

US Rates

Primer: Fed policy plumbing, '23 edition

Primer

Fed plumbing critical to understanding money markets

The rates market starts at the front end of the curve. To understand the US front end it is critical to understand the plumbing, which includes the setting of Fed administered rates, fed funds, & other key rates (OBFR & SOFR). This primer delves into the plumbing.

This primer also reviews the basics of the Fed balance sheet, the mechanics of QT, and discusses impacts of this liquidity drain on money markets. This primer builds off our '22 piece (see the report: [Fed policy plumbing](#)). Key topics highlighted in this primer:

Fed key policy rates & tools: We review key front-end rates and how IORB and ON RRP are adjusted to keep the fed funds rate within the target range

Dynamics of the fed funds market: we discuss how fed funds dynamics remain dominated by Federal Home Loan Bank lending.

Fed balance sheet: we provide an overview of the Fed's balance sheet, including key liability items like bank reserves, Fed overnight reverse repo, and Treasury cash balance.

QT progress to date: we review Fed QT progress and how the liquidity drain has impacted reserves + ON RRP. We also discuss the link to commercial banks.

Fed unrealized losses: we discuss Fed unrealized losses, how they work mechanically, and why they are not a constraint on current policy setting.

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See page 24 for acronym definitions.

Fed policy rates & tools

The Fed sets monetary policy to promote its dual mandate of maximum employment and stable inflation.¹ The Fed primarily achieves these goals by managing the level of short-term interest rates and uses its balance sheet as a secondary tool.

In setting the level of short-term interest rates the Fed uses a 25bps range for its target effective federal funds rate (EFFR), which represents overnight unsecured interbank borrowing. To achieve the 25bps range, the Fed primarily relies on interest rate on reserve balances (IORB). IORB serves as a “magnet” for other money market rates because it pays a rate of return that depository institutions will typically be hesitant to lend below.

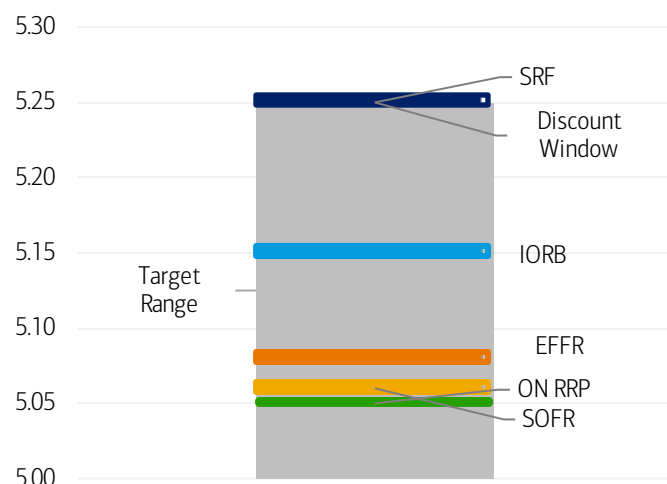
The Fed supplements IORB with two tools to ensure broader control over money markets: an overnight reverse repo facility (ON RRP) to prevent rates from moving too low and the standing repo facility (SRF) to prevent rates from moving too high (Exhibit 1). The Fed also has a backstop lending facility, the discount window.

The Fed’s official policy target is the EFFR but there are 2 other rates that receive special focus: overnight bank funding rate (OBFR) & secured overnight financing rate (SOFR). OBFR is similar to fed funds but includes a wider range of unsecured overnight bank borrowings. SOFR is a collateralized overnight repo rate.

We discuss the Fed’s policy target, other key rates, and tools in greater detail below.

Exhibit 1: Key interest rates relative to Fed target range

The Fed aims to control EFFR via IORB and ON RRP



Source: BofA Global Research, Bloomberg. Data as of 7/3/23

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Exhibit 2: Fed funds volumes (\$bn)

Fed funds volumes have averaged around \$110bn YTD



Source: BofA Global Research, FRBNY;

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Target range for fed funds effective rate & primary tools

The Fed sets a 25bps range for the EFFR, which is its primary objective for policy implementation. The Fed’s key policy tools of IORB, ON RRP, and SRF can be set to any rate of interest to ensure that the EFFR remains squarely within the Fed’s target range.

- **IORB:** the Fed’s primary tool for controlling money markets since it serves as a rate at which banks will be hesitant to lend below. Depository institutions receive this rate on reserves held at the Fed.
- **ON RRP:** intended to function as a floor for money market rates. ON RRP allows the Fed to drain cash out of the banking system when money market rates are too low.

¹<https://www.federalreserve.gov/monetarypolicy/monetary-policy-what-are-its-goals-how-does-it-work.htm>



- **SRF:** this is intended to act as a ceiling for UST secured funding. The SRF allows the Fed to add cash into the banking system when reserves are limited in relation to the amount of UST collateral outstanding. Although the SRF was only formalized in '21, the Fed has been operating a functional SRF / daily repo operation since '19.

Detail on Fed policy target, key rates, & primary tools

EFFR (effective Federal Funds Rate)

The EFFR is the primary monetary policy target for the Fed. According to the NY Fed, the EFFR “consists of domestic unsecured borrowings in U.S. dollars by depository institutions from other depository institutions and certain other entities, primarily GSEs.”

The EFFR is calculated as a volume-weighted median of overnight FF trades.

Daily volumes in the overnight EFFR market have declined since the financial crisis: EFFR volumes peaked at almost \$250bn / day prior to the financial crisis but have averaged \$111bn / day YTD (Exhibit 2). The Fed has also changed the way they collect fed funds transactions, previously from brokered data, which only included transactions that went through four brokers, to FR2420, which allows individual institutions to submit their transaction data, therefore reflecting a broader range of activity. Today, roughly 95% of all FF activity is driven by government sponsored enterprise (GSE), primarily FHLBs, lending to foreign banks (discussed further [below](#)).

OBFR (overnight bank funding rate)

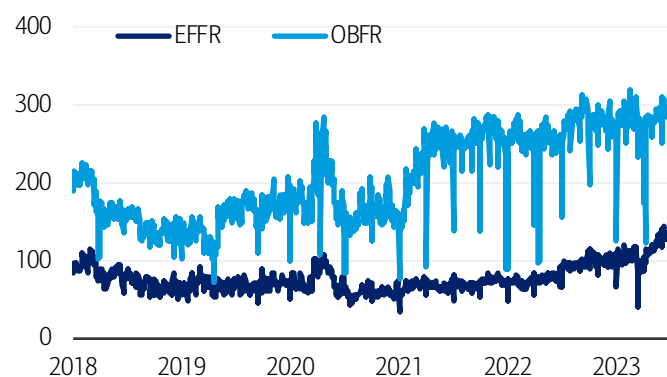
The Fed publishes another broad overnight unsecured bank borrowing rate along with EFFR: the overnight bank funding rate (OBFR). This rate is not the Fed's policy target but it is a similar rate used to inform overnight unsecured borrowing activity.

The OBFR consists of overnight FF and certain Eurodollar transactions. According to the NY Fed, the “Eurodollar market consists of unsecured U.S. dollar deposits held at banks or bank branches outside of the United States” and “U.S.-based banks can also take Eurodollar deposits domestically through international banking facilities.”

Money market funds, corporations, foreign central banks, and other official accounts are all active lenders in the Eurodollar market which is encapsulated in OBFR. Essentially, the EFFR represents overnight unsecured lending activity from the GSEs while OBFR represents overnight unsecured lending from MMFs / corporates / official accounts / others. OBFR is also calculated as a volume-weighted median. Eurodollar activity has historically comprised around 60% of OBFR activity (Exhibit 3, Exhibit 4).

Exhibit 3: EFFR versus OBFR volumes (\$bn)

OBFR volumes have average around \$280bn YTD

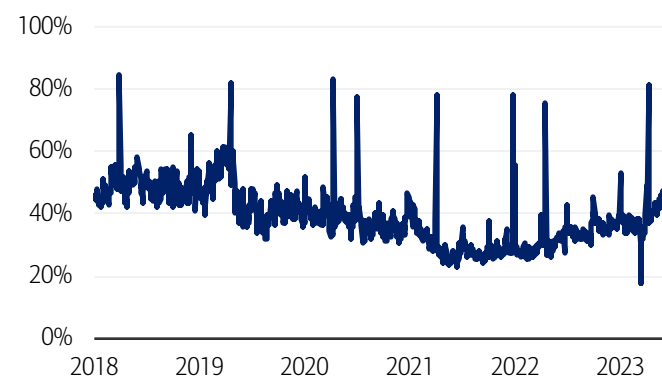


Source: BofA Global Research, Bloomberg

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Exhibit 4: EFFR as % of OBFR

Fed funds volumes average around 40% of OBFR volumes YTD



Source: BofA Global Research, Bloomberg

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SOFR (secured overnight financing rate)

The Fed publishes a variety of Treasury collateralized repo rates daily. The broadest measure of these repo rates is SOFR, which is designed to measure the cost of borrowing cash overnight collateralized by Treasury securities. SOFR is not a Fed policy target but it has special significance given its widespread adoption as a result of the LIBOR transition. If the Fed were ever to consider moving its policy target away from EFFR we expect SOFR would be the most logical replacement candidate.

Much more detail on SOFR & the repo market can be found in our primer (see: [US Treasury repo primer](#)).

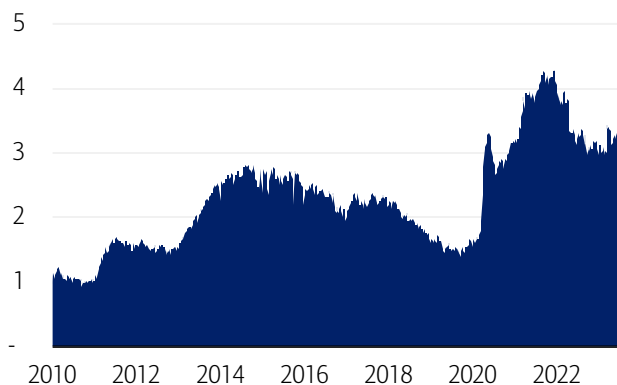
IORB (Interest on Reserve Balances)

This is the main tool that the Fed uses to move the FF rate within the target range. It is the rate of interest paid to depository institutions for their balances held overnight at the Fed. It is set by the Board of Governors (not the FOMC). The Fed's ability to pay interest on reserves is a relatively new policy tool that was granted by Congress in fall 2008. IORB was not part of the Fed's pre-2008 crisis toolkit.

