

US Rates Watch

Follow the money: cash & collateral trends Nov 14 update

Cash / collateral shift suggests higher funding over time

As collateral continues to come into the system and cash is drained via QT, upward pressure in funding is likely to become more persistent. We are already seeing increased signs of this with SOFR averaging 2bps above ON RRP in Nov vs only 1bp in Oct.

Money map: repo rates feeling the funding pressure

Overnight repo rates have stabilized but landed higher with SOFR now 2bps above ON RRP. The move higher in SOFR is likely representative of the cash / collateral shift where cash is being drained from the system via QT but collateral continues to come in, especially from Treasury issuance. This week's \$68b in UST settlements from bills and coupons could put further upward pressure on SOFR.

Cash: ON RRP decline offset increase in TGA & reserves

Fed balance sheet data for the week ending Nov 8, showed a \$12b decline from the FDIC bridge bank credit extension repayment but a \$4bn increase in the BTFP (Exhibit 1). The increase in the BTFP is the largest since early June and may be reflective of banks taking advantage of the 8bp decline in the rate which is equal to 1y OIS + 10bps. It may also be reflective of commercial banks who are increasingly liquidity constrained. On the liability side, reserve balances grew \$46b and are now \$45b higher than the level at the start of QT (Exhibit 2). TGA grew another \$10b but is now around the levels the Treasury has forecasted for year-end so unlikely to have any offsetting or exacerbating impacts on the Fed's liabilities for some time. Offsetting the increase in the TGA and reserves balances was ON RRP (Exhibit 3), which declined \$55b on the week.

Cash: MMFs continue to see inflows, esp gov't inst'l MMFs

Over the week ending Nov 10, MMF AUM increased \$32b according to Crane Data (Exhibit 4). The inflows were broad across MMF types but primarily into gov't institutional funds. Gov't inst'l funds are now up \$359b YTD. We expect MMF inflows to continue but slow and potentially reverse as the curve steepens (Exhibit 6).

Cash: Domestic bank cash higher driven by deposits

Bank balance sheet data, which is lagged an additional week compared to Fed balance sheet data, shows banking system assets grew \$116b on the week ending Nov 1, driven by large domestic banks (Exhibit 7). Domestic banks saw deposit inflows primarily into small retail deposits likely driven by month-end paychecks. Additionally, small banks increased loans & leases while large domestics and foreign banks were flat.

...More detail on cash & collateral dynamics on page 2...

14 November 2023

Rates Research
United States

Katie Craig
Rates Strategist
BofAS
+1 646 855 6625
katie.craig@bofa.com

Mark Cabana, CFA
Rates Strategist
BofAS
+1 646 855 9591
mark.cabana@bofa.com

US Rates Research
BofAS
+1 646 855 8846

[See Team Page for List of Analysts](#)

Abbreviations:

BTFP: bank term funding program
ME: month-end
CB: Central bank
DW: discount window
FHLB: Federal Home Loan Banks
FIMA: Foreign and international monetary authorities
Gov't: government
GSE: Government sponsored enterprises
Inst'l: institutional
MMF: Money market funds
ON RRP: Overnight reverse repo facility
P&I: principal & interest
TGA: Treasury General Account
w/w: week on week
DL: debt limit
WTD: week to date
DN: Discount Note
PD: Primary Dealer
UST: US Treasury
FRN: Floating rate note
FF: Fed funds

Trading ideas and investment strategies discussed herein may give rise to significant risk and are not suitable for all investors. Investors should have experience in relevant markets and the financial resources to absorb any losses arising from applying these ideas or strategies.

BofA Securities does and seeks to do business with issuers covered in its research reports. As a result, investors should be aware that the firm may have a conflict of interest that could affect the objectivity of this report. Investors should consider this report as only a single factor in making their investment decision.

Refer to important disclosures on page 8 to 10.

12628056

Timestamp: 14 November 2023 10:00AM EST

Cash bottom line: Reserve balances continue to move higher, offset by lower ON RRP. TGA is not likely to have a significant impact on other Fed liabilities as its now around the levels Treasury has forecasted for the next two quarters. MMFs saw broad inflows across MMF types, but gov't ins't funds continue to see most of the inflows. Domestic banks cash and securities holdings moved modestly higher.

Collateral: UST issuance moving higher

UST issuance has grown \$78b MTD due to T-bills (Exhibit 8). We forecast \$109b in net coupons to the public in November alongside net bill issuance of \$249b to help meet a typically large deficit month.

FHLB debt declined \$41b on the week ending Nov 10 (Exhibit 9) according to our estimates. We recently updated our forecasts for FHLB supply, see [FHLB supply outlook: low & uncertain](#).

CP issuance: Data from the Federal Reserve shows that on the week ending Nov 8 CP outstanding increased \$20b for financial CP but declined \$12b for non-fin CP (Exhibit 11). Bank borrowing via CP typically declines on the week of month-end and reverses the following week as we have seen recently but volumes remain roughly \$60b below levels seen pre-March bank stress events.

Collateral bottom line: UST issuance will pick up with this week's coupon and bill settlements. FHLB debt issuance is likely to be small but positive going forward. CP issuance remains well below levels pre-bank stress events as banks have diversified their sources of funding.

Funding: less cash & more collateral=higher funding levels

To translate cash / collateral dynamics into funding markets we examine dealer holdings, repo volumes, & realized funding levels.

Dealer holdings, which are lagged, show a \$12b increase in Treasury holdings on the week ending Nov 1 (Exhibit 12, Exhibit 13), but are still \$6b lower MoM and \$32b lower since the debt limit resolution. As UST auction sizes grow, dealers will likely need to take down more and more of each auction and as a result USTs are likely to cheapen and repo rates and volumes could move higher.

