US Rates Watch

Pension de-risking opportunity may narrow with lower rates

01 June 2023

Rates Research
United States

Meghan Swiber, CFA
Rates Strategist
BofAS
+1 646 855 9877
meghan.swiber@bofa.com

US Rates Research
BofAS
+1 646 855 8846

See Team Page for List of Analysts

De-risking not enough to protect PFS from rate rally

Private defined benefit (DB) pension funding status (PFS) improved to some of the highest levels in decades alongside the increase in UST yields at the end of last year. Improved pension funded status drew a stronger bid for back-end duration and a pickup in risk transfer activity. Despite this de-risking activity, we think DB pensions are still quite vulnerable to a fall in interest rates. This means that the duration bid pensions have generated over the last year could be cut short should a sharp decline in interest rates result in a worse funded status.

De-risk opportunity supported UST bid and risk transfers

Historically high pension funded status, given the increase in interest rates last year, offered many pensions a prime opportunity to de-risk. Pensions can do this by buying longer dated duration assets and conducting risk transfers. We see evidence of this in a pickup in stripping activity consistent with pensions wanting to own the longest duration security they can buy to better match liabilities. Risk transfer transactions, where private pension obligations are moved to an insurer's balance sheet have also been elevated. Most recent LIMRA data shows that corporate risk transfer transactions in Q1 were more than double what they were in Q1 last year.

FI allocation higher, not enough to insulate from rates

Despite this pickup in de-risking behavior, we believe pension funded status is still sensitive to changes in interest rates. Data suggests that pensions have made only small changes to their fixed income allocations over the last year; Milliman data indicates that fixed income (FI) allocations increased only 1 percentage point and FoF data shows FI is only around 33% of total DB private pension fund assets.

Peak in funded status could be peak in UST demand

Because DB pensions have likely not fully de-risked, this means that the liability side of their balance sheet will still be more sensitive to shocks in interest rates than assets. The 25-50bps decline in 10y UST rates that we expect by the end of the year would imply that the Milliman pension funded status would drop to below 98%. While this is still elevated vs recent history, a turn in funded status would likely represent a cooling in the elevated demand from DB private pensions observed in the last year.

Cooling demand more evident when auction sizes increase

This shift in demand is unlikely to be a near-term issue as UST supply in coming months will be heavily concentrated in bills. However, it could become more of a concern later this year as we expect UST to increase coupon auction sizes beginning at the August refunding.

Glossary
UST = US Treasury
DB = defined benefit
PFS= pension funded status
LDI = liability driven investing
IRA= individual retirement account
LIMRA= Life Insurance Marketing and Research Association
FoF= Flow of funds

Pension opportunity window narrowing

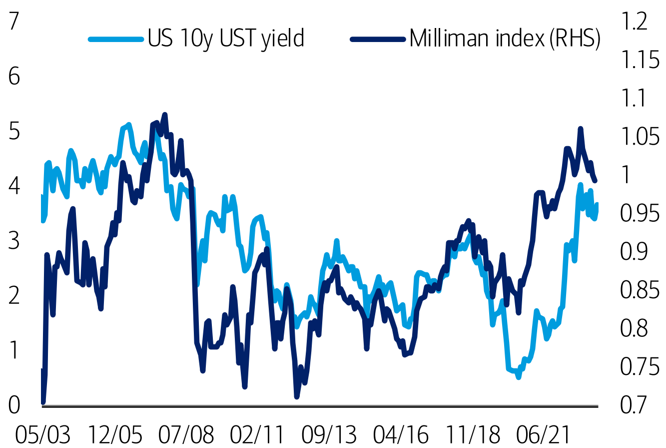
De-risking not enough to protect from rate rally

Private defined benefit (DB) pension funding status improved to some of the highest levels in decades alongside the increase in UST yields at the end of last year (Exhibit 1). When DB pensions have a stronger funded status, they usually de-risk and increase holdings of fixed income to better match the duration of liabilities. Indeed, DB pensions saw historically elevated UST demand last year as evidenced in Federal Reserve Flow of Funds data (Exhibit 2).

While pension duration buying at stronger funded levels is consistent with LDI strategy, this bid is also the result of rebalancing. Higher interest rates that underpin an improved funding status also imply fixed income losses that generate a larger rebalancing bid (see [Pension rebalancing update](#)).

