Liquid Insight

Approaching the largest TLTRO maturity

15 May 2023

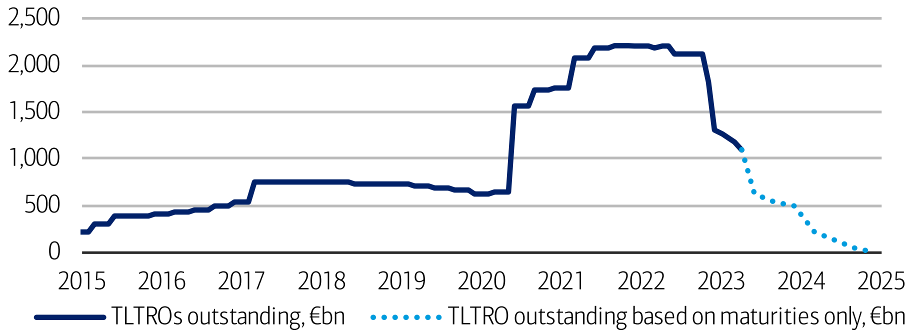
Rates and Currencies Research
Global

Key takeaways

- Liquidity in Euro area will fall by > €475bn in Jun23 as the largest TLTRO III matures
- TLTRO maturities are highly anticipated and may increase cash demand by some banks more than others
- Abrupt movements in front-end EUR rates from the Jun23 maturity may be limited but medium term path could be more volatile

By Ronald Man, Sphia Salim, Alastair Ryan, Antonio Reale

Chart of the day: TLTRO outstanding and projection based on maturity schedule only (*)
Outstanding TLTRO to fall by at least €477bn in Jun23 due to maturity of Jun20 operation



Source: ECB (*) without accounting for potential early repayments

BofA GLOBAL RESEARCH

The anticipated involuntary drop

The largest targeted longer-term refinancing operation (TLTRO) will mature on 28 June 2023. That alone will reduce TLTRO outstanding by €477bn, that is 43% (Chart of the Day). Most of the TLTRO decline in June 2023 will be involuntary, yet widely anticipated. As TLTRO outstanding continues to decline, banks without enough cash at the central bank to cover all their TLTROs may eventually need to raise cash from other sources. Country level data suggest this would be the case for some banks in Italy (Exhibit 2), and we cannot rule out that some banks in other countries are also in that situation. Others may also want to maintain cash at the ECB even as their TLTRO borrowings mature.

To bridge the gap between cash at the central bank and TLTRO borrowings, banks may reduce their assets or find alternative borrowing sources. We distinguish two cases of asset sales and five types of alternatives to TLTRO fundings, along with their potential market implications.

Global Rates & Currencies Research
MLI (UK)

Ronald Man
Rates Strategist
MLI (UK)
+44 20 7995 1143
ronald.man@bofa.com

Sphia Salim
Rates Strategist
MLI (UK)
+44 20 7996 2227
sphia.salim@bofa.com

Alastair Ryan >>
Research Analyst
MLI (UK)
+44 20 7996 4806
alastair.ryan@bofa.com

Antonio Reale >>
Research Analyst
MLI (UK)
+44 20 7996 1763
antonio.reale@bofa.com

Adarsh Sinha
FX Strategist
Merrill Lynch (Hong Kong)
+852 3508 7155
adarsh.sinha@bofa.com

Janice Xue
Rates Strategist
Merrill Lynch (Hong Kong)
+852 3508 8587
janice.xue@bofa.com