The Fed used to have different requirements for interest on **required** and interest on **excess** reserves, though the two always received the same interest rate. The Fed reduced its reserve requirement to zero in March of 2020 because of a shift to an abundant reserve regime that it established in January 2019; this change technically made all reserves excess. Given the conversion of the two rates, the Fed has changed the name to interest on reserve balances.

Exhibit 5: Reserve balances (\$tn)

Reserve balances have been declining due to QT

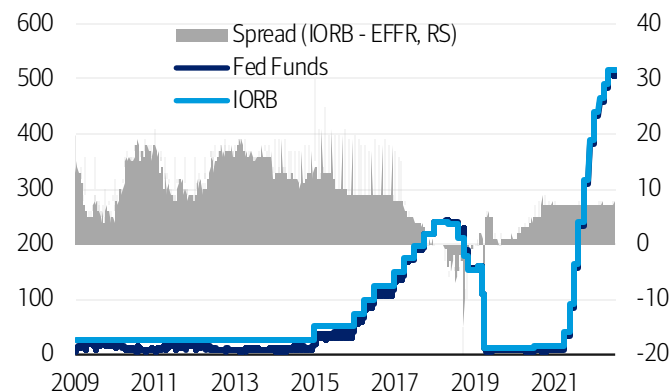


Source: Bloomberg

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Exhibit 6: IORB - EFFR spread (bps)

EFFR typically prints below IORB when reserves are ample



Source: BofA Global Research, Bloomberg

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Reserve balances fluctuate with the expansion and reduction of the Fed's SOMA portfolio which holds assets such as Treasuries and mortgage-backed securities (Exhibit 5). Currently, reserve balances are slightly below \$3.2tn and we forecast them declining to roughly \$2.5tn (if market conditions allow) through a process known as quantitative tightening, which we discuss in more detail [below](#).

IORB is only eligible for depository institutions and is not available to other entities that can transact in the federal funds market, such as GSEs. The EFFR often trades below IORB when reserves are ample (Exhibit 6). This is because GSEs would prefer to earn a positive return by lending their excess cash to an entity willing to pay a positive rate of return (even if below IORB) instead of leaving these funds either (1) on deposit with the Fed earning zero (2) in the Fed's overnight reverse repo facility. The inability for the GSEs to earn IORB drives most lending activity in the FF market.



ON RRP Facility (Overnight Reverse Repurchase Agreement)

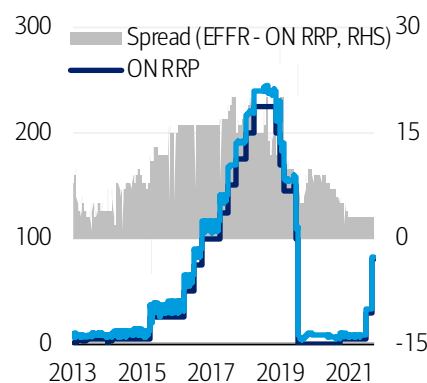
The Fed's ON RRP facility is a supplementary tool to prevent the EFFR from trading below the bottom of the 25bps target range. Since the Fed introduced the ON RRP in 2013 it has served as a relatively firm floor for overnight Treasury repo and kept the EFFR above the bottom end of the Fed's 25 bps target range on all days except year-end 2015 (Exhibit 7).

ON RRP can be thought of as an investment option of last resort for eligible counterparties that cannot earn IORB. An ON RRP eligible counterparty would only invest with the Fed if there were no other readily available higher yielding alternative investments. In theory, entities that have access to this facility should not be willing to invest in overnight secured or unsecured markets at a rate below ON RRP since the Fed has better credit risk vs any private counterparty.

ON RRP does not provide a firm floor on all money market rates because (1) not all market participants have access to it (2) some investors may be willing to accept a modest discount vs ON RRP to maintain key money market relationships (3) relatively late timing of when cash is returned from the Fed vs other overnight negotiated investments. These factors explain why we have seen the Fed's broad Treasury repo rate and SOFR print below ON RRP (Exhibit 8). Similarly, short-tenor Treasury bill rates frequently trade through the bottom end of the Fed's target range, especially when bill supply is limited (Exhibit 9). We briefly discuss these factors below:

Exhibit 7: EFFR-ON RRP rate & spread (bp)

EFFR > ON RRP every day except year-end '15

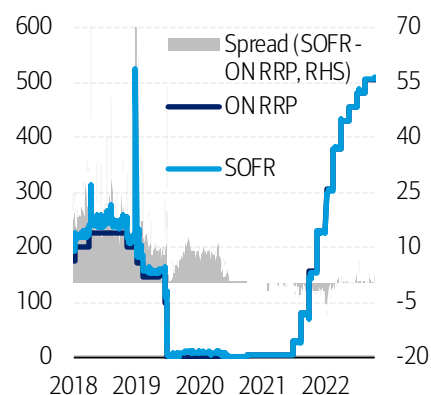


Source: BofA Global Research, Bloomberg

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Exhibit 8: SOFR-ON RRP rate & spread (bp)

SOFR-ON RRP spread avg .6bp YTD

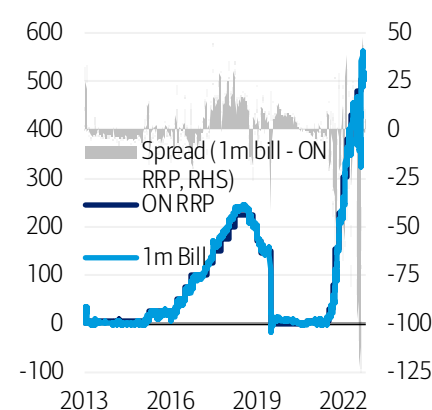


Source: BofA Global Research, Bloomberg

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Exhibit 9: 1m bill-ON RRP rate & spread

1m bill-ON RRP spread avg -17bp YTD



Source: BofA Global Research, Bloomberg

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Not all market participants have ON RRP access: there are currently 165 eligible counterparties that have access to the Fed's ON RRP facility including primary dealers, banks, GSEs, and money market mutual funds. Most ON RRP usage has been driven by MMF, followed by GSEs, primary dealers, and banks (Exhibit 10, Exhibit 11). The large set of counterparties able to invest directly with the Fed both in terms of the number and share of money market activity explains why the ON RRP has proven to be such an effective floor on USD short-dated interest rates.

However, several key investors do not have access to Fed ON RRP including Treasury only MMF, corporates, state & local governments, or non 2a-7 regulated MMF. These investors may be more willing to invest directly in US front end rates at levels below ON RRP. These investors may prefer to invest directly at the US front end rather than allocating cash to MMF & pay any associated management fees.

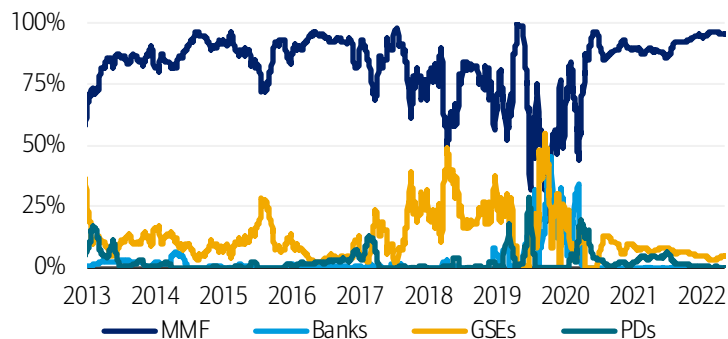
The Fed currently has a \$160bn per counterparty limit per day for ON RRP operations. The MMF per counterparty limit applies to each fund that is eligible to access the ON RRP, not the broader fund family. The per-counterparty limit can be temporarily increased at the discretion of the Chair; this step might be taken if ON RRP usage was increasing amidst a flight to safety out of the banking system.



The Fed has historically been willing to increase the per counterparty cap before it becomes binding. If the per counterparty cap were to bind broadly it would risk these funds investing directly in the front end & challenging the Fed's ability to maintain short rate control. The per counterparty cap does not currently bind though some funds have approached it (Exhibit 12).

Exhibit 10: Counterparty ON RRP usage as a % of total (1m moving avg.)

MMFs make up a majority of ON RRP use



Source: BofA Global Research, Bloomberg

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Exhibit 11: Eligible ON RRP Counterparties

MMFs make up most RRP counterparties

Type	Number	Avg % Usage in 1Q20
GSEs	16	10%
Banks	15	9%
Primary Dealers	24	15%
MMFs	110	67%

Source: BofA Global Research, FRBNY

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Exhibit 12: Top 10 MMFs ON RRP use (\$bn)

The largest MMF still remains below the \$160bn counterparty cap

Fund	May Assets	May ON RRP	Apr ON RRP	Mar ON RRP	Feb ON RRP
Goldman Sachs FS Govt	275	144	143	138	138
JPMorgan US Govt MM	275	133	105	109	84
Vanguard Federal MM Fund	253	117	130	122	118
Fidelity Govt Money Market	274	106	120	123	136
Fidelity Inv MM: Govt Port	190	95	91	0	N/A
Fidelity Govt Cash Reserves	225	89	N/A	102	119
American Funds Central Cash	165	65	61	56	50
BlackRock Lq FedFund	142	60	62	71	58
Northern Instit Treasury MMkt	73	59	58	52	53
Morgan Stanley Inst Liq Govt	157	56	75	61	43

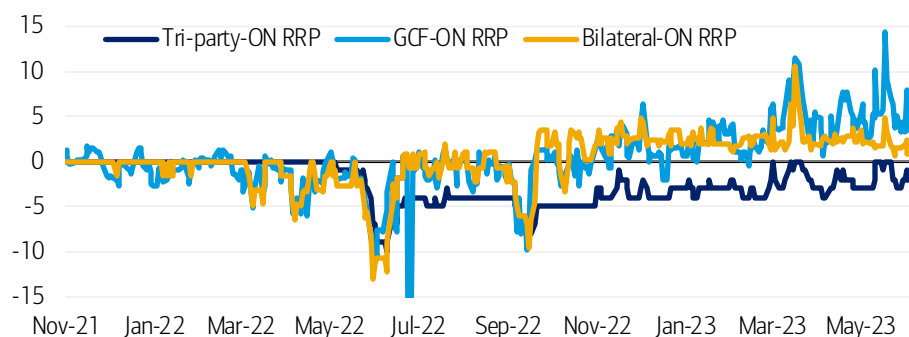
Source: BofA Global Research, Bloomberg

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Modest discount to maintain front end relationships: we believe some market participants with access to Fed ON RRP may be willing to invest at market rates slightly below ON RRP to maintain front end relationships. Specifically, we believe some MMF are willing to invest in ON UST GC repo with dealers at a rate slightly below ON RRP. This is consistent with the Fed's tri-party repo rate trading below ON RRP (Exhibit 13).