In this note we discuss how much de-risking these DB pensions have been able to implement in recent years and how insulated they are to future interest rate shocks. We conclude that while de-risking has in fact been ongoing, DB pensions are still quite vulnerable to a fall in interest rates. This means that the duration bid pensions have generated over the last year could be cut short should a sharp decline in rates result in a worse funded status.

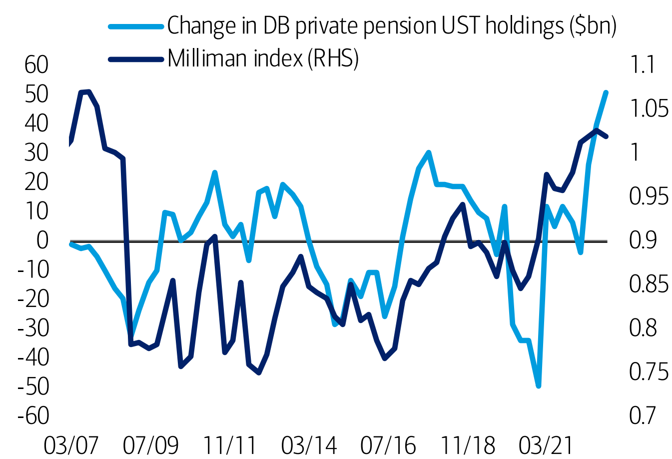
Exhibit 1: 10y UST yield and Milliman pension funded index
Funded status historically improves with an increase in interest rates



Source: BofA Global Research, Bloomberg

BofA GLOBAL RESEARCH

Exhibit 2: UST holdings of private DB pensions and funded status
When funded status is higher, pension funds buy more USTs



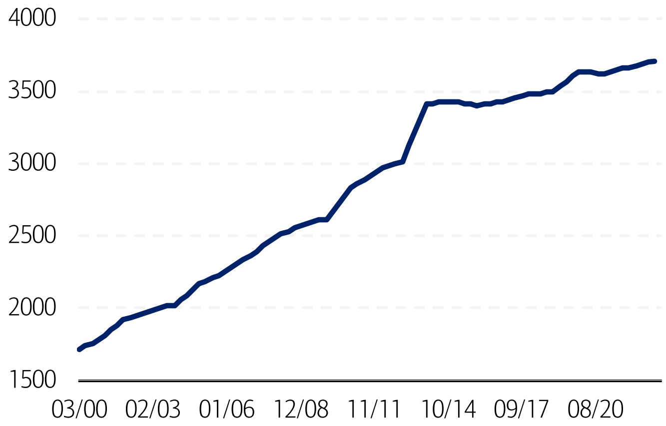
Source: BofA Global Research, Bloomberg, Federal Reserve

BofA GLOBAL RESEARCH

De-risk opportunity supported UST bid and risk transfers

For context, DB private pensions currently hold around $3.7tn in assets according to the Fed's Flow of Funds (FoF) data (Exhibit 3). Their asset growth has moderated in recent years (Exhibit 4) as new private retirement funds are largely concentrated in IRAs and defined contribution plans.

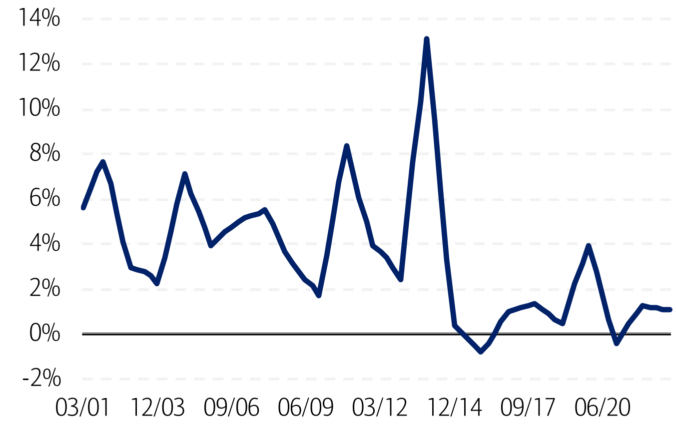
Exhibit 3: Private DB pension assets ($bn)
Assets currently total around $3.7tn



Source: BofA Global Research, Federal Reserve

BofA GLOBAL RESEARCH

Exhibit 4: Private DB pension asset YoY growth
Asset growth has slowed meaningfully in recent decades