Repo volumes: SOFR volumes declined \$110b on the week ending Nov 10th (Exhibit 15). The decline in repo volumes was also seen in sponsored repo, which is \$18b lower on the week (Exhibit 16). The decline in SOFR and sponsored repo volumes were both driven by lower bilateral volumes. The higher cost of funding may have contributed to the lower bilateral repo volumes.

Funding bottom line: repo rates have normalized at a level 2bp above ON RRP, driven by bilateral transactions. The higher funding rate is likely a result of the cash / collateral shift as collateral continues to come into the system while cash is drained via QT. We expect upward pressure in funding to become more persistent especially around large settlement dates.

Key takeaway: Reserve balances continued to move higher, offset by lower ON RRP. TGA impact on other Fed liabilities likely to be limited near-term. Treasury collateral continues to come into the system and pressure SOFR higher. Higher rates are clearly evident in recent price action with SOFR averaging 2bps above ON RRP in Nov vs only 1bp in Oct.

Exhibit 1: Fed balance sheet, selected assets & liabilities (\$bn, Wednesday comparison data)

Fed bal sheet \$6b lower due to FDIC bank credit extension repayment. ON RRP decline was offset by reserves and TGA higher

Assets								Liabilities						
Dates	Securities	Repo	Discount Window	BTFP	FDIC bank credit extension	FX Swaps	Other	Currency	Foreign RRP	ON RRP	TGA	Reserves	Other	Total
12/28/2022	8,145	0	5	0	0	0	451	2,307	334	2,293	410	2,980	277	8,601
11/1/2023	7,338	0	3	109	47	0	420	2,325	317	1,079	753	3,315	128	7,917
11/8/2023	7,338	0	2	113	35	0	423	2,326	319	1,024	763	3,360	117	7,911
WoW Change	0	0	-1	4	-12	0	2	1	2	-55	10	46	-10	-6
YTD Change	-806	0	-2	113	35	0	-28	19	-15	-1,269	354	381	-159	-689

Source: BofA Global Research, Federal Reserve

BofA GLOBAL RESEARCH

Exhibit 2: Fed reserve balances outstanding (\$bn)

Change in reserve balance from prior week was +\$45.8bn as of Nov 8



Source: Federal Reserve

BofA GLOBAL RESEARCH

Exhibit 3: ON RRP take-up (\$bn)

ON RRP take-up decreased \$38.42bn from prior week as of Nov 10



Source: FRBNY

BofA GLOBAL RESEARCH

Exhibit 4: Daily Crane MMF AUM (\$bn)

MMF AUM increased \$32b WoW as of Nov 10, with inflows primarily into gov't institutional funds

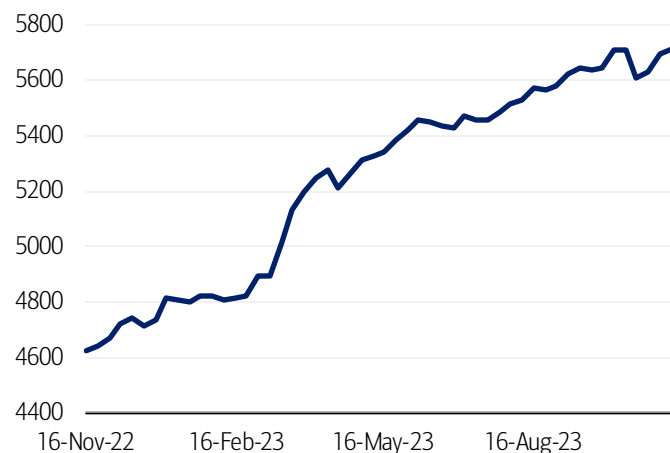
Dates	Total	Prime	Gov't	Tax exempt	Retail	Institutional	Prime Institutional	Gov't Institutional	Prime Retail	Gov't Retail
12/30/2022	5,073	1,077	3,996	0	1,584	3,489	655	2,834	421	1,163
11/3/2023	6,078	1,289	4,655	133	2,147	3,797	626	3,171	663	1,484
11/10/2023	6,110	1,298	4,680	131	2,155	3,824	630	3,193	668	1,487
WoW change	32	9	25	-2	8	27	5	22	4	3
YTD Change	1,037	222	684	131	571	334	-25	359	247	325

Source: Crane Data

BofA GLOBAL RESEARCH

Exhibit 5: MMF AUM (\$bn)

MMFs saw \$16.87bn in flows from prior week as of Nov 8

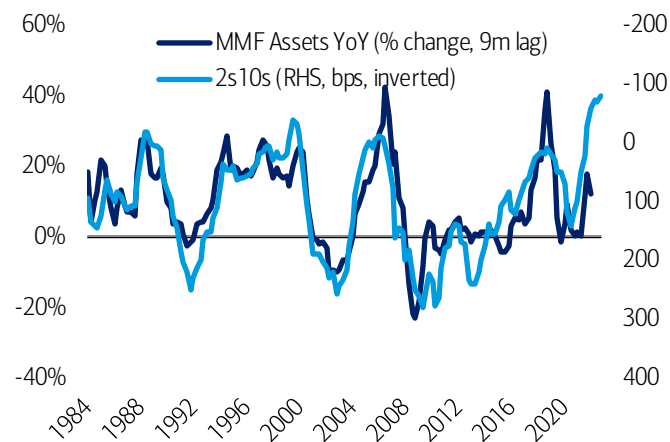


Source: ICI, Bloomberg

BofA GLOBAL RESEARCH

Exhibit 6: MMF assets and 2s10s curve

MMF assets are typically negatively correlated to the yield curve with a lag



Source: BofA Global Research, Federal Reserve, Haver

BofA GLOBAL RESEARCH

Exhibit 7: US Commercial Bank balance sheets, selected assets & liabilities (\$bn)