Exhibit 13: Treasury repo rates relative to ON RRP (bps)

Tri-party GC repo consistently trades below ON RRP



Source: BofA Global Research, Bloomberg

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MMF are likely aware that dealer repo balances are a scarce resource and that repo rates should trend above ON RRP over time. As a result, they are willing to remain invested with dealers at a discount to ON RRP to ensure this investment option is available in a higher repo rate environment.

Cash flow timing: money market rates can also trade below ON RRP due to the relatively late day timing of Fed cash flows. The Fed conducts ON RRP via tri-party repo infrastructure, which relies on BNY Mellon as a clearing & custodial agent. This infrastructure typically results in a late-day movement of cash flow on the date of initial ON RRP investment & associated unwind. The repo unwind typically does not occur until 3 PM on the day following ON RRP investment. A preference for an earlier return of cash may also be another reason certain investors prefer investing at levels below ON RRP.

Fed ON RRP utilization: higher use when money market rates are rich

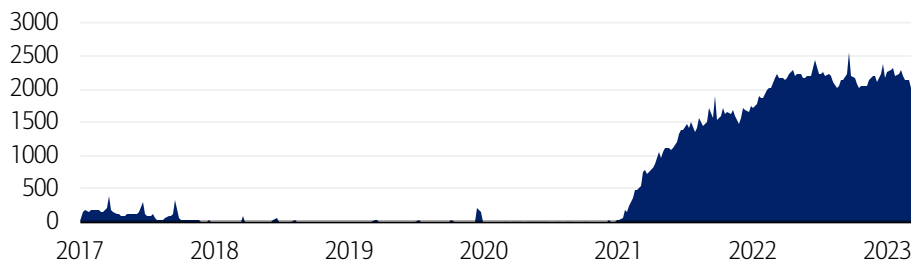
Usage of the Fed's ON RRP facility is related to (1) amount of excess liquidity in the system (2) richness of money market rates. In recent years ON RRP use increased sharply as the Fed expanded its balance sheet & Treasury supplied a relatively small amount of money market supply. When Treasury collateral is scarce and repo rates are relatively low, usage of the Fed's ON RRP increases.

There are other technical drivers of ON RRP use. ON RRP use has spiked around month and quarter end reporting dates when some dealers shrink their balance sheets, limiting overnight investment options for cash rich money market participants (Exhibit 14).

The Fed has stated it will use ON RRP *"only to the extent necessary and will phase it out when it is no longer needed to help control the federal funds rate"*. However, with the Fed's adoption of an "abundant reserve regime" for its longer-run monetary policy framework in January 2019² we expect the ON RRP to remain a permanent policy tool.

Exhibit 14: Fed overnight reverse repo take-up (\$bn)

Fed ON RRP take-up is primarily driven by cash rich MMFs



Source: BofA Global Research, Bloomberg

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Standing repo facility (SRF)

The Fed's overnight repo facility, now referred to as the standing repo facility, is a long-standing tool that allows primary dealers to borrow cash from the Fed in exchange for open market eligible collateral (including Treasury, agency debt, and agency MBS). The facility is simply a daily repo operation at a fixed rate with primary dealers & banks.

In 2020, the Fed expanded SRF counterparties from just primary dealers to include depository institutions. Before 2008, when reserves in the system were scarce, the Fed frequently used temporary ON RP and ON RRP operations to fine tune reserves in the banking system. This was done to offset changes in other Fed liabilities and ensure reserves were adjusted so the EFFR continued to trade at the desired level. The 2008 financial crisis brought about a substantial increase in reserves. This meant that the Fed no longer needed to micro-manage the level of reserves in the system and relied more heavily on IORB and ON RRP to keep Fed funds in the range. The Fed's repo operations were not used for many years following the 2008 financial crisis.

² [FOMC press release](#)

However, in mid-September 2019 front end funding markets experienced substantial stress as the Fed drained too many reserves in the banking system for banks to meet their desired liquidity requirements. On Sept 17 '19 the Fed restarted overnight repo operations to increase the amount of cash in the banking system and implemented term repo operations soon thereafter. Around the March 2020 market volatility the Fed increased its repo offering sizes to support market functioning (Exhibit 15). The Fed continues to offer \$500bn in overnight repo each business day as well as regular term repo operations, but market take up declined as the Fed's QE program increased cash in the banking system and the Fed increased the minimum bid rate on the repo operations "given the substantial improvements in U.S. dollar funding market conditions" (Exhibit 16).

The facility now serves as a backstop - it is unlikely that investors will participate in the operations with market rates trading below the minimum bid level, but the Fed will now leave the facility in place in case of unexpected repo market stress. We think of the SRF as an automatic stabilizer to add cash into the banking system which will ensure any spike in repo rates is confined to the Fed's target range. In the event of any large unexpected upward repo pressure, the Fed would likely increase the SRF offering amount to ensure that overnight rates remain well contained.

Exhibit 15: Fed repo facility usage (\$bn)

Weekly data as of Wednesday close

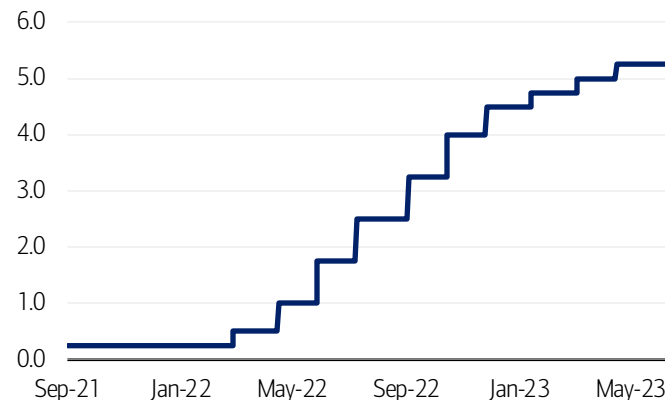


Source: Federal Reserve

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Exhibit 16: SRF minimum bid rate (%)

The Fed has set the SRF rate to the top of the target range



Source: Federal Reserve

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Exhibit 17: Summary of rates & tools used in Fed policy implementation

Levels as of 07/03/23

Rate	Cash Flow	Lender	Borrower	Level
Policy Target				
FF	GSE → Bank	GSEs (mainly FHLBs) lend funds overnight	Domestic banks borrow funds when in need of liquidity. Foreign banks borrow funds to engage in FF-IOER arb	508bp
OBFR	MMF/Corp → Bank	MMFs, corporations, foreign central banks and other official accounts lend in the ED market	Banks borrow funds	507bp
SOFR	MMF → Dealer, Dealer → Counterparty	MMF lends to dealer, dealer lends to counterparties seeking leverage	Dealers borrow from MMFs, counterparties borrow from dealers	506bp
Tool				
IORB	Bank → Fed	Banks leave reserves at the Fed and earn interest	Fed holds reserves and pays interest	515bp
ON RRP	MMF → Fed	MMF lends cash to Fed with an agreement for the cash to be returned on a specified date	Fed sells security to counterparty and agrees to buy it back on a specified date	505bp
SRF	Fed → Primary Dealer & Banks	Fed lends cash to primary dealers and banks	Primary dealers & banks lend collateral to the Fed	525bp
Discount Window	Fed → Needy borrower	Fed offers collateralized loans	Banks in need of funding use the discount window as a last resort	525bp

Source: BofA Global Research, Bloomberg, FRBNY

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Technical adjustments: IORB & ON RRP

The Fed uses its administered rates to ensure fed funds stays within the target range. The Fed has made multiple technical adjustments to their operating tools to continue to manage the federal funds rate at different levels of cash & collateral in funding markets. In periods where cash overwhelms collateral & overnight rates are pressured lower, the Fed keeps IORB & ON RRP relatively “high” in the target range. Conversely, when collateral overwhelms cash, the Fed keeps IORB & ON RRP relatively “low” in the range.

Today, the Fed keeps IORB & ON RRP relatively “high” in the target range since they are worried about downward pressure on funding markets that could push EFFR below the bottom end of the target range.

Historical perspective: During the 2015-2018 hiking cycle the Fed set a relatively wide range for the IORB – ON RRP corridor. The Fed kept IORB at the top of the target range while ON RRP was set at or just above the bottom of the target range. The Fed kept a relatively wide spread of IORB – ON RRP because these tools were untested in their effectiveness to increase rates with a large balance sheet & elevated reserves.

The wide IORB – ON RRP range at the outset of the tightening cycle incentivized banks to engage in IORB arbitrage. Specifically, the wide spread provided a large amount of compensation for banks to borrow from the FHLBs & deposit this cash with the Fed at IORB. The Fed likely wanted a wide spread between these administered rates because they were uncertain how far EFFR might fall in the target range & did not want to risk EFFR setting near the bottom or on top of ON RRP.

The Fed eventually lowered IORB in the target range as the cash / collateral environment shifted and resulted in upward pressure on money market rates. This upward money market pressure occurred after the Fed launched QT in 2017 & there was a large increase in bill supply in 2018. These factors put upward pressure on money market rates & EFFR started trading higher in the range. To better control their monetary policy target the Fed made several “technical adjustments” to IORB (Exhibit 18, Exhibit 19).

At the June 2018 meeting the Fed first adjusted IORB 5bp lower in the target range to “foster trading in the federal funds market at rates well within the FOMC’s target range.” FOMC participants highlighted that adjusting IORB did not reflect a change in policy. In particular that “the IOER rate is a helpful tool for implementing the FOMC’s policy decisions but does not, in itself, convey the stance of policy.”

The Fed went on to adjust IORB lower four more times and adjusted the ON RRP below the bottom of the target range in Sept 2019. Then in early 2020 the Fed increased IORB and ON RRP once after they achieved improved control of money market rates after large scale repo operations and bill purchases. In Sept 2021 the Fed raised both ON RRP



and IORB by 5bps to allow for money funds to earn interest above zero to help cover operating costs as they play a vital role in the financial system (Exhibit 19, Exhibit 20).

