

US Rates Watch

Follow the money: cash & collateral trends October 10 update

Money map: repo rates continue to move higher

Repo rates continue to trend higher, driven by bilateral transactions. ON RRP continues to see large and significant reductions in take-up. Going forward, we expect a continuation of the reduction in Fed ON RRP, which will likely greatly outpace the decline in reserve balances.

Cash: ON RRP sees further declines

Fed balance sheet data for the week ending Oct 4, showed a \$28b decline in securities holdings from QT in addition to a \$18b decline in FDIC bank loans (Exhibit 1). On the liability side, the Fed's RRP facilities declined \$22b and \$101b for foreign and domestic RRP (Exhibit 3), respectively. Conversely, reserves continued their increase and are now up \$261b YTD (Exhibit 2). The decline in the Fed's foreign RRP over the past two weeks may be reflective of increased FX intervention activity. FX intervention activity may also be supporting a recent drop in UST custodial holdings at the NY Fed.

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

Over the week ending Oct 5, MMF AUM increased \$50b according to Crane Data (Exhibit 4). The increase was relatively evenly split between retail and institutional funds but most flows were still into government funds rather than prime MMFs, trend that has continued since the bank stress events in March.

Cash: Banks saw deposit outflows reverse

Bank balance sheet data, which is lagged an additional week compared to Fed balance sheet data, shows banking system assets increased \$84b on the week ending Sep 27, a partial reversal of outflows seen the prior week around the corporate tax date (Exhibit 6). Domestic banks saw cash holdings increase, driven by large bank small deposit inflows and higher borrowing. These flows helped drive a sharp \$72bn increase in bank reserve balances on the week.

10 October 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.

12610030

Timestamp: 10 October 2023 04:33PM EDT

Cash bottom line: Fed RRP take-up continues to decline at a record pace with reserves proving resilient. Bank balance sheet data shows a reversal of the corporate tax date deposit outflows in mid Sept. MMF AUM continues to increase, primarily for government MMFs, but MMF Fed RRP take-up continues to decline. This aligns with the extension of MMF WAMs and their shift into the wave of Treasury bill supply.

Collateral: keeps building

UST issuance has increased \$65b MTD in October from Treasury bill issuance (Exhibit 7). Treasury has been increasing bill auction sizes, in line with expectations for a higher deficit in October and November. Bill auction takedown last week was split between primary dealers and indirect bidders, which includes MMFs (Exhibit 8).

FHLB debt declined \$19b in September according to the Office of Finance (Exhibit 10). According to BofA estimates, FHLB debt continued to decline another \$7b on the week ending Oct 5 (Exhibit 9). We continue to be surprised by limited FHLB borrowing / advance demand given banks continue to raise other borrowings. We think the limited FHLB activity may be due to regulatory guidance that dissuades Home Loan borrowing.

CP issuance: Data from the Federal Reserve shows that CP outstanding declined \$14b for financial CP but increased \$19b for non-financial CP (Exhibit 11).

Collateral bottom line: UST issuance continues with bill and coupon auction sizes increasing in October. Higher issuance has also aligned with a cheapening in Treasury securities last week. As we discussed in [Funding pressures small but rising](#), MMFs may be requiring additional compensation to extend further out the curve following the recent extension in their WAM towards more neutral levels, which could be driving the bill cheapening.

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 \$10b increase in Treasury holdings on the week ending Sep 27 (Exhibit 12, Exhibit 13), primarily from higher Treasury bill holdings. 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. We see some signs this is already happening.

Repo volumes: SOFR volumes declined \$15b on the week ending October 5 (Exhibit 15). At the same time, the rate on O/N SOFR peaked at 5.33% before settling back at 5.32%. SOFR has been persistently elevated following quarter-end, driven by the bilateral component. Sponsored repo volumes increased \$29b on the week ending Oct 5, with GC rising \$36b but sponsored volumes declining \$7b (Exhibit 16).

Funding bottom line: dealer UST holdings increased on the week ending Sept 27. Repo rates continue to print above the ON RRP, as collateral overwhelms cash. We expect this theme to build in coming months & quarters.

Key takeaway: Repo rates have continued to rise following quarter-end, driven by bilateral repo transactions. GC repo continues to print in line with the rate on ON RRP. ON RRP take-up continues to see large and significant declines. There are risks of SOFR seeing more upward pressure, especially around large Treasury settlement dates due to dealers needing to finance their UST portfolios in repo. We expect the trends we've been seeing in ON RRP and reserves to continue, especially as the Treasury continues to issue a significant amount of bills. We expect greater funding pressure in coming months & quarters as collateral slowly overwhelms cash.

