially a default fund for FICC to ensure that all cash settle obligations could be covered in the event of a member default. Sponsoring members are expected to contribute to the CCLF in generally proportionate terms to the potential liquidity need that members present to the FICC.

The sponsored member

Sponsored members are clients that are brought into the FICC program by sponsoring members. Sponsored members are currently money funds (cash lenders) and hedge funds (cash borrowers). Historically, sponsored members were limited to registered investment companies (an investment company registered with the FICC). In May 2018, the service was expanded to include all institutions that fulfill the requirements of a qualified institutional buyer (see Appendix). There are nearly 1900 individual funds that are sponsored members of the FICC, including numerous MMFs.[1] It seems likely the list of sponsored members will grow over time and other cash providers will likely be added to the program in the future, ex GSEs, corporates, sec lenders, asset managers, etc.

Cash borrowers

The main cash borrowers in the sponsored repo facility are hedge funds. There is no available data on hedge fund repo activity with the FICC, but sponsored members include Millennium, Capula, and Citadel. The key benefit for cash borrowers is greater leverage availability, as sponsored repo can expand the cash lending base.

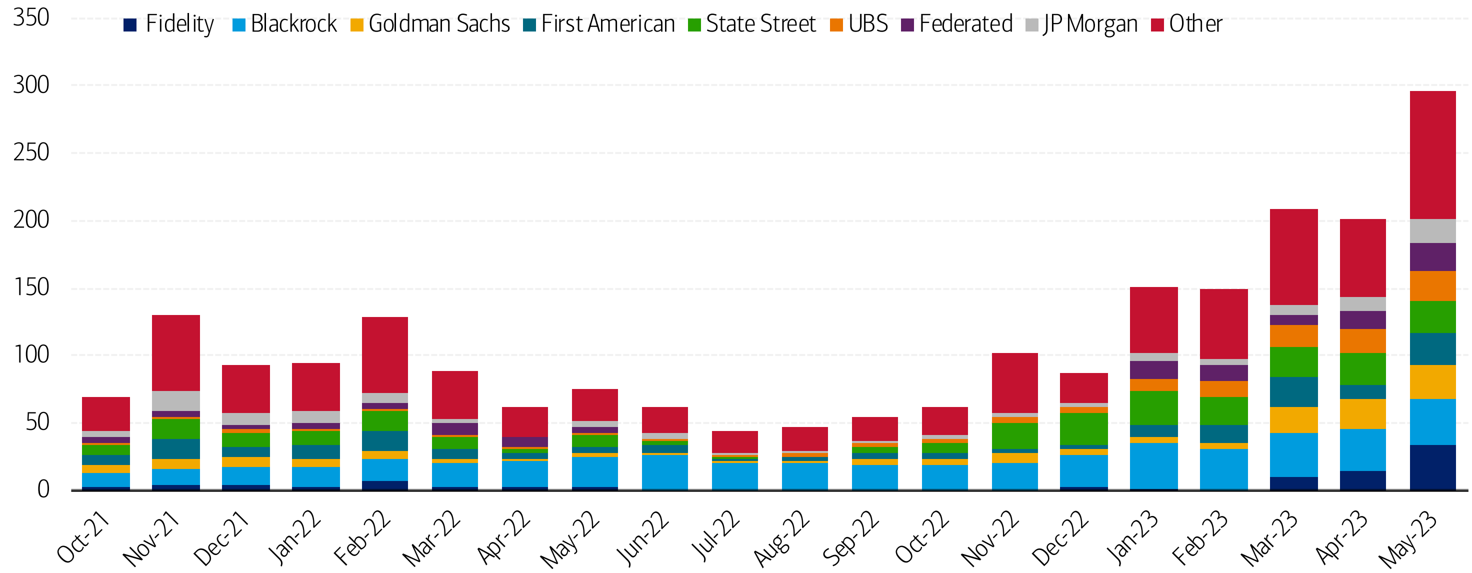
[1] http://www.dtcc.com/~/media/Files/Downloads/client-center/FICC/sponsored-membership-list.xlsx

Cash lenders

The main cash lenders in the sponsored repo facility are money market funds (MMFs). According to data from the Office of Financial Research, total MMF repo activity across UST collateral is about $2.8tn, based upon monthly disclosures with nearly $300bn in FICC repo.

Exhibit 36: FICC repo activity by MMF fund family ($bn)

FICC repo activity with MMF has recently increased



Source: Office of Financial Research

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The largest MMFs active in the FICC facility are Fidelity, Blackrock and Goldman Sachs funds.