Domestic banks saw cash higher on the week ending Nov 1 driven by month-end deposit inflows and higher borrowing at large banks

		Total	Assets						Liabilities					
			Cash	UST & Agy	MBS	Repo & FF	Loans & Leases	Other	Deposits	Large	Small	Borrowings	Net due to related foreign offices	Other
All Banks	11/1/2023	22989	3404	1541	2518	610	12240	2675	17357	2231	15126	2329	330	2972
	1w Chg	116	50	24	5	23	9	5	156	5	151	-23	31	-48
	1m Chg	116	90	28	-9	0	21	-13	24	50	-25	-29	134	17320
	YTD Chg	13	308	-112	-256	10	136	-72	-587	579	-1166	476	60	18008
Domestic Banks	11/1/2023	19930	2116	1433	2491	258	11205	2427	16099	1428	14670	1366	-343	2809
	1w Chg	132	87	19	5	9	7	5	169	10	160	12	-3	-47
	1m Chg	70	35	26	-8	5	27	-14	43	52	-9	26	7	16049
	YTD Chg	-73	246	-114	-247	-55	157	-60	-532	613	-1145	382	-5	16712
Large Banks	11/1/2023	13399	1675	1138	1920	220	6770	1676	10804	783	10021	942	-371	2024
	1w Chg	123	80	21	7	8	0	7	142	7	135	21	-3	-37
	1m Chg	70	38	28	-2	4	12	-9	36	46	-10	31	6	10765
	YTD Chg	-26	203	-82	-58	-48	2	-42	-426	396	-822	348	5	11277
Small Banks	11/1/2023	6531	441	294	572	38	4435	751	5295	645	4650	424	28	785
	1w Chg	9	8	-3	-3	1	7	-2	28	2	25	-8	0	-10
	1m Chg	0	-3	-1	-6	1	14	-5	7	6	1	-5	1	5284
	YTD Chg	-47	43	-32	-188	-7	155	-18	-106	216	-323	34	-10	5436
Foreign Banks	11/1/2023	3059	1288	108	27	352	1035	248	1259	803	456	963	673	163
	1w Chg	-16	-37	5	0	14	1	0	-14	-4	-9	-35	35	-1
	1m Chg	46	55	2	-1	-5	-6	1	-19	-2	-17	-55	127	1271
	YTD Chg	86	62	2	-10	65	-22	-12	-55	-34	-21	94	65	1295

Source: Federal Reserve H8

BofA GLOBAL RESEARCH

Exhibit 8: Treasury bill and coupon issuance (\$000s)

Treasury issuance has grown \$78b MTD in November, all from bills

	Net total	Net bills	Net coupons	Gross new issue	Gross bill issue	Gross coupon issue	Gross maturing	Gross bill maturing	Gross coupon maturing
MTD	78,044	78,044	-	716,000	716,000	-	637,956	637,956	-
YTD	2,727,685	1,897,661	830,024	18,222,025	15,379,025	2,843,000	15,494,340	13,481,364	2,012,976
FYTD	367,348	282,256	85,092	3,052,000	2,749,000	303,000	2,684,652	2,466,744	217,908

Source: BofA Global Research, Haver Analytics

BofA GLOBAL RESEARCH

Exhibit 9: Cumulative growth in FHLB debt since March 1 (\$bn)

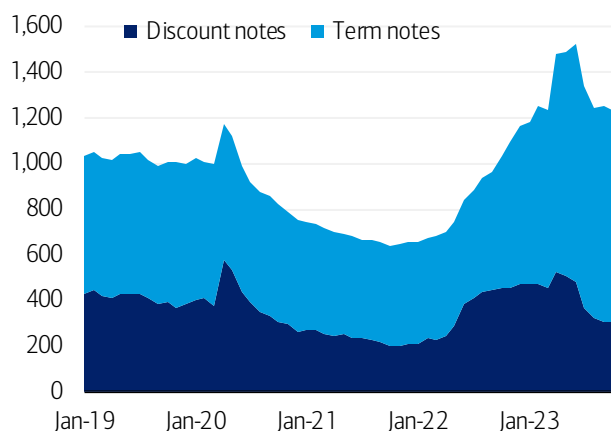
FHLB debt outstanding declined \$41b on the week ending Nov 10



Source: Bloomberg, FHLB Office of Finance. Note: we use estimates of daily net issuance
BofA GLOBAL RESEARCH

Exhibit 10: FHLB debt issuance (\$bn)