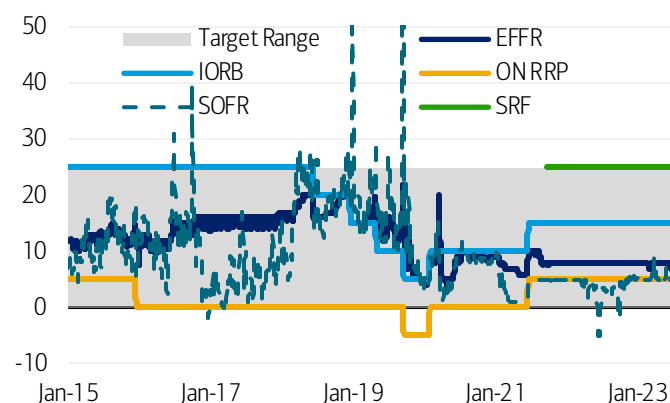
Historically before adjusting IORB, the EFR has traded at least 5bps away from the top or bottom of the Fed funds target range. This is the same general rule we expect today.

We do not expect the Fed to make technical adjustments to IORB or ON RRP to “push” cash out of ON RRP & back into the commercial banking system. These changes could include (1) widening the IORB to ON RRP spread (2) capping ON RRP use (3) lower the ON RRP rate. For more detail on our views see: [ON RRP tweaks won't stop bank stress](#).

Bottom line for technical adjustments: the Fed will adjust their key administered rates to ensure EFR remains comfortably within the target range. The exact setting of IORB & ON RRP will be a function of money markets & the cash / collateral environment. Unlike EFR, SOFR is not the Fed's policy target, and though the rate has printed below the target range recently the Fed did not shift their administered rates higher.

Exhibit 18: Weekly Fed rates and tools within the target range (bps)

The Fed adjusts ON RRP and IORB to keep EFR within the range



Source: BofA Global Research, Bloomberg

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Exhibit 19: IORB adjustments (bps)

The Fed has adjusted IORB 6 times to keep EFR near middle of target range

	Target Range prior to FOMC meeting	EFR prior to FOMC meeting	IORB adjustment
Jun-18	150-175	170	-5
Dec-18	200-225	220	-5
May-19	225-250	245	-5
Sep-19	200-225	225	-5
Jan-20	150-175	155	+5
Jun-21	0-25	6	+5

Source: BofA Global Research, Bloomberg

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Exhibit 20: ON RRP adjustments (bps)

The Fed has adjusted ON RRP 4 times

	Target Range prior to FOMC meeting	EFR prior to FOMC meeting	ON RRP adjustment
Dec-15	0-25	15	-5
Sep-19	200-225	225	-5
Jan-20	150-175	155	+5
Jun-21	0-25	6	+5

Source: BofA Global Research, Bloomberg

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Dynamics of the Fed funds market

EFR is the Fed's policy target but the fed funds market is highly idiosyncratic: lending is dominated by the Federal Home Loan Banks (FHLBs), while borrowing has historically been concentrated among foreign banks for IORB – fed funds arbitrage purposes.

Fed funds lenders

The FHLBs are the dominant lenders in the FF market. The NY Fed has indicated FHLBs comprise roughly 95% of total activity³. FHLBs are a GSE system of 11 independent regional cooperative banks that provide low cost, collateralized loans to support

³ See Potter, "Confidence in the implementation of U.S. Monetary Policy Normalization"



mortgage lending and related community investment amongst their member institutions. The FHLBs seek to have ample short-term liquidity to meet either the loan or advance needs of their member institutions or to withstand a stressed scenario of reduced market access. FHLBs use any daily excess cash to invest in positive yielding overnight instruments since they can't earn IORB. However, the FHLBs do have access to the Fed's ON RRP facility where they can earn interest by lending cash to the Fed.

The FHLBs appear to have three investments for their excess overnight cash: (1) fed funds (2) Treasury GC repo (3) bank deposits (Exhibit 21). Fed funds offers an early return feature that is unavailable through the more rigid triparty Treasury GC repo market, where cash is typically not returned until around 3 PM the next day. This early return feature of cash has been seen as a compelling reason for the FHLBs to lend uncollateralized in the FF market as opposed to investing in overnight repo markets. FHLBs can also deposit cash with commercial banks but the balances are <25% of their total unsecured credit exposure; the relatively small deposit balances are likely because some banks desire FHLBs to maintain a minimum balance which decreases the attractiveness of these deposits as a deep liquidity pool.

Exhibit 21: Unsecured credit exposure by investment type (\$mn)

Fed funds make up a large majority of FHLB investments

Carrying Value	31-Mar-23	31-Dec-21
Interest bearing deposits	25,063	22,937
Federal funds sold	86,856	65,920
Total	111,919	88,857

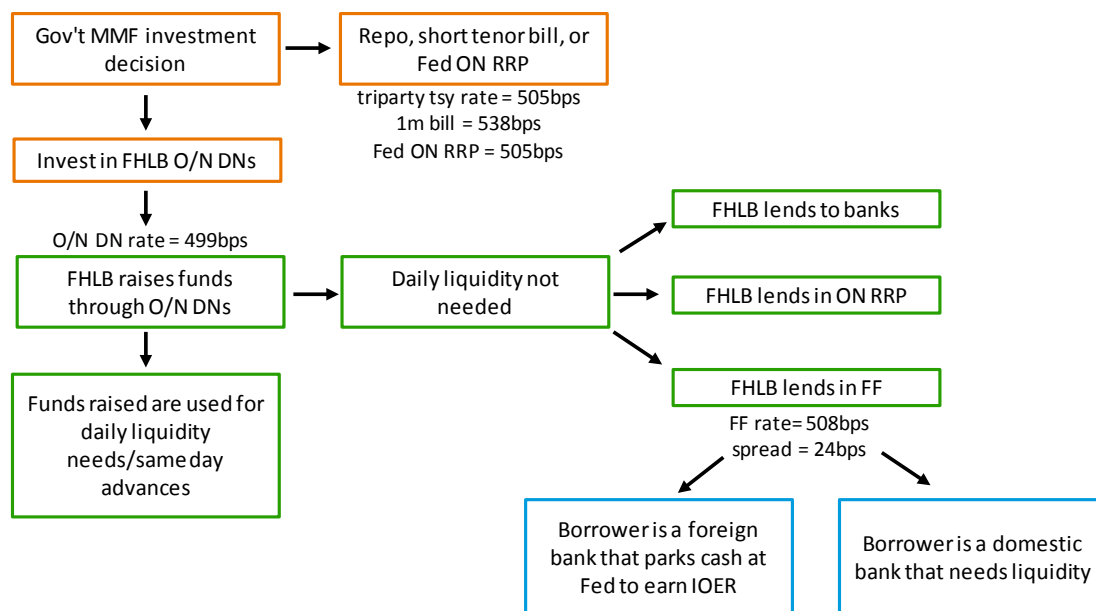
Source: FHLB Combined Financial Report

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FHLBs have deposit accounts at the Fed which yield zero but are a very safe and intra-day liquid allocation option. Should the Fed ever return to the zero lower bound & EFFR fall to 2 to 3 bps or lower we anticipate that most FHLBs would stop their FF lending activity and simply park cash with the Fed. This could lead to a material decrease in EFFR trading volumes and might force the Fed to make technical adjustments to their administered rates to preserve FF volumes.

Exhibit 22: FHLB and FF dynamics

FHLBs are the primary lender in FF market, foreign banks are the primary borrower



Source: BofA Global Research, Bloomberg. Levels as of July 4 2023

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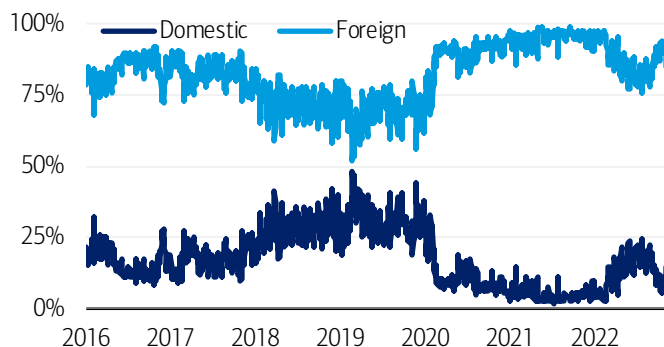


FF borrowers

Borrowing in the FF market has historically been dominated by foreign banks that can capitalize on IORB-FF arbitrage when EFRF trades below IORB (Exhibit 23). Activity slightly shifted toward domestic banks in 2018 as EFRF increased and the Fed's balance sheet unwind reduced cash in the banking system. More recently foreign banks have again increased their share of borrowing in the FF market as liquidity turned abundant & funding levels have declined versus IORB (Exhibit 24).

Exhibit 23: Domestic and Foreign bank borrowing as % of FF volume

Foreign banks comprise 90% of FF volumes as of year-end 2022



Source: Federal Reserve

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Foreign banks - High quality foreign banks with branches in the US were historically the most willing borrowers in the FF market since they could earn the largest IORB arbitrage spread. Specifically, foreign banks could borrow from the FHLBs in the FF market or from a wider set of lenders in the Eurodollar market below IOBR and then place this cash at the Fed to earn a risk free rate of return.

Foreign banks find this activity more profitable vs domestic banks since they are not subject to (1) FDIC insurance fees or supplemental capital charges, as their deposit base is primarily corporate / institutional clients that are not protected by the FDIC guarantee (2) Fed leverage ratio requirements, since foreign bank branches operating in the US need only to be compliant with the less stringent leverage ratio rules stipulated by their home country regulator. The less stringent regulatory treatment for foreign banks allows them to more profitably engage in the IORB-FF trade and thus resulted in them accumulating a more sizeable share of reserves held at the Fed vs their large domestic counterparts, especially in relation to their total assets (Exhibit 25).