The key benefits for lenders using the facility are (1) possibly higher return on their investments (2) more stability of repo investment options for late day activity or around key dealer balance sheet reporting dates. A bit on each below:

- FICC sponsorship allows MMF the ability to earn a higher rate of return on their repo investments. This occurs since the sponsored repo program allows MMF to move their repo out of the tri-party market and into the interdealer market.
- FICC sponsorship also allows for more stability of repo investment options for MMF. MMF reportedly have greater ability to invest cash with FICC late in the day as dealer funding is typically squared away in the afternoon.

The FICC sponsored repo facility is complicated but serves a very useful function given dealer repo balance sheet constraints. FICC sponsored repo activity is expected to grow over coming years given rigid dealer balance sheet constraints. FICC repo can be expensive which may still result in a preference for more traditional repo models.

Specials and TMPG fails charge

“Specials” refer to specific treasury securities, usually the on-the-run benchmark, that trade at a lower repo rate due to high demand. Specific securities can be in high demand for shorting in an environment where rates are anticipated to rise.

The borrower of the security intending to establish a short position will generate cash when selling the security and this cash goes to the security lender. The short seller - or the cash "lender" – may be willing to earn a below-market rate on their cash because the security posted as collateral is “special” and holds an intrinsic value, typically much higher liquidity, which the cash lender will attempt to monetize.

Repo specials activity is generally driven by 3 dynamics: (1) elevated short positioning at a particular security tenor (2) delivery into a CTD futures contract (3) large failures to deliver. A bit of detail on each:

- **Elevated short positioning**: market participants may speculate on higher interest rates by shoring a specific security. The speculator may sell short a security that they do not own & be required to borrow this security to make delivery on their short position. Elevated speculator demand to acquire a specific security & make delivery on the short position can drive specialness.
- **Delivery as CTD into futures contract**: some UST futures sellers may have a hard time acquiring a security needed for delivery into a futures clearing house. As failure to deliver to a clearing house could incur penalties so the UST future sellers may borrow a specific security in the repo market. Elevated demand for a CTD can therefore drive specialness in specific CUSIPS.
- **Failures to deliver**: a string of counterparty failure to delivers can also drive specialness. Market participants that have agreed to sell or deliver a security to a counterparty will pay a premium to acquire a specific CUSIP. If these sellers have been failed upon they will then seek other ways to acquire the specific security. Large failures to deliver can therefore drive specialness.

Specials rates can also trade negative. This occurs when a market participants will pay a cash borrower to their money in exchange for a specific security. The prevalence of negative rate specials trading occurs frequently when interest rates are low & are incentivized by the Treasury Market Practices Group (TMPG) fails charge. Some market participants will drive specials rates more deeply negative than the TMPG fails charge to acquire specific securities for delivery to key counterparties.

TMPG fails charge: penalty for failure when rates are low

The Treasury Market Practices Group (TMPG) implemented a charge in May 2009 to reduce the incentive for failures to deliver & encourage increased specials trading when rates are low. Prior to the fails charge implementation market participants had limited incentive to make delivery & receive cash proceeds when rates are low. For example, assume GC repo is 10bps, a seller who fails to deliver would forge the receipt of sales proceeds & the subsequent opportunity cost of investing those proceeds in GC at 10bps. This is a small opportunity cost when rates are low, which resulted in elevated fails.

The TMPG fixed this incentive issue by implementing a sizeable fails charge when rates are low. Specifically, the TMPG fails charge is 3% minus the bottom end of the Fed target range. If the Fed target range bottom is zero then the fails charge is 300bp; if the Fed target range bottom is 2% then the fails charge is 100bp.

The imposition of the TMPG fails charge led to a reduction of UST failures to deliver & increased specials activity when interest rates are low.

Fed repo & liquidity facilities

The Fed has four facilities focused on the repo market: (1) standing repo facility, (2) FIMA repo facility (3) ON RRP facility, (4) foreign reverse repo facility. The standing repo & FIMA repo facilities add cash into the banking system; the ON RRP & foreign reverse repo facilities drain liquidity from the financial system.