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

Cash in banking system exceeded Fed balance sheet growth due to lower ON RRP

Dates	Assets								Liabilities							Total
	Securities	Repo	Discount Window	BTFP	FDIC bank credit extension	FX Swaps	Other		Currency	Foreign RRP	ON RRP	TGA	Reserves	Other		
12/28/2022	8,145	0		5	0	0	0	451	2,307	334	2,293	410	2,980	277		8,601
9/27/2023	7,440	0		3	108	82	0	419	2,324	312	1,443	672	3,169	133		8,053
10/4/2023	7,412	0		3	108	64	0	419	2,326	290	1,342	679	3,241	128		8,006
WoW Change	-28	0		0	0	-18	0	0	2	-22	-101	7	72	-5		-46
YTD Change	-732	0		-2	108	64	0	-32	19	-44	-951	269	261	-149		-594

Source: BofA Global Research, Federal Reserve

BofA GLOBAL RESEARCH

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

Change in reserve balance from prior week was \$72bn



Source: Federal Reserve

BofA GLOBAL RESEARCH

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

ON RRP take-up decreased \$188bn from prior week



Source: FRBNY

BofA GLOBAL RESEARCH

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

MMF AUM increased \$54b WoW as of Sep 29, with inflows primarily into gov't institutional funds

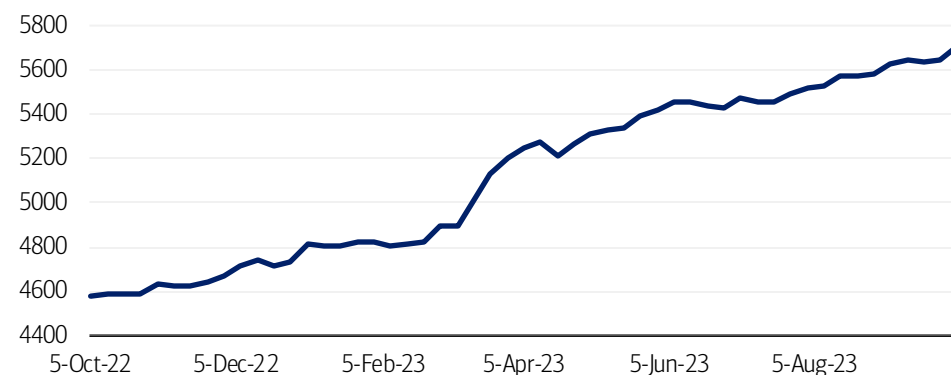
Dates	Total	Prime	Gov't	Tax exempt	Retail	Institutional	Prime Institutional	Gov't Institutional	Prime Retail	Gov't Retail
12/30/2022	5,073	1,077	3,996	0	1,584	3,489	655	2,834	421	1,163
9/28/2023	6,063	1,252	4,687	123	2,072	3,868	622	3,245	630	1,442
10/5/2023	6,113	1,263	4,722	128	2,096	3,889	624	3,265	639	1,457
WoW change	50	11	35	4	24	21	2	20	9	15
YTD Change	1,040	187	726	128	512	400	-31	431	218	294

Source: Crane Data

BofA GLOBAL RESEARCH

Exhibit 5: MMF AUM (\$bn)

MMFs saw \$64.13bn in flows from prior week



Source: ICI, Bloomberg

BofA GLOBAL RESEARCH



Exhibit 6: US Commercial Bank balance sheets, selected assets & liabilities (\$bn)

Domestic banks saw cash decline significantly on the week corresponding with the Sept Corp tax date largely due to deposit outflows