Domestic banks - Domestic banks borrow in the FF market to access funding for either regulatory or true liquidity demands. In 2018 and 2019 the most dominant domestic bank borrowers in the fed funds market were medium sized or smaller institutions that may have smaller liquidity buffers vs larger US banks. In Q1 2023 we see the largest player in the FF market is US Bank National Association (Exhibit 26). The two dominant reasons domestic banks borrow in the fed funds market are:

- **Regulatory / LCR purposes:** Banks that borrow from the FHLBs receive favorable regulatory treatment under the liquidity coverage ratio (LCR). Under LCR, borrowings from FHLBs have a lower outflow rate because FHLBs are not considered "financial sector entities." Our reading of LCR suggests that FHLB short term unsecured lending has at worst a 40% outflow assumption, and some interpretations of the rule may allow for an outflow rate as favorable as 25%. This means that for every \$100 borrowed from the FHLBs in FF, there is at worst a \$60 LCR benefit. For LCR constrained institutions, there are clear benefits to paying higher rates in FF with FHLB counterparties and the Fed has cited evidence that domestic banks are increasingly willing to do so. Stricter LCR requirements for smaller US banks could potentially see increased domestic FF borrowing demand.

Exhibit 24: Borrowers in the fed funds market

Foreign banks are larger borrowers when EFRF < IORB

Type	Motivation	Constraints	Level
Foreign banks	Arbitrage profits	FF-IOER spread	Below IORB
Domestic banks	Liquidity needs	FDIC insurance, SLR	Above IORB

Source: BofA Global Research, Federal Reserve

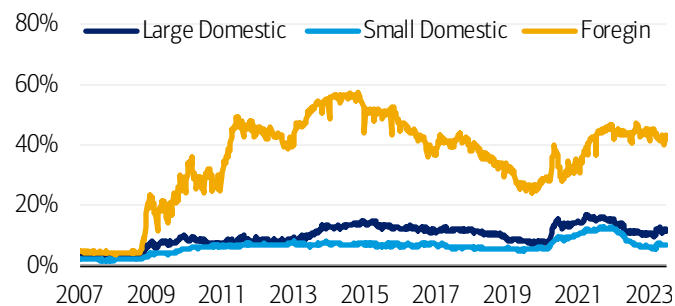
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- **Liquidity demand needs:** Domestic banks can also be more willing to borrow funds in the FF market to meet their liquidity demands. In 2018 as the Fed gradually reduced the size of its balance sheet and cash in the banking system declined, we saw evidence of domestic banks increasing borrowing activity. If the Fed is able to continue QT towards reserve scarcity, domestic borrowing activity could increase.

Exhibit 25: Bank cash/asset ratio (NSA)

Less stringent regulations for foreign banks allows them to more profitably engage in the IORB-FF trade



Note: cash assets include vault cash, cash items in process of collection, balances due from depository institutions, and balances due from Federal Reserve Banks; **Source:** Federal Reserve

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Exhibit 26: Top 10 domestic banks by Fed funds activity 1Q '23, \$bn

Domestic bank FF activity is relatively small

	Fed Funds purchased	Total Assets	FF % of total assets
U.S. Bank National Association	6.2	590.5	1%
The Northern Trust Company	4.0	150.6	3%
JPMorgan Chase Bank, National Association	1.7	3,268.0	0%
ServisFirst Bank	1.5	14.6	10%
Wells Fargo Bank, National Association	1.4	1,687.5	0%
KeyBank National Association	1.3	195.2	1%
BOKF, National Association	1.1	45.3	2%
International Bank of Commerce	0.9	9.2	10%
Commerce Bank	0.8	31.9	2%
Old National Bank	0.6	47.6	1%

Source: S&P Market Intelligence

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FHLB liquidity: sources, uses, and FF volumes

Another key element in understanding FF dynamics is the source of FHLB liquidity. FHLB debt obligations are not guaranteed by the federal government but their GSE status allows them to raise funds at very favorable rates that are only slightly above USTs. The FHLBs have recently increased their reliance on short-term funding (Exhibit 27).

Exhibit 27: FHLB short term issuance as % of all debt

The FHLBs use of short-term funding has reversed to near 2020 highs of 71% after a June '22 trough



Note: 397 eligible bonds; **Source:** FHLB Office of Finance

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The FHLBs issue debt at a variety of tenors but rely on overnight funding as an important source of their liability mix. We believe it is reasonable to assume that FHLB overnight discount note (DN) issuance is a core funding source used to meet daily liquidity needs. When FHLB cash holdings exceed their liquidity needs, they seek to invest a portion of the remaining proceeds in the FF or other money markets. Therefore, FHLB overnight debt issuance ends up being a core source of funding for daily FF investments and contributes to overall FF market volumes.

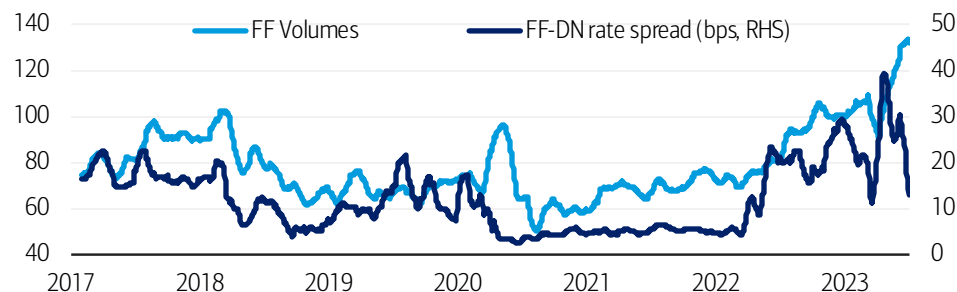
While the FHLBs are most concerned with ensuring they have adequate cash on hand to meet their member advance needs, they are also likely cognizant of where their overnight funding costs are in relation to their overnight investment alternatives. Some FHLBs may issue overnight DNs and invest in the FF market when the O/N DN to EFR spread is relatively wide. As the spread between the EFR and FHLB DNs widens, the FHLBs may issue more overnight DNs, which results in them lending more in the FF market and FF

volumes increase. When the EFFR to FHLB DN spread narrows, the FHLBs are likely to issue fewer overnight DNs and FF market volumes decrease. We see historical evidence of this dynamic by examining recent trends between (1) the EFFR and FHLB overnight DN spread, and (2) FF volumes (Exhibit 28). The strength of this relationship appears to have weakened after March 2020 as the Fed rapidly grew reserves outstanding and as fed funds borrowing was likely done for true liquidity need.

Issuing fewer DNs and lending less in the FF market when the FF-DN spread is tight allows for either (1) richer DNs due to their relative scarcity (2) upward pressure on the EFFR, since the FHLBs would presumably concentrate their lower FF investments to those paying the highest rates.

Exhibit 28: FF to FHLB DN spread vs FF volumes (1m mo. avg.)

Until the COVID 19 pandemic, FF to DN spread moved with FF volumes



Note: spread is FF less Chicago FHLB overnight DN, 10D MA; Source: Bloomberg

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Bottom line on fed funds: the fed funds market is highly idiosyncratic. Its is dominated by FHLB lenders & foreign bank borrowers. We expect to see increased domestic bank borrowing as liquidity is drained & reserves become less abundant.

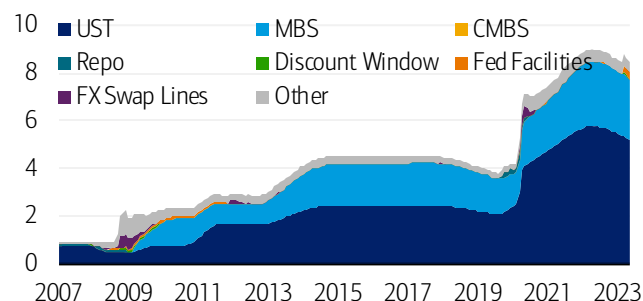
Fed balance sheet and reserve dynamics

The Fed's balance sheet has played a much larger role in monetary policy implementation over the last two economic cycles. The Fed has greatly expanded their balance sheet through a process known as quantitative easing or QE. Through QE, the Fed does large scale asset purchases of primarily US Treasuries and to a large but lesser extent, agency MBS. The securities purchased are typically longer tenor to ease financial conditions & improve market functioning.

As of June '22 the Fed began reducing its balance sheet in a process known as QT or quantitative tightening. This is intended to normalize the size of the balance sheet by allowing a certain amount of maturing securities to roll off each month without being reinvested. We will go into further detail regarding the process of QT [below](#).

Exhibit 29: Federal reserve balance sheet assets (\$bn)

UST and MBS comprise most of the Fed's balance sheet

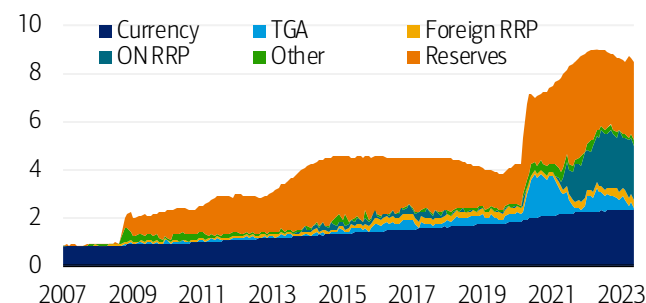


Source: BofA Global Research, Bloomberg

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Exhibit 30: Federal reserve balance sheet liabilities (\$bn)

Reserves are the largest component of the Fed's liabilities



Source: BofA Global Research, Bloomberg

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Fed balance sheet assets

The Fed's balance sheet growth has primarily been driven by UST and MBS purchases during each of the Fed's 4 QE programs. The Fed conducts QE via purchases in the secondary market and transacts with primary dealers. The Fed's QE4 began in March 2020 at an unprecedented clip to improve market functioning before eventually slowing and finally ending in March 2022.

A large portion of the Fed's assets, primarily their Treasury and MBS holdings, are held in a portfolio called the System Open Market Account (SOMA). The SOMA's Treasury holdings consist primarily of Treasury notes and bonds, but also includes bills, FRNs, and inflation-protected securities (Exhibit 31, Exhibit 32).

Other balance sheet assets, such as FX swap lines, the discount window, and temporary Fed lending facilities make up a much smaller portion of the Fed's balance sheet. FX swap lines, provide US dollars from the Federal Reserve to five other major central banks. However, given the stability in US dollar funding markets, take-up has been minimal. The Fed's discount window provides access to funding to depository institutions. Take-up increased significantly at the onset of the COVID-19 pandemic & after early '23 regional bank stress but has been steadily declining. The Fed also set up several temporary facilities that provided short-term credit extensions to support financial markets during the COVID-19 pandemic. Several of these facilities have already been fully wound down with those remaining all set to end by 2026.