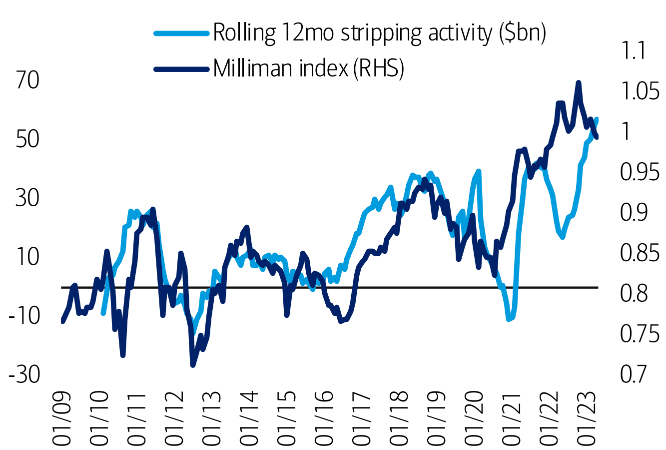
Source: BofA Global Research, Federal Reserve

BofA GLOBAL RESEARCH

Elevated pension funded status given the increase in interest rates last year offered many pensions a prime opportunity to de-risk. Pensions can do this by buying longer dated duration assets and conducting risk transfers.

As shown in Exhibit 5, we have observed a pickup in stripping activity in recent months alongside a strong funded status. This is consistent with pensions wanting to own the longest duration security they can buy to better match liabilities. Risk transfer transactions, where private pension obligations are moved to an insurer's balance sheet have also been elevated (Exhibit 6). Most recent LIMRA data shows that corporate risk transfer transactions in Q1 were more than double what they were in Q1 last year.

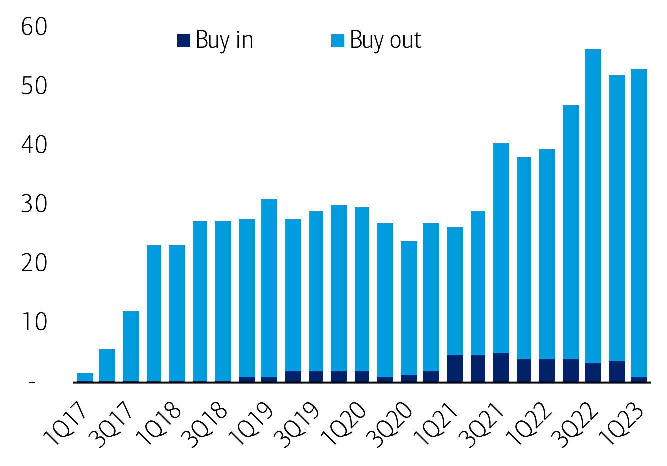
Exhibit 5: Milliman index and 12mo increase in USTs held in stripped form
Higher pension funded status aligns with higher stripping activity



Source: BofA Global Research, Bloomberg

BofA GLOBAL RESEARCH

Exhibit 6: Risk transfers over prior 12months ($bn)
Pension risk transfers over last couple of years have been elevated



Source: BofA Global Research, LIMRA

BofA GLOBAL RESEARCH

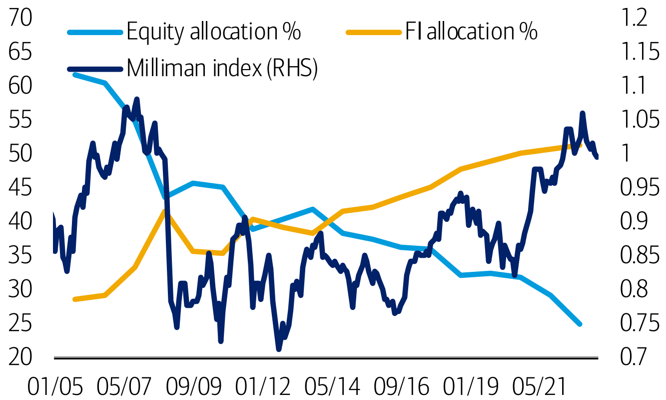
FI allocation higher, not enough to insulate from rates

Despite this pickup in de-risking behavior, pension funded status is still likely sensitive to changes in interest rates. Pensions have only made small changes to their fixed income allocations over the last year. Exhibit 7 shows the asset allocation and funded status for the 100 largest DB pension plans sponsored by U.S. public companies compiled by Milliman. These account for about 40% of all private DB pension assets. While de-risking has been ongoing steadily since 2014, over the past year these funds have only increased their fixed income allocation by 1 percentage point.