FHLB debt has been roughly flat after the bank stress normalized

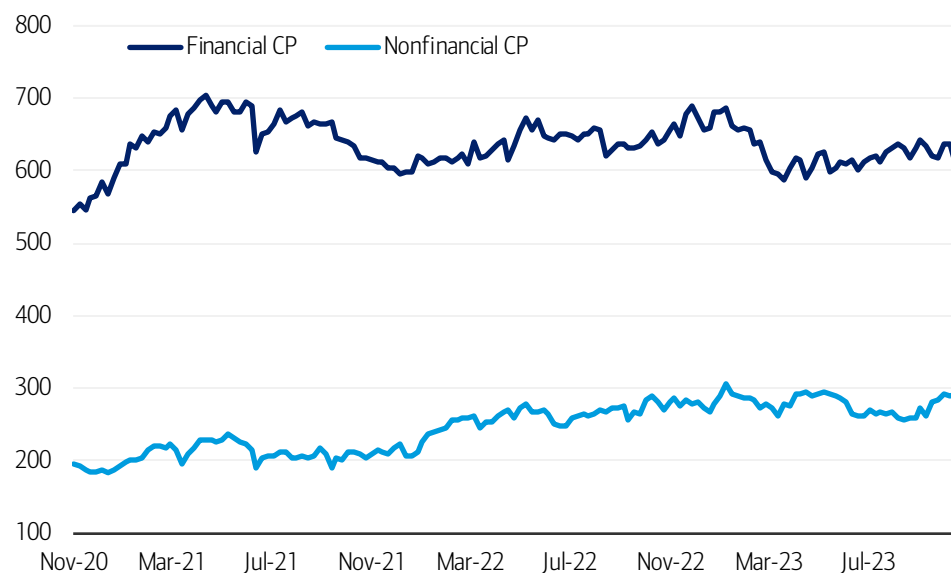


Source: BofA Global Research, FHLB Office of Finance

BofA GLOBAL RESEARCH

Exhibit 11: Commercial paper (\$bn)

Financial CP is \$20b higher WoW, nonfin is \$12b lower WoW as of Nov 8



Source: Bloomberg

BofA GLOBAL RESEARCH

Exhibit 12: Primary dealer holdings (\$mn)

PD holdings are \$11b higher WoW, primarily from UST holdings which are still lower since the debt limit resolution despite higher issuance

	Total	US Treasuries					Agency ex MBS	MBS	Corporates	Commercial Paper	State & Munis	ABS	Variable Rate Notes
		Bills	Coupons	FRNs	TIPS								
11/1/2023	355,539	211,223	57,129	129,304	5,825	17,000	16,704	85,866	20,011	9,737	11,866	8,683	1,186
Chg WoW	10,715	11,713	7,602	3,601	-2,395	940	4,537	-4,193	2,469	153	-2,336	246	-1,721
Chg MoM	-5,760	-6,260	-20,851	11,573	-742	1,795	2,028	-1,366	-102	530	475	-151	-384
Chg since DL	-29,172	-31,965	-30,124	545	430	-4,781	177	5,021	1,869	167	-3,011	1,564	-2,827

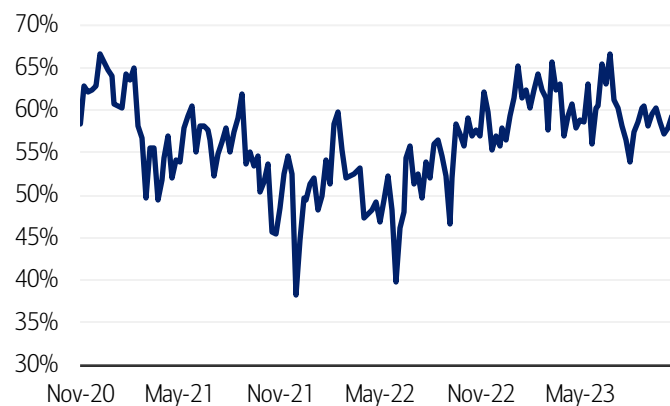
Source: BofA Global Research, Bloomberg

BofA GLOBAL RESEARCH



Exhibit 13: US Treasuries as a % of overall PD holdings

USTs as a % of PD holdings has increased vs the prior week of data



Source: BofA Global Research, Bloomberg

BofA GLOBAL RESEARCH

Exhibit 15: SOFR volumes (\$bn)

SOFR volumes decreased \$110bn from prior week as of Nov 10



Source: FRBNY

BofA GLOBAL RESEARCH

Exhibit 14: PD UST holdings by security type (\$mn)

PD holdings of bills are still higher than avg but declining

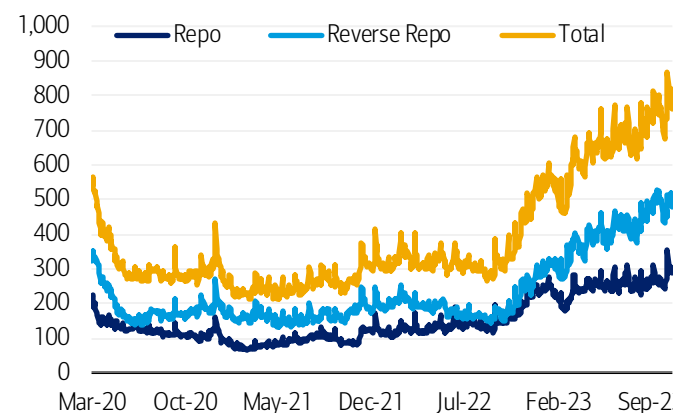
	Bills	Coupons	FRNs	TIPS	Total
10/4/2023	77,980	117,731	6,567	15,205	217,483
11/1/2023	57,129	131,269	5,825	17,000	211,223
MoM Change	(20,851)	13,538	(742)	1,795	(6,260)
Level Z-score	0.67	0.18	(0.45)	1.25	0.51

BofA Global Research, Bloomberg

BofA GLOBAL RESEARCH

Exhibit 16: Sponsored Repo Volumes (\$bn)

Sponsored repo volumes have risen \$238 YTD but down \$18b WoW



Source: OFR

BofA GLOBAL RESEARCH

Appendix

Exhibit 17: Daily FHLB debt issuance estimates (\$mn)

We estimate daily issuance from Bloomberg and FHLB Office of Finance website. Data is subject to revisions