Liquidity Providing Facilities: Standing Repo & FIMA

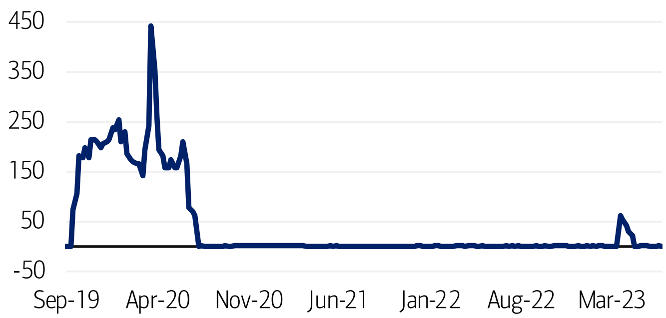
Standing Repo Facility

Prior to 2008, the Fed's overnight repo facility (a repo from the counterparty's perspective, not the Fed's) was a long standing tool that allowed primary dealers to borrow cash from the Fed in exchange for open market eligible collateral (including Treasury, agency debt, and agency MBS). During this period of reserve scarcity, the Fed frequently used overnight repos and reverse repos to fine tune the amount of reserves in the banking system so that supply and demand would land on their target fed funds rate. However, when the Fed grew the size of reserves through LSAPs starting in 2008, overnight repo operations were no longer necessary and were shelved.

In mid-September 2019 front end funding markets experienced substantial stress as reserves became scarce. The Fed restarted overnight repo operations to increase the amount of cash in the banking system which in turn helped normalize funding costs. During March 2020 market volatility the Fed increased its repo offering sizes to support market functioning. The Fed continues to offer $500bn in overnight repo each day but market take up is now typically zero given abundant level of reserves (Exhibit 37).

The repos now serve as a backstop – and the facility is now known as the standing repo facility (SRF), which was officially put in place in July 2021. It is unlikely that investors will participate in the operations with market rates trading below the minimum bid level, but the Fed is leaving the facility in place in case of unexpected market stress. The SRF acts as an automatic stabilizer to add liquidity if unexpected funding market stress.

Exhibit 37: Fed repo facility usage ($bn)
Weekly data as of Wednesday close. Take-up currently = 0



Source: Federal Reserve

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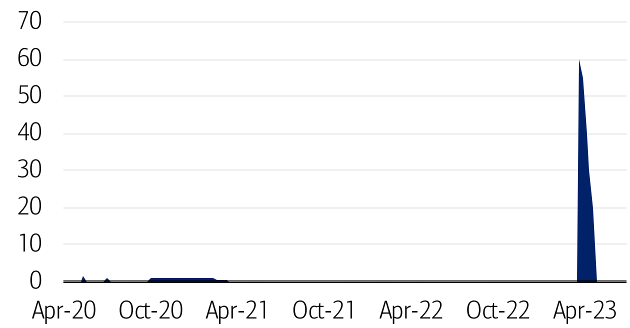
Exhibit 38: FIMA repo facility usage ($bn)
Weekly data, Wednesday close. Take-up currently = 0



Source: Federal Reserve

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FIMA repo facility

The FIMA (Foreign and International Monetary Authority) repo facility was announced in March 2020 and was made a standing facility in July 2021. The facility allows certain foreign institutions to exchange USTs for US dollars with the Fed. The goal of this facility is likely to reduce the need for foreign institutions to sell USTs outright.

The facility rate is set at the top of the target range, which is relatively elevated in relation to UST repo rates. The Fed acknowledged in their FAQ that this rate "*generally exceeds private repo rates when the Treasury market is functioning well, so the facility would primarily be used only in unusual circumstances.*" Usage of the FIMA repo facility has been quite low but ticked up during banking system stress in early '23 (Exhibit 38).

Liquidity Draining Facilities: ON RRP & Foreign RRP

Reverse Repo facility

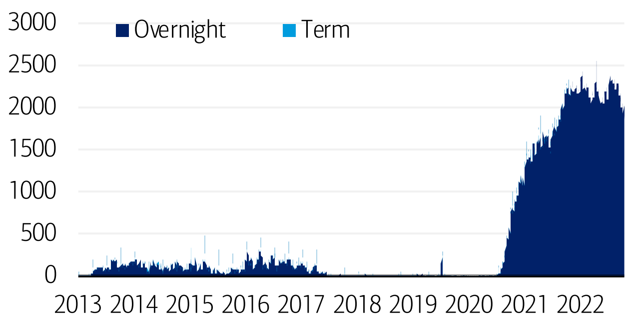
The Fed has a reverse repo facility for a broader range of market participants, including MMF & GSEs, which helps the Fed control money market rates during periods of abundant liquidity. This RRP facility can be thought of as an investment option of last resort for eligible counterparties who would invest with the Fed only if there are no other readily available higher yielding alternative investments.

Most activity at the RRP facility is overnight repo, so it is typically referred to as the ON RRP facility (Exhibit 39). Since the Fed introduced the ON RRP in 2013 it has served as a relatively robust floor for overnight Treasury repo rates. When Treasury collateral is scarce and repo rates are relatively low, usage of the Fed's ON RRP tends to increase.