Across the broader private DB pension complex, the Fed's flow of funds (FoF) data shows a much more gradual de-risking process that has resulted in total fixed income holdings only around 33% (Exhibit 8). This difference could because the Milliman 100 funds may be better funded vs the larger universe and therefore more motivated de-risk over the past decade.

Exhibit 7: Milliman 100 DB private pension allocations and funded status

Fixed income allocations have increased steadily over last 10 years

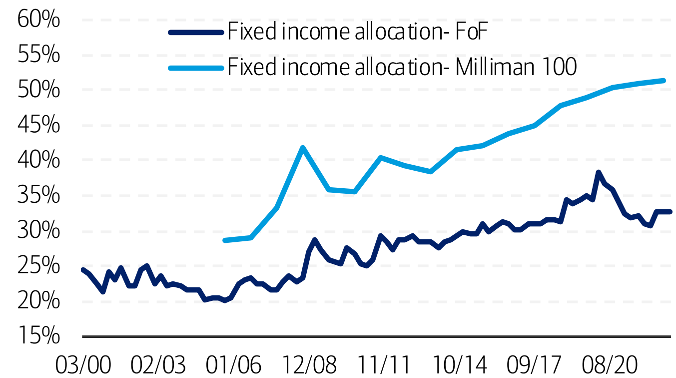


Source: BofA Global Research, Milliman

BofA GLOBAL RESEARCH

Exhibit 8: DB private pension fixed income allocation from Flow of Funds and smaller Milliman subset

Milliman funds have shown more de-risking than broader private DB pension funds according to FoF



Source: BofA Global Research, Milliman, Federal Reserve

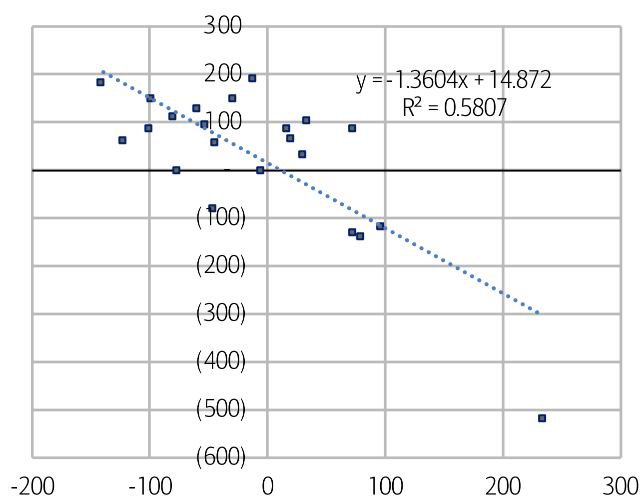
BofA GLOBAL RESEARCH

Peak in funded status could be peak in UST demand

Because DB pensions have not fully de-risked, this means that the liability side of their balance sheet will still be more sensitive to shocks in interest rates than assets. Exhibit 9 shows the sensitivity of Milliman 100 pension obligations to changes in interest rates since 2000 vs Exhibit 10 which shows the sensitivity of assets. Historically, changes in the value of liabilities have much stronger relationship with changes in interest rates than assets.

Exhibit 9: Sensitivity of Milliman 100 liabilities ($bn) to 10y UST rates (bps)

Liabilities show relatively strong sensitivity to interest rates

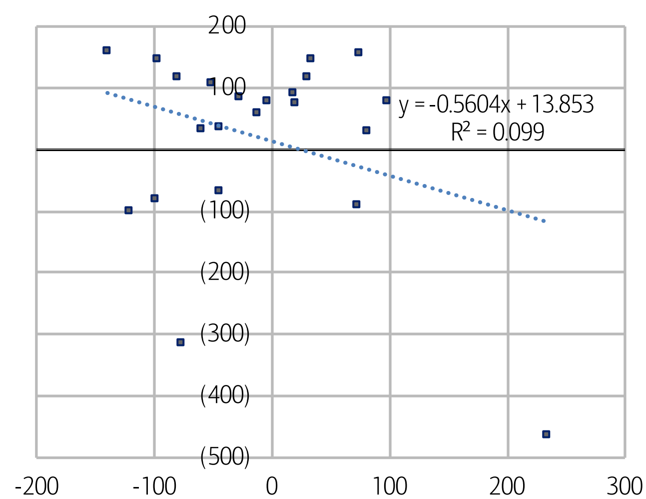


Source: BofA Global Research, Bloomberg, Milliman

BofA GLOBAL RESEARCH

Exhibit 10: Sensitivity of Milliman 100 assets ($bn) to 10y UST rates (bps)