	O/N	Term DN	Auction	Maturing DN	FRNs	Callable	Bullets	Maturing	Called	Total
10/2/2023	17,963	1,035	-	(25,184)	1,601	75	231	(2,427)	-	(6,707)
10/3/2023	22,405	3,235	4,425	(19,218)	1,000	-	355	(8,921)	-	3,281
10/4/2023	21,342	824	-	(27,164)	2,100	1,050	135	(1,769)	-	(3,483)
10/5/2023	23,645	4,989	4,815	(22,834)	2,545	15	-	(185)	-	12,990
10/6/2023	20,731	2,412	-	(27,834)	2,700	15	1,562	(7,512)	(15)	(7,941)
10/10/2023	21,515	3,666	1,725	(24,268)	2,550	1,486	-	(3,530)	(15)	3,129
10/11/2023	32,858	4,103	-	(30,414)	2,350	125	150	(526)	-	8,647
10/12/2023	17,435	1,948	905	(23,903)	3,430	3	215	(1,220)	-	(1,186)
10/13/2023	21,101	2,674	-	(37,889)	3,972	1,525	395	(2,285)	-	(10,508)
10/16/2023	21,800	1,731	-	(25,012)	3,030	95	255	(615)	-	1,284
10/17/2023	20,208	1,333	2,895	(21,690)	500	280	150	(100)	(15)	3,561
10/18/2023	18,100	3,072	-	(30,662)	3,177	2,074	265	(35)	-	(4,010)
10/19/2023	18,347	1,917	4,655	(19,125)	3,652	1,025	670	(1,260)	-	9,880
10/20/2023	19,030	3,958	-	(27,129)	2,600	1,055	75	(1,775)	(610)	(2,796)
10/23/2023	19,582	3,447	-	(20,820)	8,045	83	198	(3,619)	-	6,916
10/24/2023	18,826	3,092	6,415	(20,642)	3,455	87	25	(3,396)	-	7,863
10/25/2023	18,415	4,081	-	(28,573)	4,250	153	-	(105)	(113)	(1,891)
10/26/2023	18,657	5,421	2,795	(20,610)	10,260	194	153	(3,500)	(275)	13,094
10/27/2023	15,659	1,998	-	(26,323)	4,500	203	160	(4,395)	(625)	(8,823)
10/30/2023	15,950	2,182	-	(19,852)	17,186	1,074	429	(4,932)	-	12,037
10/31/2023	8,350	2,665	6,890	(22,199)	-	-	-	-	-	(4,293)
11/1/2023	17,154	2,628	-	(20,411)	2,305	50	80	(5,916)	-	(4,110)
11/2/2023	18,550	1,273	5,995	(21,039)	2,750	15	-	(1,256)	-	6,289
11/3/2023	17,400	2,923	-	(25,877)	733	60	129	(6,661)	-	(11,293)
11/6/2023	18,077	2,108	-	(22,131)	160	156	80	(1,880)	-	(3,430)
11/7/2023	18,516	2,082	3,035	(20,126)	(4,393)	90	225	(1,200)	-	(1,772)
11/8/2023	14,930	2,162	-	(24,276)	(6,750)	1,063	150	(1,255)	-	(13,976)
11/9/2023	17,023	3,842	3,150	(15,886)	(9,107)	-	5	(3,452)	-	(4,425)
11/10/2023	17,288	2,290	-	(21,158)	(11,464)	1,002	-	(5,273)	(25)	(17,340)

Source: Bloomberg, FHLB Office of Finance. Note: We use estimates of daily FHLB debt issuance

BofA GLOBAL RESEARCH

Disclosures

Important Disclosures

BoFA Global Research personnel (including the analyst(s) responsible for this report) receive compensation based upon, among other factors, the overall profitability of Bank of America Corporation, including profits derived from investment banking. The analyst(s) responsible for this report may also receive compensation based upon, among other factors, the overall profitability of the Bank's sales and trading businesses relating to the class of securities or financial instruments for which such analyst is responsible. BoFA Securities fixed income analysts regularly interact with sales and trading desk personnel in connection with their research, including to ascertain pricing and liquidity in the fixed income markets.

Other Important Disclosures

Prices are indicative and for information purposes only. Except as otherwise stated in the report, for any recommendation in relation to an equity security, the price referenced is the publicly traded price of the security as of close of business on the day prior to the date of the report or, if the report is published during intraday trading, the price referenced is indicative of the traded price as of the date and time of the report and in relation to a debt security (including equity preferred and CDS), prices are indicative as of the date and time of the report and are from various sources including BoFA Securities trading desks.

The date and time of completion of the production of any recommendation in this report shall be the date and time of dissemination of this report as recorded in the report timestamp.

This report may refer to fixed income securities or other financial instruments that may not be offered or sold in one or more states or jurisdictions, or to certain categories of investors, including retail investors. Readers of this report are advised that any discussion, recommendation or other mention of such instruments is not a solicitation or offer to transact in such instruments. Investors should contact their BoFA Securities representative or Merrill Global Wealth Management financial advisor for information relating to such instruments.

Rule 144A securities may be offered or sold only to persons in the U.S. who are Qualified Institutional Buyers within the meaning of Rule 144A under the Securities Act of 1933, as amended. SECURITIES OR OTHER FINANCIAL INSTRUMENTS DISCUSSED HEREIN MAY BE RATED BELOW INVESTMENT GRADE AND SHOULD THEREFORE ONLY BE CONSIDERED FOR INCLUSION IN ACCOUNTS QUALIFIED FOR SPECULATIVE INVESTMENT.

Recipients who are not institutional investors or market professionals should seek the advice of their independent financial advisor before considering information in this report in connection with any investment decision, or for a necessary explanation of its contents.

The securities or other financial instruments discussed in this report may be traded over-the-counter. Retail sales and/or distribution of this report may be made only in states where these instruments are exempt from registration or have been qualified for sale.