The Fed also introduced a new set of emergency lending programs after bank stress in March '23. These emergency lending programs have increased the size of Fed assets, including through new programs like the Bank Term Funding Program (BTFP). BTFP & other emergency Fed lending increased the amount of bank reserves & liquidity in the system to stem broader banking system stress.

Exhibit 31: Fed's SOMA holdings

Fed SOMA is made up of UST, MBS, and Agency securities

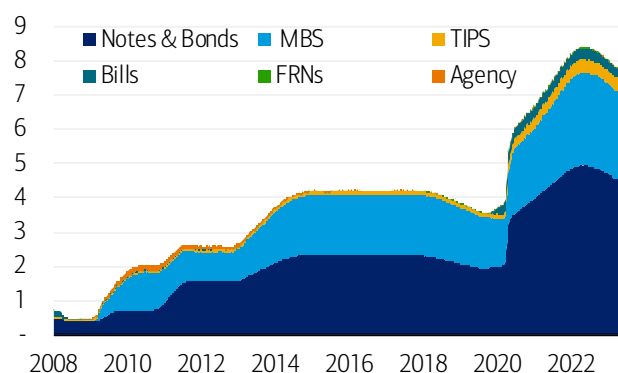
SECURITY TYPE	TOTAL (\$bn)	% of Total
US Treasury Bills (T-Bills)	272	4%
US Treasury Notes and Bonds (Notes/Bonds)	4,376	58%
US Treasury Floating Rate Notes (FRNs)	20	0%
US Treasury Inflation-Protected Securities (TIPS)	368	5%
Federal Agency Securities	2	0%
Agency Mortgage-Backed Securities	2,530	33%
Agency Commercial Mortgage-Backed Securities	8	0%
Total SOMA Holdings	7,577	

Source: BofA Global Research, FRBNY

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Exhibit 32: SOMA Holdings (\$tn)

UST and MBS holdings increased dramatically during QEs



Source: BofA Global Research, Bloomberg, FRBNY

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Fed balance sheet liabilities

On the liabilities side, reserves, or cash in the banking system, and ON RRP take-up increase as the Fed purchases securities. Fed QT has drawn down both reserves & ON RRP while other liabilities such as currency continue to grow. We provide more detail on the key liabilities on the Fed's balance sheet below:

- Reserves:** Reserves are cash balances held by depository institutions at the Fed. Depository institutions earn the current level of IORB on their reserves. Other institutions, such as GSEs, also hold deposits at the Fed but they do not earn interest on these holdings. When the Fed purchases USTs and MBS in the secondary market, those selling the assets receive cash in return, and cash in the banking system/reserves increase. We discuss the relationship between reserves and commercial banks in further detail [below](#).

- **Treasury cash balance (TGA):** the TGA is essentially the checking account for the US Treasury and is used for federal spending. The amount of cash in the Treasury's bank account is reflected through the cash balance. Treasury prefers to hold sufficient cash balances to meet five days of potential outflows (Exhibit 33, Exhibit 34). The 5-day average helps provide a buffer around periods of excess outflows.

The cash balance can decline significantly around debt ceilings and debt supply cuts. TGA fell sharply ahead of the '23 debt limit but is being rebuilt.

- **Currency:** Currency in circulation reflects actual printed money in the system. This is differentiated from reserves, which may be considered digital cash. Currency in circulation typically follows seasonal and long-term trends but grew significantly during QE4 and has since returned to a more normal range. On average, currency has grown 7% y/y from 2008-2023 (Exhibit 36)
- **Reverse repo:** Reverse repo activity on the Fed's balance sheet includes both the Fed's ON RRP and foreign RRP facilities. The Fed sells a security to an eligible counterparty with an agreement to repurchase that same security in the future. We discuss the Fed ON RRP facility [above](#).

With the foreign RRP facility, certain foreign banks and official institutions have custodial accounts with the NY Fed and can invest overnight funds in repo directly with the Fed (Exhibit 38). According to the Fed, the rate paid on foreign RRP is "a rate generally equivalent to the Fed's ON RRP rate, although the NY Fed may vary the rate of return at any time" (Exhibit 39).

Inverse relationship between reserves and other liabilities

The TGA, currency in circulation, reserves, and reverse repo all have an inverse relationship. If one of these liabilities increases (or decreases) by \$1 then another should decrease (or increase) by \$1, all else equal (Exhibit 35). An increase in cash in the Treasury's checking account, in printed cash, or cash invested in the reverse repo facility means there is less cash equivalent in the banking system.

Prior to the 2008 financial crisis when reserves were scarce, the Fed would need to actively offset changes in other Fed liabilities to ensure reserves remained relatively stable and the EFFR continued to trade in the target range. In the current abundant reserve framework the Fed does not need to actively manage the level of reserves.

Exhibit 33: Average Treasury 5 day outflows by year

The Treasury prefers to keep at least 5 days' worth of withdrawals in the TGA

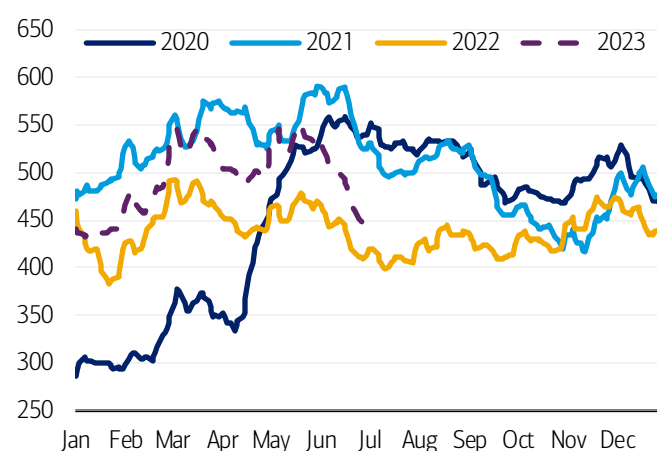
	2020	2021	2022	2023
Avg 5 day outflow	460,614	508,786	438,950	496,400

Source: BofA Global Research, Treasury, Haver Analytics

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Exhibit 34: Treasury 5 day outflows (1 mo moving average)

Avg 5 days outflows between 2020-2023 is roughly \$430bn



Source: US Treasury, Haver Analytics

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Exhibit 35: Treasury cash balance (\$bn)

If TGA is increasing, reserves are typically decreasing

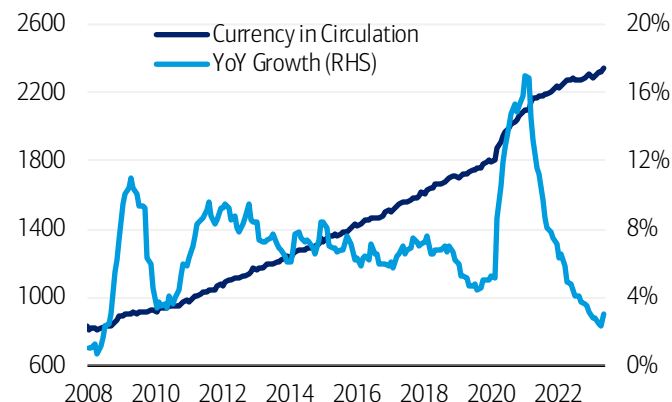


Source: US Treasury, Bloomberg

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Exhibit 36: Currency in circulation (\$bn)

Currency in circulation growth avg 1.6% YoY

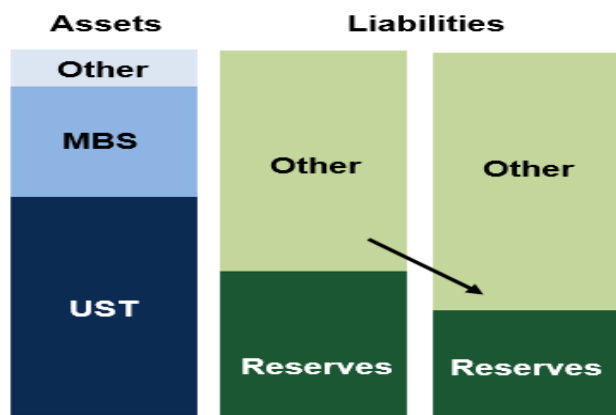


Source: BofA Global Research, Bloomberg

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Exhibit 37: Fed b/s when other liabilities increase, all else equal

When other liabilities increase, reserves decrease

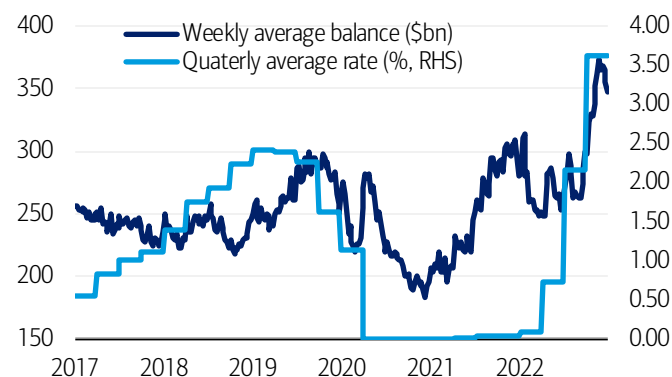


Source: BofA Global Research

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Exhibit 38: Foreign reverse repo facility

Foreign repo pool weekly avg balance averaged \$290b in '22

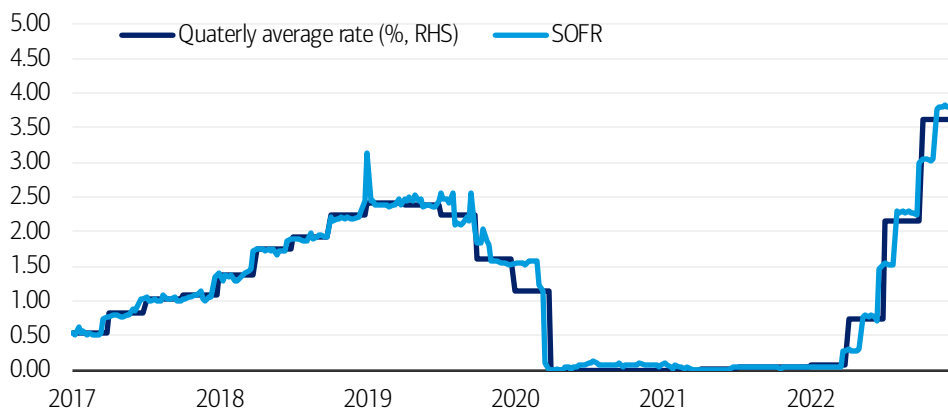


Source: BofA Global Research, Bloomberg

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Exhibit 39: 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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Reserves and commercial banks

The Fed's QE is directly linked to commercial bank balance sheets through reserves. To purchase USTs and MBS, the Fed credits the institution that has purchased the securities, creating new cash. On the Fed balance sheet, this results in an increase in UST/MBS on the asset side and reserves on the liability side. On the commercial bank balance sheet it can either result in (1) unchanged total assets but an asset reallocation from USTs or MBS into reserves (2) increased total assets via more cash on the asset side and deposits on the liability side.