		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	9/27/2023	22831	3272	1533	2537	614	12208	2666	17291	2168	15123	2303	242	2994
	1w Chg	84	35	14	-26	27	29	5	53	10	43	23	-10	19
	1m Chg	-29	-48	21	-46	26	27	-10	4	44	-40	29	-65	17289
	YTD Chg	-145	176	-120	-237	14	104	-81	-653	516	-1170	450	-27	18030
Domestic Banks	9/27/2023	19837	2048	1425	2509	258	11170	2427	16013	1364	14649	1331	-343	2835
	1w Chg	113	100	20	-26	9	18	-8	64	8	56	22	10	18
	1m Chg	59	68	27	-48	13	15	-16	5	46	-41	34	5	16023
	YTD Chg	-166	177	-122	-229	-55	123	-60	-618	548	-1166	348	-4	16739
Large Banks	9/27/2023	13310	1618	1127	1927	221	6750	1667	10754	728	10026	893	-371	2035
	1w Chg	100	90	9	-8	9	11	-10	60	5	55	19	10	11
	1m Chg	67	78	20	-29	13	1	-16	7	32	-25	44	6	10758
	YTD Chg	-114	147	-94	-51	-47	-18	-51	-476	341	-817	299	5	11288
Small Banks	9/27/2023	6526	429	298	582	37	4420	760	5259	636	4623	438	28	800
	1w Chg	13	10	11	-18	1	7	2	4	3	1	3	0	7
	1m Chg	-9	-10	8	-20	0	13	0	-2	14	-16	-9	-1	5265
	YTD Chg	-52	31	-28	-178	-9	141	-9	-141	208	-349	49	-9	5451
Foreign Banks	9/27/2023	2994	1224	108	28	356	1038	239	1278	804	473	972	585	159
	1w Chg	-29	-65	-6	0	18	11	13	-11	2	-13	1	-19	1
	1m Chg	-88	-116	-6	3	13	13	5	-1	-2	1	-6	-69	1266
	YTD Chg	21	-2	2	-8	69	-19	-21	-36	-32	-4	102	-23	1291

Source: Federal Reserve H8

BofA GLOBAL RESEARCH

Exhibit 7: Treasury bill and coupon issuance (\$000s)

Treasury issuance has grown \$65b in October MTD from bill issuance

	Net total	Net bills	Net coupons	Gross new issue	Gross bill issue	Gross coupon issue	Gross maturing	Gross bill maturing	Gross coupon maturing
MTD	65,052	65,052	-	456,000	456,000	-	390,948	390,948	-
YTD	2,425,389	1,680,457	744,932	15,626,025	13,086,025	2,540,000	13,200,636	11,405,568	1,795,068
FYTD	2,798,639	1,753,606	1,045,033	19,558,025	16,352,025	3,206,000	16,759,386	14,598,419	2,160,967

Source: BofA Global Research, Haver Analytics

BofA GLOBAL RESEARCH

Exhibit 8: Treasury bill auctions

Primary dealers and indirect bidders took down most of the bill supply last week

	Tenor	Auction Date	Maturity Date	Offering amount (\$mn)	High rate	Bid to Cover ratio	% Direct bidders	% Indirect bidders	% Primary Dealers
Upcoming bill auctions	43-Day	10/10/2023	11/24/2023	70,000					
	13-Week	10/10/2023	1/11/2024	73,000					
	26-Week	10/10/2023	4/11/2024	66,000					
Last week's bill auctions	4-Week	10/5/2023	11/7/2023	90,000	5.31%	2.95	2.66%	64.12%	33.23%
	8-Week	10/5/2023	12/5/2023	80,000	5.36%	2.46	5.83%	50.25%	43.92%
	17-Week	10/4/2023	2/6/2024	54,000	5.35%	2.96	3.44%	55.00%	41.56%
	42-Day	10/3/2023	11/16/2023	65,000	5.33%	2.46	7.52%	29.89%	62.59%
	52-Week	10/3/2023	10/3/2024	44,000	5.19%	3.21	0.12%	76.42%	23.46%
	13-Week	10/2/2023	1/4/2024	71,000	5.35%	2.77	4.79%	54.65%	40.56%
	26-Week	10/2/2023	4/4/2024	64,000	5.34%	2.88	2.84%	66.87%	30.29%

Source: BofA Global Research, US Treasury. Note: green highlight represents higher than the avg over the last 3 months, red highlight is lower than the avg over the last 3 months

BofA GLOBAL RESEARCH

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

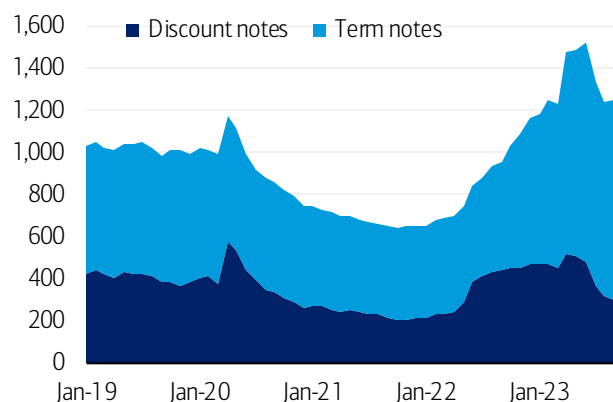
Daily FHLB cumulative debt is roughly \$88.6714bn lower since March 1