Officers of BoFA or one or more of its affiliates (other than research analysts) may have a financial interest in securities of the issuer(s) or in related investments.

This report, and the securities or other financial instruments discussed herein, may not be eligible for distribution or sale in all countries or to certain categories of investors, including retail investors.

Refer to [BoFA Global Research policies relating to conflicts of interest](#).

"BoFA Securities" includes BoFA Securities, Inc. ("BoFA") and its affiliates. Investors should contact their BoFA Securities representative or Merrill Global Wealth Management financial advisor if they have questions concerning this report or concerning the appropriateness of any investment idea described herein for such investor. "BoFA Securities" is a global brand for BoFA Global Research.

Information relating to Non-US affiliates of BoFA Securities and Distribution of Affiliate Research Reports:

BoFA and/or Merrill Lynch, Pierce, Fenner & Smith Incorporated ("MLPF&S") may in the future distribute, information of the following non-US affiliates in the US (short name: legal name, regulator): Merrill Lynch (South Africa): Merrill Lynch South Africa (Pty) Ltd., regulated by The Financial Service Board; MLI (UK): Merrill Lynch International, regulated by the Financial Conduct Authority (FCA) and the Prudential Regulation Authority (PRA); BoFASE (France): BoFA Securities Europe SA is authorized by the Autorité de Contrôle Prudentiel et de Résolution (ACPR) and regulated by the ACPR and the Autorité des Marchés Financiers (AMF). BoFA Securities Europe SA ("BoFASE") with registered address at 51, rue La Boétie, 75008 Paris is registered under no. 842 602 690 RCS Paris. In accordance with the provisions of French Code Monétaire et Financier (Monetary and Financial Code), BoFASE is an établissement de crédit et d'investissement (credit and investment institution) that is authorised and supervised by the European Central Bank and the Autorité de Contrôle Prudentiel et de Résolution (ACPR) and regulated by the ACPR and the Autorité des Marchés Financiers. BoFASE's share capital can be found at www.bofam.com/BoFASEdisclaimer; BoFA Europe (Milan): Bank of America Europe Designated Activity Company, Milan Branch, regulated by the Bank of Italy, the European Central Bank (ECB) and the Central Bank of Ireland (CBI); BoFA Europe (Frankfurt): Bank of America Europe Designated Activity Company, Frankfurt Branch regulated by BaFin, the ECB and the CBI; BoFA Europe (Madrid): Bank of America Europe Designated Activity Company, Sucursal en España, regulated by the Bank of Spain, the ECB and the CBI; Merrill Lynch (Australia): Merrill Lynch Equities (Australia) Limited, regulated by the Australian Securities and Investments Commission; Merrill Lynch (Hong Kong): Merrill Lynch (Asia Pacific) Limited, regulated by the Hong Kong Securities and Futures Commission (HKSF); Merrill Lynch (Singapore): Merrill Lynch (Singapore) Pte Ltd, regulated by the Monetary Authority of Singapore (MAS); Merrill Lynch (Canada): Merrill Lynch Canada Inc, regulated by the Investment Industry Regulatory Organization of Canada; Merrill Lynch (Mexico): Merrill Lynch Mexico, SA de CV, Casa de Bolsa, regulated by the Comisión Nacional Bancaria y de Valores; Merrill Lynch (Argentina): Merrill Lynch Argentina SA, regulated by Comisión Nacional de Valores; BoFA Japan: BoFA Securities Japan Co., Ltd., regulated by the Financial Services Agency; Merrill Lynch (Seoul): Merrill Lynch International, LLC Seoul Branch, regulated by the Financial Supervisory Service; Merrill Lynch (Taiwan): Merrill Lynch Securities (Taiwan) Ltd., regulated by the Securities and Futures Bureau; BoFA India: BoFA Securities India Limited, regulated by the Securities and Exchange Board of India (SEBI); Merrill Lynch (Israel): Merrill Lynch Israel Limited, regulated by Israel Securities Authority; Merrill Lynch (DIFC): Merrill Lynch International (DIFC Branch), regulated by the Dubai Financial Services Authority (DFSA); Merrill Lynch (Brazil): Merrill Lynch S.A. Corretora de Títulos e Valores Mobiliários, regulated by Comissão de Valores Mobiliários; Merrill Lynch KSA Company: Merrill Lynch Kingdom of Saudi Arabia Company, regulated by the Capital Market Authority.

This information: has been approved for publication and is distributed in the United Kingdom (UK) to professional clients and eligible counterparties (as each is defined in the rules of the FCA and the PRA) by MLI (UK), which is authorized by the PRA and regulated by the FCA and the PRA - details about the extent of our regulation by the FCA and PRA are available from us on request; has been approved for publication and is distributed in the European Economic Area (EEA) by BoFASE (France), which is authorized by the ACPR and regulated by the ACPR and the AMF; has been considered and distributed in Japan by BoFA Japan, a registered securities dealer under the Financial Instruments and Exchange Act in Japan, or its permitted affiliates; is issued and distributed in Hong Kong by Merrill Lynch (Hong Kong) which is regulated by HKSF; is issued and distributed in Taiwan by Merrill Lynch (Taiwan); is issued and distributed in India by BoFA India; and is issued and distributed in Singapore to institutional investors and/or accredited investors (each as defined under the Financial Advisers Regulations) by Merrill Lynch (Singapore) (Company Registration No 198602883D). Merrill Lynch (Singapore) is regulated by MAS. Merrill Lynch Equities (Australia) Limited (ABN 65 006 276 795), AFS License 235132 (MLEA) distributes this information in Australia only to 'Wholesale' clients as defined by s.761G of the Corporations Act 2001. With the exception of Bank of America N.A., Australia Branch, neither MLEA nor any of its affiliates involved in preparing this information is an Authorised Deposit-Taking Institution under the Banking Act 1959 nor regulated by the Australian Prudential Regulation Authority. No approval is required for publication or distribution of this information in Brazil and its local distribution is by Merrill Lynch (Brazil) in accordance with applicable regulations. Merrill Lynch (DIFC) is authorized and regulated by the DFSA. Information prepared and issued by Merrill Lynch (DIFC) is done so in accordance with the requirements of the DFSA conduct of business rules. BoFA Europe (Frankfurt) distributes this information in Germany and is regulated by BaFin, the ECB and the CBI. BoFA Securities entities, including BoFA Europe and BoFASE (France), may outsource/delegate the marketing and/or provision of certain research services or aspects of research services to other branches or members of the BoFA Securities group. You may be contacted by a different BoFA Securities entity acting for and on behalf of your service provider where permitted by applicable law. This does not change your service provider. Please refer to the [Electronic](#)