Notably, reserves are a closed system. This means that on aggregate, the amount of reserves across all commercial bank balance sheets cannot change. An individual bank may decide to shift cash into loans or securities but on aggregate reserves can only be increased or decreased by the Fed.

Fed QT: draining from reserves & ON RRP

Quantitative tightening (QT) is the reverse of quantitative easing (QE). In QT, the Fed allows asset holdings of TSY and MBS to decline, resulting in lower reserve & overnight reverse repo (ON RRP) levels on the liability side. QT can occur by the Fed allowing securities to mature without reinvestment which gradually shrinks holdings or can be implemented more actively through sales of securities. The Fed's current QT approach involves only the former, but with the option to perform sales in the future if necessary.

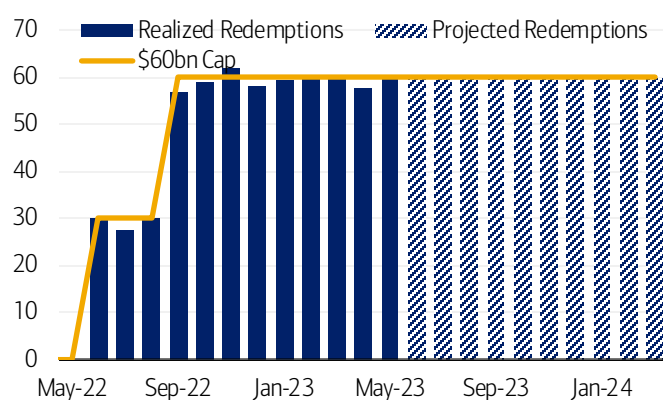
The Fed announced QT at their May '22 FOMC meeting and it began on June 1st '22. QT is the normalization of the Fed's balance sheet through the passive roll-off of Treasury and MBS held in the Fed's portfolio. The Fed does so by allowing a certain amount of redeeming securities, up to a redemption cap, to roll-off without being reinvested.

Fed assets: redemption caps, \$60bn UST & \$35bn MBS

Fed QT is driven by the pace of reduction in holdings on the asset side of its balance sheet. The Fed is using a \$60bn redemption cap for Treasuries and \$35bn redemption cap for MBS (Exhibit 40, Exhibit 41). The Fed phased in cap sizes starting in June '22 before reaching terminal cap size in Sept. '22. The Fed uses redemption caps to allow for a controlled and steady decline in the balance sheet. MBS redemption caps have not been reached most months due to relatively high interest rates & slow prepayments.

Exhibit 40: UST coupon and bill redemptions under \$60bn cap (\$bn)

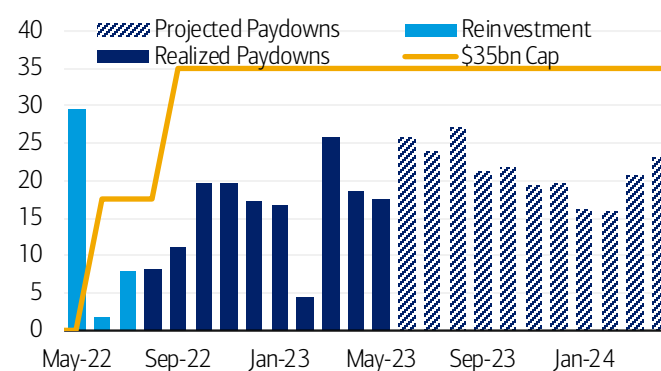
UST maturities above the \$60bn cap gets reinvested



Source: BofA Global Research, Federal Reserve; Note: This chart excludes UST reinvestments
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Exhibit 41: MBS reinvestments & redemptions under \$35bn cap (\$bn)

MBS prepaes are likely to slow as rates rise



Source: BofA Global Research, Federal Reserve

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The Fed will allow UST coupons to roll-off at maturity if they fall under the redemption cap and reinvest any amount above the cap back into newly issued USTs (Exhibit 40). Similarly, MBS prepayments that fall below the cap will roll off but anything above (which is rare) will be reinvested (Exhibit 41). The only difference between the two is that for USTs, the Fed will use bills to "top-up" maturing coupons. Meaning, for any



month that maturing coupons fall below the cap, the Fed will allow bills to roll-off up to the \$60bn cap. Most months will see \$60bn in USTs roll-off the Fed's balance sheet to allow for a smooth and steady decline in the Fed's balance sheet.

Fed liabilities: draining from reserves to ON RRP

Fed QT asset reduction must have an offsetting impact on the liability side of the balance sheet. The 3 most likely sources of Fed liability reduction are from reserves (commercial bank cash assets invested with the Fed), ON RRP (MMF excess cash invested with the Fed), or Treasury cash balance (US gov't deposits with Fed, aka TGA).

We have long expected QT to occur over three phases. Phase 1: early stages of QT are likely to see reserves falling faster than ON RRP as unwanted bank deposits leave for MMF or higher yielding alternatives. Phase 2: will see ON RRP take-up decline faster as USTs cheapen vs OIS making bills a more attractive alternative to ON RRP for MMFs. Banks will also have to start competing for deposits if loan growth increases to sustain NIM. Phase 3: as QT nears the terminal balance sheet size, we will see signs of reserve scarcity with banks bidding up for FF above IORB and ON RRP take-up near zero. We discuss the impact on front end rates in more detail [here](#).

The QT liquidity drain has generally proceeded as we expected though there have been a couple wrinkles. Wrinkle 1: the Treasury cash balance (TGA) declined substantially since the start of QT due to the debt limit, which has helped offset some of the reserve or ON RRP liquidity drain. All else equal a decline in TGA will be offset by an increase in other Fed liabilities, typically reserves or ON RRP. Wrinkle 2: Fed emergency bank lending programs have added reserves into the financial system and offset some QT impact.

Fed QT has drained mostly from TGA and only partially from reserves (Exhibit 43). The reserve decline was pronounced prior to mid-March Fed emergency lending (Exhibit 44).

Fed QT has generally proceeded as we expected with most of the non-TGA reserve drain coming from reserves vs ON RRP. Going forward, we believe the QT drain has recently entered "phase 2" with the surge of UST bill supply post debt limit. We now expect incremental Fed QT & TGA rebuild to draw more from ON RRP vs reserves. The ON RRP draw is due to sufficient conditions for MMF to extend out the curve with (1) slower pace of Fed tightening (2) cheaper bills vs ON RRP expectations. Our Fed liability projections see ON RRP absorbing 90% of the TGA & QT liquidity drain & reserves absorbing 10% of the drain until ON RRP use falls to zero.

We expect Fed QT to continue until 1 of 3 conditions are met: (1) recession / rate cuts to support growth (2) market functioning issue (3) reserve scarcity. Detail on each:

- Recession & QT cessation: our base case sees Fed stopping QT if cutting rates b/c economic slowdown; this would avoid contradictory stance of monetary policy, i.e. easing via rate cuts & tightening via QT. However, US economic soft landing could allow for exception; it is possible soft landing & lower inflation see rate cuts without recession + QT continuation. Rate cuts & QT will be condition dependent.
- Market functioning: QT could also be stopped if there is a deterioration in UST or agency MBS market functioning. This could occur amidst lack of US debt demand or deterioration in USD funding market conditions. We see this risk increasing in late '23 or '24 due to ongoing UST supply & potentially soft real money demand.
- Reserve scarcity: we see aggregate system wide scarcity with reserves / GDP at ~8%, similar to the Sept '19 repo spike. Our Fed balance sheet forecasts suggest aggregate reserve scarcity will not be reached until late '24 or early '25 (Exhibit 42). We expect Fed ON RRP use will fall very close to zero before aggregate reserve scarcity is reached.



It is possible the banking system may see other individual banks reserve scarce before system-wide reserve scarcity is achieved. In this event, we would expect bank consolidation or Fed bank-specific emergency lending (similar to BTFP).

Our US economist's base case sees QT stopping with the first rate cut in May '24. In this scenario the Fed's balance sheet would stop shrinking at \$7.5tn with reserves at \$3tn & ON RRP use at \$0.7tn. An alternative scenario where QT is allowed to run to reserve scarcity would see the Fed balance sheet reduction cease in Q2 '25 with ON RRP near zero and reserves at \$2.5tn. Once the Fed reaches the minimal level of reserves, we believe the Fed will reinvest MBS into USTs for a return to primarily UST portfolio.

As QT continues & more collateral is added to the system, we expect to see upward pressure on money market rates. We do not expect SOFR to meaningfully lift of ON RRP until utilization falls to \$500b or lower. This will likely limit the ability for meaningful SOFR/FF tightening until '24. For more detail on our SOFR/FF projections see: [Monthly rates models update](#), [SOFR/FF basis: biased wider](#).