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

Exhibit 10: FHLB debt issuance (\$bn)

Higher FHLB debt issuance leading to more MMF investment

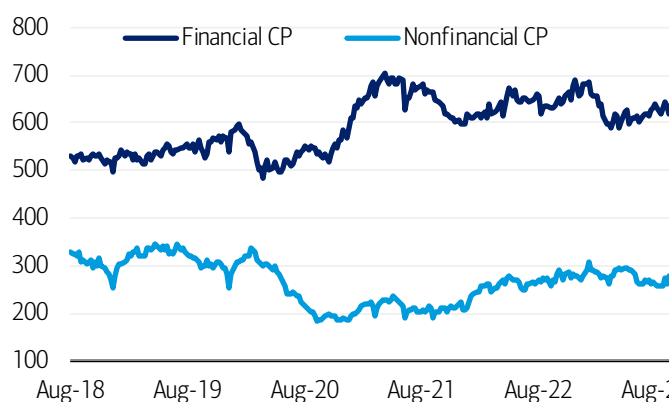


Source: BofA Global Research, FHLB Office of Finance

BofA GLOBAL RESEARCH

Exhibit 11: Commercial paper (\$bn)

Financial CP is \$14b lower WoW, nonfin is \$19b higher WoW as of Oct 4



Source: Bloomberg

BofA GLOBAL RESEARCH

Exhibit 12: Primary dealer holdings (\$mn)

PD holdings of UST has declined roughly \$3b over the week ending Sept 20, with declines across US Treasury types

	Total	US Treasuries					Agency ex MBS	MBS	Corporates	Commercial Paper	State & Munis	ABS	Variable Rate Notes
		Bills	Coupons	FRNs	TIPS								
9/27/2023	370,168	220,791	70,429	129,304	8,522	13,762	14,475	88,310	21,518	8,857	13,323	8,675	3,076
1w Chg	6,938	9,632	6,287	63	4,098	410	-2,520	-1,510	2,159	-352	-412	40	-451
1m Chg	25,909	18,819	14,822	2,600	2,551	72	-1,874	-475	8,142	469	835	298	164
YTD Chg	111,611	70,982	41,799	31,451	1,620	-2,662	1,224	16,023	16,083	5,317	2,113	2,855	2,331

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 declined slightly vs the prior week of data

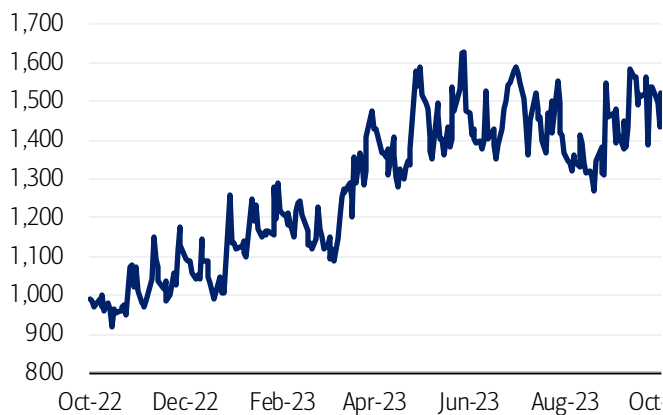


Source: BofA Global Research, Bloomberg

BofA GLOBAL RESEARCH

Exhibit 15: SOFR Volumes (\$bn)