There are currently around 160 eligible counterparties that have access to the Fed's ON RRP facility including primary dealers, banks, GSEs, and money market mutual funds. Most historical ON RRP usage has been driven by MMFs (Exhibit 40). The Fed currently has a $160bn per counterparty limit per day for ON RRP operations.

Exhibit 39: Fed reverse repo facility usage ($bn)

RRP take-up grew significantly during the last round of QE



Source: Federal Reserve

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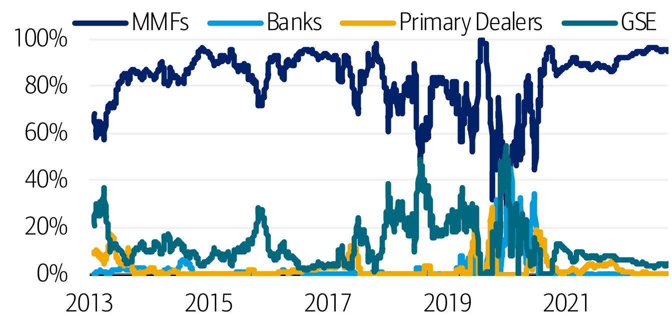
Exhibit 40: Fed RRP take-up by counterparty (% total)

MMFs are the largest cash lenders in Fed RRP. Data is lagged, as of 5/31/23



Source: BofA Global Research, Bloomberg

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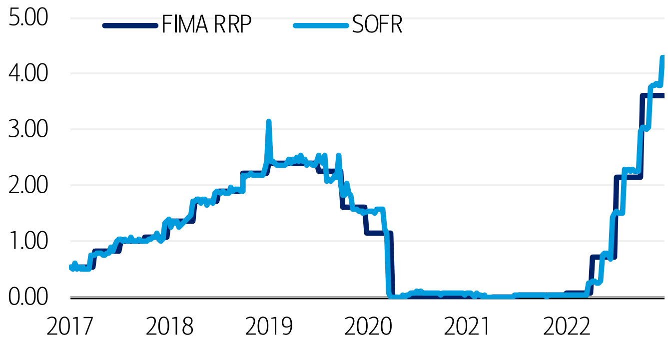
FIMA reverse repo pool

The foreign repo pool, or FIMA reverse repo pool, represents a stock of cash that the Fed's foreign official and international custodial accounts can invest with the Fed overnight. These overnight investments are collateralized by Treasuries from the Fed's SOMA portfolio and are unwound the following business day. FIMA RRP transactions essentially represent a repo between the Fed and foreign official or multilateral accounts that custody their USD holdings with the Federal Reserve Bank of New York (FRBNY). Foreign investors earn a rate generally equivalent to ON RRP (Exhibit 41)

The FRBNY provides this custodial service to (1) maintain a significant role in the worldwide financial system (2) promote safekeeping of USD assets (3) foster goodwill between the Fed and other foreign official or multilateral institutions.

Usage of the FIMA RRP is a bit over $300bn. The FIMA RRP increased substantially in 2015, likely driven by the Japanese Ministry of Finance (MoF). The MoF reports deposits with foreign central banks and the BIS, which increased substantially in 2015-2016 at the same time the foreign repo pool grew (Exhibit 42).

Exhibit 41: SOFR vs Foreign RRP rate (%)
Rate on foreign RRP and SOFR typically trade close in line



Source: BofA Global Research, Bloomberg

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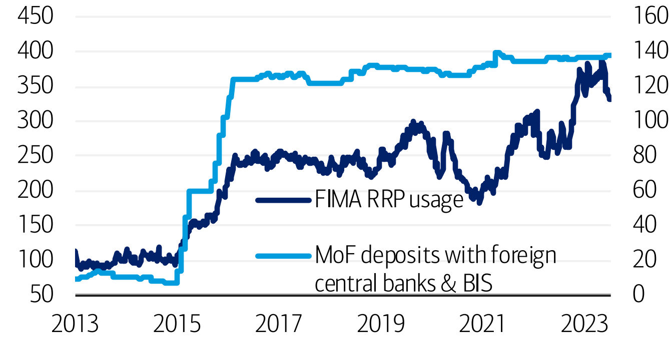
Exhibit 42: FIMA RRP pool (LS, $b) & Japanese MoF deposits (RS, $b))
FIMA RRP usage currently around $330bn