See Team Page for List of Analysts

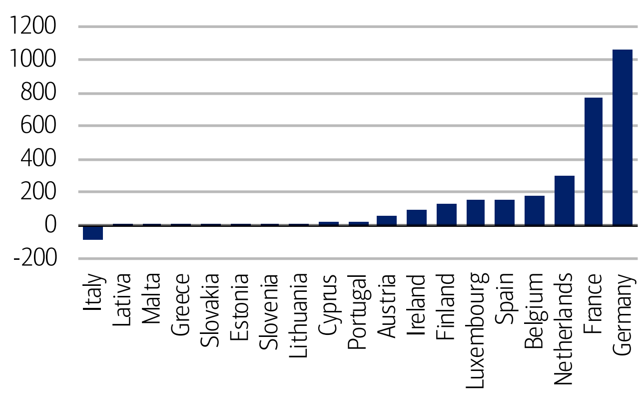
Liquid Insight
Recent Publications

BofA GLOBAL RESEARCH

The market is pricing in gradual widening of front-end spreads, which we believe reflects expectations of further declines in excess liquidity. But uncertainties over each individual bank cash levels and their potential expectations leave room for volatility and a bias for TLTRO-related widening in front-end spreads post June.

While the decline in TLTRO outstanding in Dec22 was larger, at €499bn, that was driven by voluntary early repayments. Most of the decline in June 2023 will very likely be due to the maturity of the Jun20 operation and therefore involuntary, yet widely anticipated.

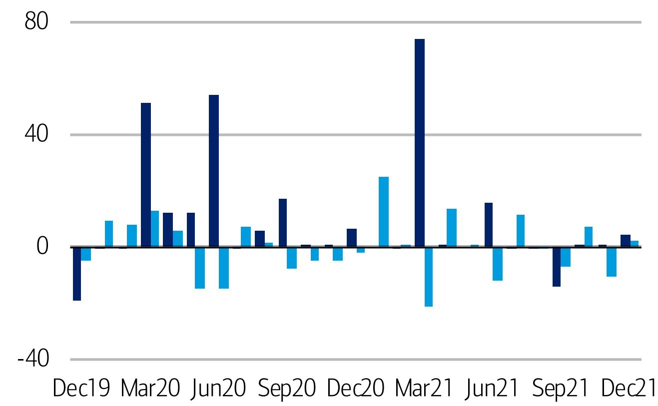
Exhibit 1: Cash at central bank minus TLTRO
Banks in Italy have less cash at central bank than TLTRO borrowing



Source: ECB. Data as of March 2023.

BofA GLOBAL RESEARCH

Exhibit 2: TLTRO and Italian government bond flows of banks in Italy
Large TLTRO III take-ups unlikely used to finance large new carry trades



Source: ECB

BofA GLOBAL RESEARCH

To bridge the gap between cash at the central bank and TLTRO borrowings, banks may reduce their assets, or find alternative borrowing sources.

On the sale of assets, we would distinguish two cases:

1. *Unwind of government bond carry trades*. To the extent banks used TLTROs to finance carry trades, such trades may be unwound, putting **upward pressure on government bond yields and widening pressure on peripheral spreads**. Focusing on the Italian case, we note that large net TLTRO III take-ups by banks at the aggregate level were not associated with large increases in Italian government bond purchases (Exhibit 3). That said, it is possible TLTRO III were used to roll over some carry trades funded by TLTRO II: prior to the large TLTRO III take-ups, banks in Italy borrowed c. €215bn via (T)LTROs.

2. *Reduce other assets*. This may include reduction in loans, which may tighten household and corporate loan terms. **The market may see this as reducing the need for further ECB policy tightening**. The central bank said its interest rate hikes are being transmitted via tighter credit standards and weaker loan growth in its May monetary policy meeting. Even tighter loan terms as a result of TLTRO maturities may reduce the need for the central bank to raise policy rates by much more in H2. The market is pricing in close to 50bp of hikes in total over June and July, consistent with our economists' baseline (Euro Area Watch, 4 May 2023). We see risks of another 25bp hike in September, as some hawks at the ECB are suggesting, but signs of a faster reduction in loan growth could prevent the market from pricing this and may indeed lead the ECB to stop at a terminal deposit facility (depo) rate of 3.75%.

We would differentiate between 5 types of alternatives to TLTRO funding. Banks could:

1. *Borrow cash from the repo market*. Collateral pledged to the central bank for TLTROs will be unencumbered when the TLTRO matures. Some of this collateral may be used to borrow cash from the repo market. This could put **upward pressure on general collateral (GC) repo rates**, in particular Italian GC repo, as we do not believe the €87bn gap would be easily absorbed by the repo market alone: daily Italy one-day GC volume has averaged €14bn year-to-date.