Exhibit 42: Fed Balance Sheet Projections (\$bn)

We forecast that going forward, 10% of the drain from QT will draw from reserves, 90% from ON RRP

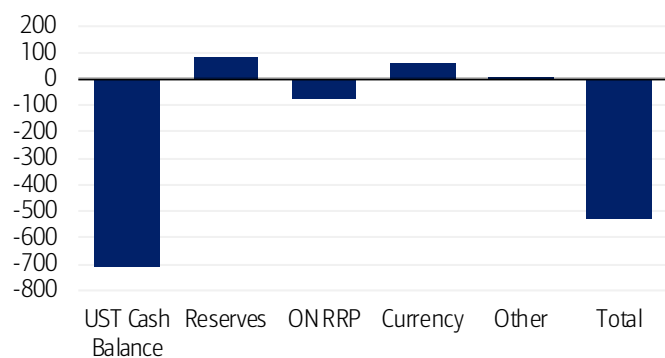
		Asset								Liabilities						
		UST	MBS	CMBS	Repo	Discount Window & PDCF	Fed Facilities	FX Swap Lines	Other	Currency	TGA	Foreign RRP	ON RRP	Other	Reserves	Total
	May-23	5164	2558	8	0	4	283	0	418	2344	49	361	2255	222	3206	8436
10% reserve / 90% ON RRP drain from QT	Jun-23	5104	2532	8	0	5	273	0	419	2357	425	362	1818	223	3157	8341
	Jul-23	5044	2509	8	0	5	263	0	420	2370	550	363	1608	224	3134	8249
	Aug-23	4984	2481	8	0	5	253	0	421	2382	500	364	1553	225	3128	8152
	Sep-23	4924	2460	8	0	5	243	0	422	2395	600	366	1368	226	3107	8062
	Oct-23	4864	2438	8	0	5	233	0	423	2408	600	367	1273	227	3096	7971
	Nov-23	4804	2419	8	0	5	223	0	424	2421	650	368	1135	228	3081	7883
	Dec-23	4744	2399	8	0	5	213	0	425	2435	700	369	996	229	3066	7794

Source: BofA Global Research, Bloomberg

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Exhibit 43: Fed liability change from QT start through May '23 (\$bn)

The vast majority of Fed QT has been drained from TGA



Source: BofA Global Research, Bloomberg

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Exhibit 44: Reserve balances in the banking system (\$bn)

Reserves had declined prior to Fed emergency bank lending



Source: BofA Global Research, Bloomberg

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Fed unrealized losses & negative equity

The Fed's financial position has been challenged as a result of their recent aggressive policy tightening. The Fed is currently running a negative print in their "other liabilities & capital" which suggests negative net interest margin (NIM) (Exhibit 45). Negative NIM represents the difference between liability costs & asset income. The Fed's negative NIM has limited direct impact policy but is mildly stimulative.



Fed negative NIM reflects the increasing set of costs to the US government from aggressive fiscal stimulus, high inflation, & elevated rates. These costs are more likely to become a Fed political liability vs a monetary policy one. We provide background on: Fed negative NIM, impact on monetary policy implementation, & where it fits in the broader set of interest-bearing gov't liabilities.

Fed negative NIM: cost of QT & sharp tightening in monetary policy

The Fed can have negative equity under two circumstances: (1) IOER & ON RRP liability cost > Fed asset income (2) Fed sells assets at loss. We discuss each below.

The Fed has historically operated with positive NIM where the income from its asset holdings (mostly USTs & MBS) exceeds its liability costs; Fed NIM is remitted to UST.

IOER & ON RRP liability cost > Fed income: Fed assets are mostly UST & agency MBS, whose coupon payments drive Fed income. Fed interest bearing liabilities are mostly reserves & ON RRP; Fed non-interest liabilities are currency & Treasury cash balance.

Fed negative NIM occurs when reserve & ON RRP costs > asset income. We estimate the Fed is currently running a negative NIM of nearly \$80b annually, assuming Fed rate levels & balance sheet remains fixed (Fed assets have weighted average coupon of ~2.4% on \$8.4tn of assets, while liabilities have a weighted average cost of ~\$5.1% on \$5.5tn of interest bearing liabilities). Note: Fed interest bearing liabilities include reserves & reverse repo costs, not currency or Treasury cash.

Sell at loss: Fed negative NIM could also occur if assets were sold at a loss. This is relevant in context of potential MBS sales to ensure a minimum monthly QT reduction. The Fed has largely downplayed the possibility of such sales but it is possible.

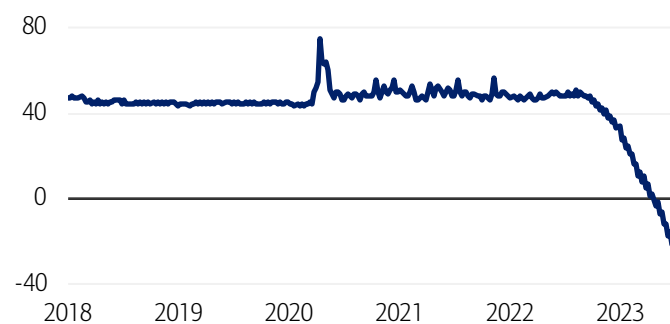
For more detail see: [Fed Negative Equity: No Tightening Limit](#)

Negative NIM is reflected as “deferred asset”

Fed negative NIM or equity does not create insolvency and does not limit how much the Fed can tighten. Rather, a “deferred asset” is booked as a negative liability on the Fed's balance sheet (Exhibit 46). This debit balance represents the amount of future Fed net earnings that need to be paid down before remittances to UST can resume.

Exhibit 45: Fed other liabilities & capital (\$bn)

Fed other liabilities & capital fallen sharply due to negative NIM from low asset yield & high liability cost



Source: Federal Reserve

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Exhibit 46: Stylized Fed balance sheet including deferred asset

Fed negative liability is required to offset growth in other liabilities

Federal Reserve	
Assets	Liabilities
Treasuries	Reserves
MBS	Currency
Repo	Treasury Cash Balance
Discount Window	Reverse Repos
BTFP	
Other Facilities	Deferred Asset

Source: BofA Global Research

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This accounting treatment allows the Fed to continue paying interest on reserve balances and at their RRP facilities even when their income does not cover the costs. While the payment of interest would typically lead to an increase in the Fed's total liabilities, the deferred asset is recorded as a negative liability & offsets this increase.



The US Treasury does not need to cover or fund the cost of this deferred asset. However, the Fed's deferred asset can increase UST funding needs. The higher funding need comes from the lack of Fed remittances which otherwise means a higher deficit & more UST issuance. In '22 the Fed remitted \$76bn to the Treasury and has been remitting \$55-\$109bn per year since at least '13. The lack of remittances may be seen as a UST funding shortfall.

Fed negative NIM doesn't limit inflation fight, but it risks political pushback

Fed negative NIM & the upcoming negative reading of "other liabilities & capital" will not be a constraint in the Fed's inflation fight. The Fed has not & will not let its negative NIM restrict its ability or willingness to keep raising rates.

The Fed can't be bankrupt from an accounting perspective, but it could be from a political one. The imposition of a "deferred asset" and no UST remittances may draw political scrutiny over time. The Fed likely wants to avoid such criticism but has little choice given the extent of financial condition tightening required to lower inflation.

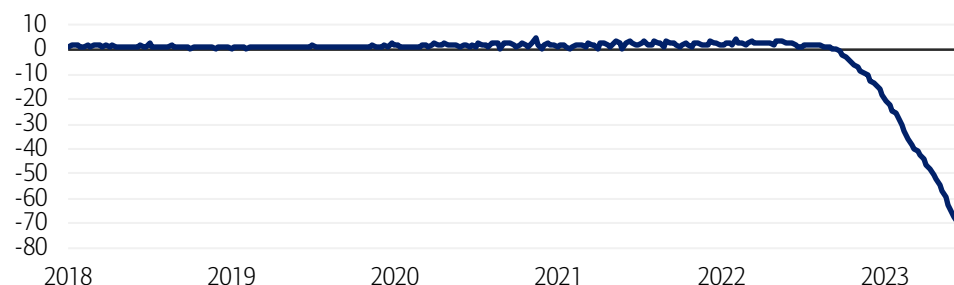
If the Fed were to come under political criticism over its negative NIM, it can point to the cumulative large-scale remittances it has provided to Treasury in the past. Since 2011 we calculate Treasury had paid nearly \$1tn in total remittance payments to UST. These payments have subsequently reduced UST deficits & debt financing needs.

Fed negative NIM is marginally stimulative & contributes to higher deficits

Fed negative NIM is marginally stimulative, all else equal. The marginal stimulus stems from the higher interest payments to its debtors & the more limited inflows it is taking in from its creditors. Specifically, the Fed is paying more money to banks & MMF vs what its USTs or agency MBS are paying it. This represents a net transfer to its lenders that is financed by the creation of higher bank reserves or ON RRP balances.

Exhibit 47: Fed remittances due to the US Treasury (\$bn)

Fed cash due to the US Treasury has built sharply over recent months



Source: Bloomberg

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The amount of stimulus provided to banks & ON RRP users is equivalent to the total "deferred asset" realized on the liability side of Fed balance sheet. To date, this stimulus has totaled \$72b & will continue to grow with elevated Fed rates (Exhibit 47).

Fed negative NIM also supports higher Treasury financing needs, all else equal. The higher financing need is driven by the lack of Fed remittance to UST. Lower remittances mean the funding needs are higher, which means more debt outstanding & higher interest payments. Larger UST deficits are generally viewed as stimulative.

Fed negative NIM is marginally stimulative because it results in greater payments to Fed creditors while also supporting higher UST deficits. Overall, negative Fed NIM is yet another cost from aggressive fiscal stimulus, high inflation, & elevated rates.

Primer bottom line: The rates market starts at the front end of the curve. To understand the US front end it is critical to understand the plumbing, which includes the setting of Fed administered rates, the federal funds rate, & other key Fed rates. Fed plumbing is also directly influenced by Fed balance sheet dynamics & QT.



Fed QT is changing some of the key money market relationships as liquidity is drained from the banking system & collateral held by the private sector increases. It will take time for a shift in these relationships to be evidenced but the market will likely see clearer signs of this in 2H '23 or '24.

Fed rate hikes & QT have also created negative NIM & equity for the central bank. These dynamics don't limit the Fed's ability to tighten policy but are a political liability.



Appendix

Acronyms defined below:

- DN – Discount Note
- EFFR – Effective Federal Funds Rate
- FF – Fed Funds
- FHLB – Federal Home Loan Bank
- FICC – Fixed Income Clearing Corporation
- FRN – Floating Rate Note
- GSE – Government Sponsored Enterprise
- IORB – Interest On Reserve Balances
- LCR – Liquidity Coverage Ratio
- MBS – Mortgage Backed Security
- MMF – Money Market Fund
- OBFR – Overnight Bank Funding Rate
- ON RP – Overnight Repo
- ON RRP – Overnight Reverse Repo
- QE – Quantitative Easing
- QT – Quantitative Tightening
- SOFR – Secured Overnight Financing Rate
- SRF – Standing Repo Facility
- TGA – Treasury General Account
- TIPS – Treasury Inflation Protected Security
- UST – US Treasury



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