SOFR volumes have declined \$15b on the week ending Oct 5



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

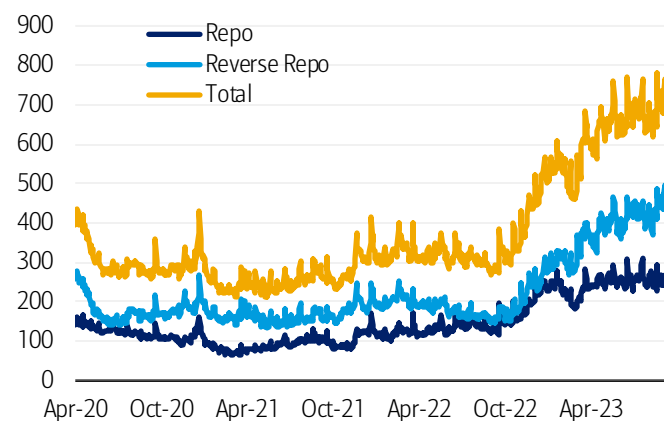
	Bills	Coupons	FRNs	TIPS	Total
8/30/2023	55,607	126,704	5,971	13,690	201,972
9/27/2023	70,429	128,078	8,522	13,762	220,791
MTD Change	14,822	1,374	2,551	72	18,819
Level Z-score	1.59	0.53	0.47	0.84	1.04

BofA Global Research, Bloomberg

BofA GLOBAL RESEARCH

Exhibit 16: Sponsored Repo Volumes (\$bn)

Sponsored repo volumes have risen \$271 YTD, \$29b 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
9/1/2023	16,950	5,880	-	(30,902)	600	53	31	(2,736)	(27)	(10,152)
9/5/2023	18,776	3,306	1,220	(18,680)	850	118	52	(4,366)	-	1,276
9/6/2023	20,155	1,847	-	(26,429)	6,325	25	10	(9,335)	-	(7,402)
9/7/2023	19,779	2,854	4,230	(22,391)	2,500	15	114	(155)	-	6,946
9/8/2023	19,932	1,882	-	(25,153)	2,653	40	50	(9,103)	(15)	(9,714)
9/11/2023	18,093	3,014	-	(22,777)	2,675	122	155	(1,072)	-	210
9/12/2023	16,750	8,294	1,995	(20,439)	1,350	1,065	100	(15)	-	9,100
9/13/2023	27,475	2,459	-	(26,167)	-	222	380	(2,245)	(100)	2,024
9/14/2023	15,830	3,469	4,600	(18,780)	-	65	74	(19,135)	(63)	(13,940)
9/15/2023	17,630	14,275	-	(40,434)	-	30	170	(761)	(1,240)	(10,330)
9/18/2023	17,046	5,399	-	(22,643)	2,885	483	252	(2,281)	-	1,142
9/19/2023	20,850	6,776	7,105	(26,873)	2,885	330	177	(3,255)	-	7,995
9/20/2023	17,199	7,020	-	(26,700)	1,050	110	100	(7,716)	(325)	(9,262)
9/21/2023	18,482	2,861	7,200	(20,563)	-	22	858	(2,662)	-	6,198
9/22/2023	16,149	2,945	-	(30,291)	1,862	4,035	845	(1,275)	(25)	(5,756)
9/25/2023	20,262	4,046	-	(21,886)	2,150	105	194	(6,110)	-	(1,239)
9/26/2023	27,998	7,195	6,680	(23,637)	4,200	2,356	62	(3,374)	(520)	20,960
9/27/2023	16,400	4,887	-	(28,079)	2,650	510	372	(1,215)	(132)	(4,608)
9/28/2023	9,300	2,918	2,630	(18,097)	2,750	444	-	(1,461)	(237)	(1,752)
9/29/2023	15,973	2,276	-	(30,501)	3,750	815	835	(2,079)	(30)	(8,962)
10/2/2023	17,963	1,035	-	(25,184)	1,601	75	84	(2,427)	-	(6,854)
10/3/2023	22,405	3,235	4,425	(19,218)	1,000	-	330	(8,921)	-	3,256
10/4/2023	21,342	824	-	(27,164)	2,100	1,050	135	(1,769)	-	(3,483)
10/5/2023	23,645	-	4,815	(22,834)	2,545	15	-	(185)	-	8,001
10/6/2023	20,731	2,412	-	(27,834)	2,700	15	1,553	(7,512)	(15)	(7,950)

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
BofAS
ralph.axel@bofa.com

Bruno Braizinha, CFA

Rates Strategist
BofAS
bruno.braizinha@bofa.com

Mark Cabana, CFA

Rates Strategist
BofAS
mark.cabana@bofa.com

Katie Craig

Rates Strategist
BofAS
katie.craig@bofa.com

Meghan Swiber, CFA

Rates Strategist
BofAS
meghan.swiber@bofa.com

Anna (Caiyi) Zhang

Rates Strategist
BofAS
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.