[Communications Disclaimers](#) for further information.

This information has been prepared and issued by BofAS and/or one or more of its non-US affiliates. The author(s) of this information may not be licensed to carry on regulated activities in your jurisdiction and, if not licensed, do not hold themselves out as being able to do so. BofAS and/or MLPF&S is the distributor of this information in the US and accepts full responsibility for information distributed to BofAS and/or MLPF&S clients in the US by its non-US affiliates. Any US person receiving this information and wishing to effect any transaction in any security discussed herein should do so through BofAS and/or MLPF&S and not such foreign affiliates. Hong Kong recipients of this information should contact Merrill Lynch (Asia Pacific) Limited in respect of any matters relating to dealing in securities or provision of specific advice on securities or any other matters arising from, or in connection with, this information. Singapore recipients of this information should contact Merrill Lynch (Singapore) Pte Ltd in respect of any matters arising from, or in connection with, this information. For clients that are not accredited investors, expert investors or institutional investors Merrill Lynch (Singapore) Pte Ltd accepts full responsibility for the contents of this information distributed to such clients in Singapore.

General Investment Related Disclosures:

Taiwan Readers: Neither the information nor any opinion expressed herein constitutes an offer or a solicitation of an offer to transact in any securities or other financial instrument. No part of this report may be used or reproduced or quoted in any manner whatsoever in Taiwan by the press or any other person without the express written consent of BofA Securities. This document provides general information only, and has been prepared for, and is intended for general distribution to, BofA Securities clients. Neither the information nor any opinion expressed constitutes an offer or an invitation to make an offer, to buy or sell any securities or other financial instrument or any derivative related to such securities or instruments (e.g., options, futures, warrants, and contracts for differences). This document is not intended to provide personal investment advice and it does not take into account the specific investment objectives, financial situation and the particular needs of, and is not directed to, any specific person(s). This document and its content do not constitute, and should not be considered to constitute, investment advice for purposes of ERISA, the US tax code, the Investment Advisers Act or otherwise. Investors should seek financial advice regarding the appropriateness of investing in financial instruments and implementing investment strategies discussed or recommended in this document and should understand that statements regarding future prospects may not be realized. Any decision to purchase or subscribe for securities in any offering must be based solely on existing public information on such security or the information in the prospectus or other offering document issued in connection with such offering, and not on this document. Securities and other financial instruments referred to herein, or recommended, offered or sold by BofA Securities, are not insured by the Federal Deposit Insurance Corporation and are not deposits or other obligations of any insured depository institution (including, Bank of America, N.A.). Investments in general and, derivatives, in particular, involve numerous risks, including, among others, market risk, counterparty default risk and liquidity risk. No security, financial instrument or derivative is suitable for all investors. Digital assets are extremely speculative, volatile and are largely unregulated. In some cases, securities and other financial instruments may be difficult to value or sell and reliable information about the value or risks related to the security or financial instrument may be difficult to obtain. Investors should note that income from such securities and other financial instruments, if any, may fluctuate and that price or value of such securities and instruments may rise or fall and, in some cases, investors may lose their entire principal investment. Past performance is not necessarily a guide to future performance. Levels and basis for taxation may change.

BofA Securities is aware that the implementation of the ideas expressed in this report may depend upon an investor's ability to "short" securities or other financial instruments and that such action may be limited by regulations prohibiting or restricting "shortselling" in many jurisdictions. Investors are urged to seek advice regarding the applicability of such regulations prior to executing any short idea contained in this report.

This report may contain a trading idea or recommendation which highlights a specific identified near-term catalyst or event impacting a security, issuer, industry sector or the market generally that presents a transaction opportunity, but does not have any impact on the analyst's particular "Overweight" or "Underweight" rating (which is based on a three month trade horizon). Trading ideas and recommendations may differ directionally from the analyst's rating on a security or issuer because they reflect the impact of a near-term catalyst or event.

Foreign currency rates of exchange may adversely affect the value, price or income of any security or financial instrument mentioned in this report. Investors in such securities and instruments effectively assume currency risk.

BofAS or one of its affiliates is a regular issuer of traded financial instruments linked to securities that may have been recommended in this report. BofAS or one of its affiliates may, at any time, hold a trading position (long or short) in the securities and financial instruments discussed in this report.

BofA Securities, through business units other than BofA Global Research, may have issued and may in the future issue trading ideas or recommendations that are inconsistent with, and reach different conclusions from, the information presented herein. Such ideas or recommendations may reflect different time frames, assumptions, views and analytical methods of the persons who prepared them, and BofA Securities is under no obligation to ensure that such other trading ideas or recommendations are brought to the attention of any recipient of this information.