Source: MoF, Federal Reserve, BofA Global Research

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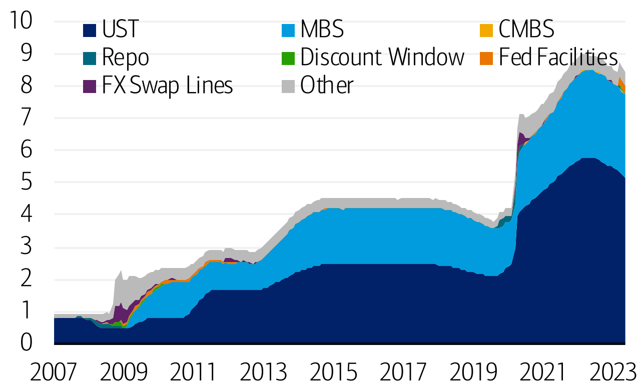
Impact on the Fed balance sheet

Fed lending facilities are assets on their balance sheet (SRF, FIMA) and cash borrowing facilities are liabilities (ON RRP, Foreign RRP) (Exhibit 43, Exhibit 44). An increase in an asset/repo will grow the Fed balance sheet & vice versa. There is an inverse relationship between other Fed liabilities and reserves. If there is more cash invested in the reverse repo facility, this means there is less cash in the banking system (Exhibit 45).

Exhibit 43: Fed balance sheet assets ($tn)
Cash lending facilities are assets as the Fed earns interest



Source: Federal Reserve, Bloomberg

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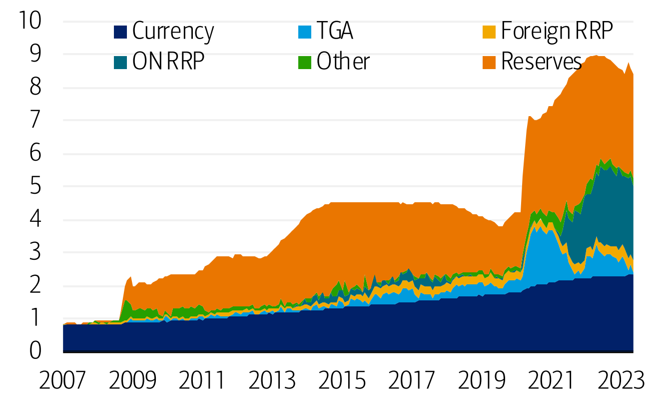
Exhibit 44: Fed balance sheet liabilities ($tn)
Cash borrowing facilities are liabilities as the Fed pays interest



Source: Federal Reserve, Bloomberg

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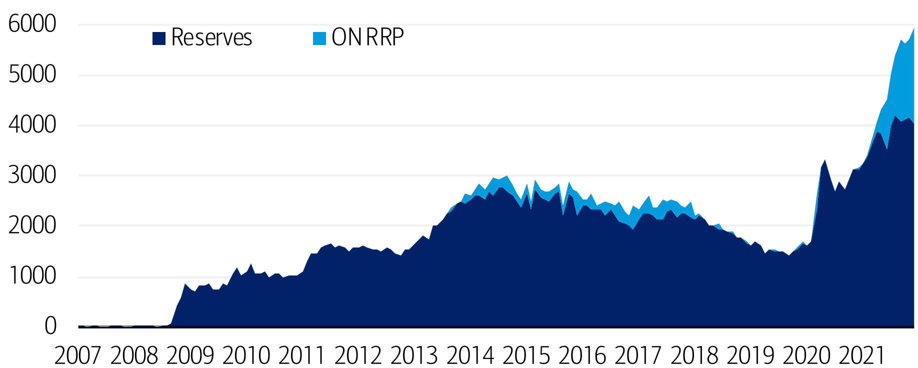
Exhibit 45: Fed reserves and ON RRP ($bn)
An increase in reserves, holding everything else equal, typically is reflected in a decline in ON RRP



Source: Bloomberg

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Appendix I: Acronyms

Acronyms defined below:

- BGCR – Broad General Collateral Rate
- DN – Discount Note
- EFFR – Effective Federal Funds Rate
- FF – Fed Funds
- FHLB – Federal Home Loan Bank
- FICC – Fixed Income Clearing Corporation
- FIMA – Foreign and International Monitoring Authority
- FRN – Floating Rate Note
- GSD – Government Securities Division Solutions
- GSE – Government Sponsored Enterprise
- ILST – Internal Liquidity Stress Test
- IORB – Interest On Reserve Balances
- LCR – Liquidity Coverage Ratio
- MBS – Mortgage Backed Security
- MMF – Money Market Fund
- ON RP – Overnight Repo
- ON RRP – Overnight Reverse Repo
- QE – Quantitative Easing
- QT – Quantitative Tightening
- SRF – Standing Repo Facility
- SOFR – Securities Overnight Financing Rate
- TGA – Treasury General Account
- TGCR – Tri-party General Collateral Rate
- TIPS – Treasury Inflation Protected Security
- UST – US Treasury

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