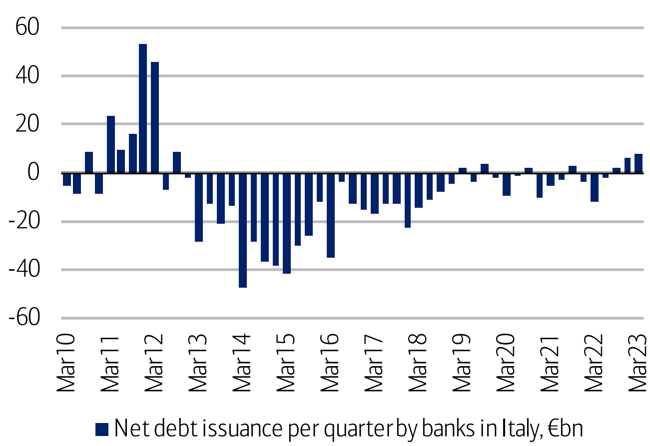
2. *Borrow short term cash from the wholesale market*. Bank borrowing from the wholesale market may **widen Euribor-euro short-term rate (€str) spreads**. We would emphasise that it is not necessarily the case that all banks in Italy face a shortfall of cash at the central bank vs their TLTRO borrowings. As a result, the impact on Euribor fixings may be dampened if it is *not* panel banks that face a shortfall between cash at the central banks and TLTRO borrowings.

3. *Borrow long term cash from the wholesale market*. Our Credit teams have noted a significant increase in bank bond issuance in January and February, across all type of bonds (e.g. senior unsecured, covered, etc). In Italy, ECB data show banks issued a total net amount of €17bn raised since 3Q22 (across short and long-term debt). This is the most significant net issuance since 2012 (Exhibit 4). If banks with a shortfall resort to term borrowing, i.e. greater than 12 months, then the impact on Euribor fixings may be further limited given Euribor's hybrid methodology.

4. *Borrow cash from the central bank*. Banks may pledge the collateral unencumbered from the TLTRO maturities to raise funds from the central bank via the 7-day Main Refinancing Operations (MRO) or the monthly 3-month Long Term Refinancing Operations (LTRO), both priced at the ECB refinancing (refi) rate. A 3m LTRO will be allotted on June 28th and settle on June 29th. The marginal cost of funding will increase by 50bp, from the depo rate to the refi rate. This may not be economical for all banks and, in our view, is a rather expensive source of funding at current market rates when compared with other money market options. Still, **potential use of the MRO means the refi rate would act as a backstop to a dramatic increase in money market rates**.

5. *Increase the deposit base*. Banks may try to attract more customer deposits, for example by raising their deposit rates, which have overall been quite sticky. In other words, bank deposit betas may increase.

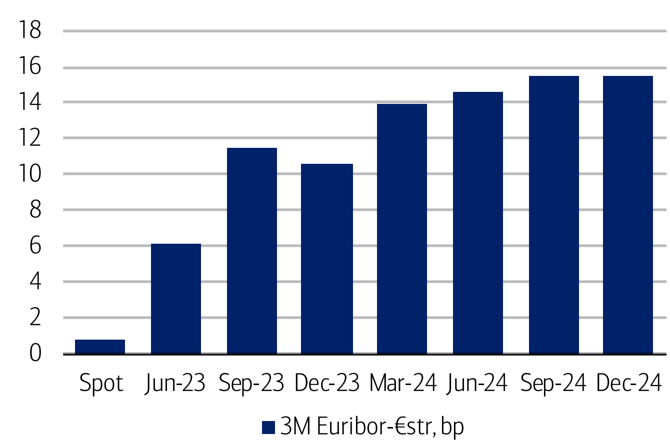
Exhibit 3: Net debt issuance by banks in Italy
Net issuance has picked up but cash at central bank-TLTRO gap remains



Source: ECB

BofA GLOBAL RESEARCH

Exhibit 4: 3M Euribor-€str spread
Medium term widening of spread could be more volatile than expected



Source: BofA Global Research. IMM dates used.