In the event that the recipient received this information pursuant to a contract between the recipient and BofAS for the provision of research services for a separate fee, and in connection therewith BofAS may be deemed to be acting as an investment adviser, such status relates, if at all, solely to the person with whom BofAS has contracted directly and does not extend beyond the delivery of this report (unless otherwise agreed specifically in writing by BofAS). If such recipient uses the services of BofAS in connection with the sale or purchase of a security referred to herein, BofAS may act as principal for its own account or as agent for another person. BofAS is and continues to act solely as a broker-dealer in connection with the execution of any transactions, including transactions in any securities referred to herein.

Copyright and General Information:

Copyright 2023 Bank of America Corporation. All rights reserved. iQdatabase® is a registered service mark of Bank of America Corporation. This information is prepared for the use of BofA Securities clients and may not be redistributed, retransmitted or disclosed, in whole or in part, or in any form or manner, without the express written consent of BofA Securities. BofA Global Research information is distributed simultaneously to internal and client websites and other portals by BofA Securities and is not publicly-available material. Any unauthorized use or disclosure is prohibited. Receipt and review of this information constitutes your agreement not to redistribute, retransmit, or disclose to others the contents, opinions, conclusion, or information contained herein (including any investment recommendations, estimates or price targets) without first obtaining express permission from an authorized officer of BofA Securities.

Materials prepared by BofA Global Research personnel are based on public information. Facts and views presented in this material have not been reviewed by, and may not reflect information known to, professionals in other business areas of BofA Securities, including investment banking personnel. BofA Securities has established information barriers between BofA Global Research and certain business groups. As a result, BofA Securities does not disclose certain client relationships with, or compensation received from, such issuers. To the extent this material discusses any legal proceeding or issues, it has not been prepared as nor is it intended to express any legal conclusion, opinion or advice. Investors should consult their own legal advisers as to issues of law relating to the subject matter of this material. BofA Global Research personnel's knowledge of legal proceedings in which any BofA Securities entity and/or its directors, officers and employees may be plaintiffs, defendants, co-defendants or co-plaintiffs with or involving issuers mentioned in this material is based on public information. Facts and views presented in this material that relate to any such proceedings have not been reviewed by, discussed with, and may not reflect information known to, professionals in other business areas of BofA Securities in connection with the legal proceedings or matters relevant to such proceedings.

This information has been prepared independently of any issuer of securities mentioned herein and not in connection with any proposed offering of securities or as agent of any issuer of any securities. None of BofAS any of its affiliates or their research analysts has any authority whatsoever to make any representation or warranty on behalf of the issuer(s). BofA Global Research policy prohibits research personnel from disclosing a recommendation, investment rating, or investment thesis for review by an issuer prior to the publication of a research report containing such rating, recommendation or investment thesis.

Any information relating to the tax status of financial instruments discussed herein is not intended to provide tax advice or to be used by anyone to provide tax advice. Investors are urged to seek tax advice based on their particular circumstances from an independent tax professional.

The information herein (other than disclosure information relating to BofA Securities and its affiliates) was obtained from various sources and we do not guarantee its accuracy. This information may contain links to third-party websites. BofA Securities is not responsible for the content of any third-party website or any linked content contained in a third-party website. Content contained on such third-party websites is not part of this information and is not incorporated by reference. The inclusion of a link does not imply any endorsement by or any affiliation with BofA Securities. Access to any third-party website is at your own risk, and you should always review the terms and privacy policies at third-party websites before submitting any personal information to them. BofA Securities is not responsible for such terms and privacy policies and expressly disclaims any liability for them.

All opinions, projections and estimates constitute the judgment of the author as of the date of publication and are subject to change without notice. Prices also are subject to change without notice. BofA Securities is under no obligation to update this information and BofA Securities ability to publish information on the subject issuer(s) in the future is subject to applicable quiet periods. You should therefore assume that BofA Securities will not update any fact, circumstance or opinion contained herein.

Certain outstanding reports or investment opinions relating to securities, financial instruments and/or issuers may no longer be current. Always refer to the most recent research report relating to an issuer prior to making an investment decision.

In some cases, an issuer may be classified as Restricted or may be Under Review or Extended Review. In each case, investors should consider any investment opinion relating to such issuer (or its security and/or financial instruments) to be suspended or withdrawn and should not rely on the analyses and investment opinion(s) pertaining to such issuer (or its securities and/or financial

instruments) nor should the analyses or opinion(s) be considered a solicitation of any kind. Sales persons and financial advisors affiliated with BofAS or any of its affiliates may not solicit purchases of securities or financial instruments that are Restricted or Under Review and may only solicit securities under Extended Review in accordance with firm policies. Neither BofA Securities nor any officer or employee of BofA Securities accepts any liability whatsoever for any direct, indirect or consequential damages or losses arising from any use of this information.

Research Analysts

Ralph Axel

Rates Strategist
BofA
ralph.axel@bofa.com

Bruno Braizinha, CFA

Rates Strategist
BofA
bruno.braizinha@bofa.com

Mark Cabana, CFA

Rates Strategist
BofA
mark.cabana@bofa.com

Katie Craig

Rates Strategist
BofA
katie.craig@bofa.com

Meghan Swiber, CFA

Rates Strategist
BofA
meghan.swiber@bofa.com

Anna (Caiyi) Zhang

Rates Strategist
BofA
cai yi.zhang@bofa.com

Trading ideas and investment strategies discussed herein may give rise to significant risk and are not suitable for all investors. Investors should have experience in relevant markets and the financial resources to absorb any losses arising from applying these ideas or strategies.