Assets show less sensitivity to changes in interest rates



Source: BofA Global Research, Bloomberg, Milliman

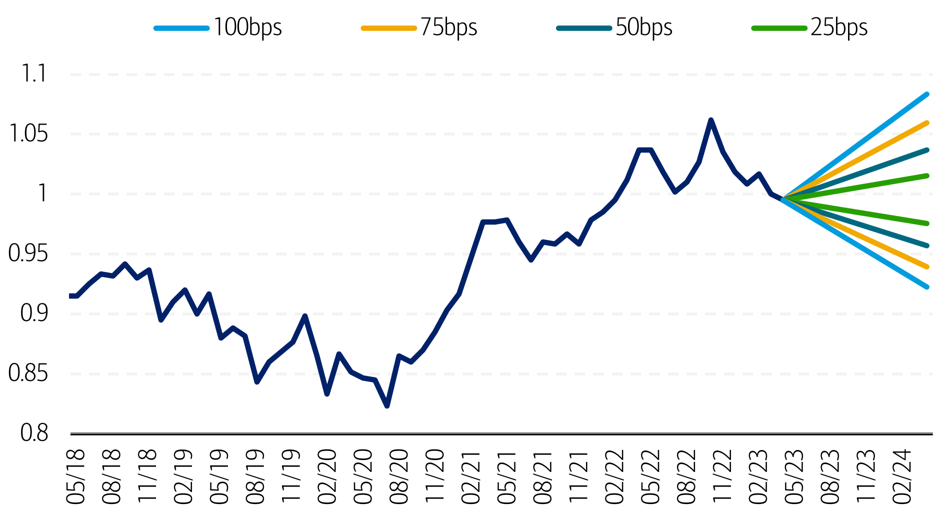
BofA GLOBAL RESEARCH

In Exhibit 11, we show what the Milliman pension funded index might look like under various rate shocks using: 1) the historical relationship between rates and liability valuation, 2) the last reported Milliman fixed income allocation as of end FY '22 3) the historical relationship between interest rates and investment grade credit returns as a proxy for DB pension fixed income returns. Applying these assumptions, a 100bps decline in rates would result in the pension funded index falling from 99.5% in April to about 92%. Alternatively, pension funded status would continue to improve with higher interest rates.

Using this analysis, the 25-50bps decline in 10y UST rates that we expect by the end of the year suggests that the Milliman pension funded status would drop to below 98%. While this is still relatively elevated, broader pensions excluding the 100 that Milliman reports on would probably see funded status decline by more given their lower fixed income allocations. Additionally, pension funded status conditional on the move in rates does not account for riskier assets that may bank poor performance alongside the mild recession our US economists expect.

In general, a turn in funded status would likely represent a cooling in the elevated demand from DB private pensions observed in the last year. This shift in demand is unlikely to be a near-term issue as UST supply in coming months will be heavily concentrated in bills. However, it could become more of a concern later this year as we expect UST to increase coupon auction sizes beginning at the August refunding (see: May refunding: bills now, coupons later).

Exhibit 11: Expected pension funded status conditional on 10y UST interest rate shock
Pension funded status likely to remain sensitive to changes in interest rates and will decline if interest rates move lower



Source: BofA Global Research, Bloomberg, Milliman, Note: we show what the Milliman pension funded index may look like under various rate shocks using: 1) the historical relationship between rates and liability valuation, 2) the last reported Milliman fixed income allocation as of end FY '22 3) the historical relationship between interest rates and investment grade credit returns as a proxy for DB pension fixed income returns.

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 BofAS 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. ("BofAS") 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:

BofAS 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.bofaml.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 (HKSFC); 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; BofAS 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; BofAS 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 BofAS 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 HKSFC; is issued and distributed in Taiwan by Merrill Lynch (Taiwan); is issued and distributed in India by BofAS 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:

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

US Rates Research
BofAS

Meghan Swiber, CFA
Rates Strategist
BofAS
meghan.swiber@bofa.com

Mark Cabana, CFA
Rates Strategist
BofAS
mark.cabana@bofa.com

Ralph Axel
Rates Strategist
BofAS
ralph.axel@bofa.com

Katie Craig
Rates Strategist
BofAS
katie.craig@bofa.com

Bruno Braizinha, CFA
Rates Strategist
BofAS
bruno.braizinha@bofa.com

Anna (Caiyi) Zhang
Rates Strategist
BofAS
caiyi.zhang@bofa.com