BofA GLOBAL RESEARCH

The market is pricing in c. 5bp of widening in the 3M Euribor-€str spread in Jun23, followed by gradual widening that we believe reflects expectations of further decline in excess liquidity (Exhibit 5). This implies the market assigns a low likelihood of an abrupt shock to front-end EUR rates from the Jun23 TLTRO maturity.

- We tend to agree with the market that large pressures on front-end EUR rates in Jun23 may be limited given the Jun23 TLTRO maturity is a highly anticipated event, and it is unclear whether any gap between cash at the central bank and total TLTRO borrowing would already be an issue for the Jun23 repayment. Also, if front-end overnight indexed swap (OIS) rates rise/short positioning increases in the front-end with the ECB surprising on the hawkish side, Jun23 and Sep23 Euribor-€str may come under tightening pressure.

- However, we see greater risks of abrupt moves beyond Jun23. It is unknown to us, and quite possibly the market, the exact TLTRO III maturity schedule by operation for banks in Italy. If the gap between cash at the central bank and TLTRO for banks in Italy impacts TLTROs maturing after Jun23, then risks of abrupt pressures on front-end rates post June may be present and not fully accounted for by the market. This suggests the medium-term widening of Euribor-€str spreads may be more volatile than expected.

Widening risks in FRA-€str spreads could also come from the following:

- The uncertainty around whether banks are indeed prepared for the Jun23 TLTRO maturity. If they are not prepared and adjust their balance sheet close to the Jun23 maturity date, then the associated flows could put stronger and more sudden upward pressures on rates.

- The fact that some investors of even banks may be expecting the ECB to provide new (T)LTRO-style operations, priced a lower rate than the refi rate, to help roll over the TLTRO borrowings. New ECB operations could be on the cards for when the ECB concludes its operational framework review (see the 1 March 2023 Liquid Insight); however, this could take some time, with the operations being considered for the medium term when excess liquidity will be much lower rather than as a way to roll over TLTRO borrowings. The details of these operations (term and pricing) will also be important considerations to determine the market impact.

- The possibility (albeit remote) that excess liquidity in the system after the Jun23 TLTRO maturity may already be insufficient to meet banks' reserve demand.

Notable Rates and FX Research

- **Global Rates, FX & EM Year Ahead 2023 – Year Ahead 2023: Pivot ≠ Peak**, 20 Nov 2022
- What to expect when pausing, **Global FX Weekly**, 12 May 2023
- The long and short of it**, Global Rates Weekly**, 12 May 2023
- Corporates buying USD/Asia FX, **Liquid Cross Border Flows**, 9 May 2023

Rates, FX & EM trades for 2023

For a complete list of our open trade recommendations, as well as our trade recommendations closed over the past 12 months, see the reports below:

Global FX Weekly: What to expect when pausing 12 May 2023

Global Rates Weekly: The long and short of it 12 May 2023

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.

Futures and options are not appropriate for all investors. Such financial instruments may expire worthless. Before investing in futures or options, clients must receive the appropriate risk disclosure documents. Investment strategies explained in this report may not be appropriate at all times. Costs of such strategies do not include commission or margin expenses.

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

Ralph Axel
Rates Strategist
BofAS
+1 646 855 6226
ralph.axel@bofa.com

Paul Ciana, CMT
Technical Strategist
BofAS
+1 646 855 6007
paul.ciana@bofa.com

John Shin
FX Strategist
BofAS
+1 646 855 9342
joong.s.shin@bofa.com

Vadim Iaralov
FX Strategist
BofAS
+1 646 855 8732
vadim.iaralov@bofa.com

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

Bruno Braizinha, CFA
Rates Strategist
BofAS
+1 646 855 8949
bruno.braizinha@bofa.com

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

Europe

Ralf Preusser, CFA
Rates Strategist
MLI (UK)
+44 20 7995 7331
ralf.preusser@bofa.com

Ruben Segura-Cayuela
Europe Economist
BofA Europe (Madrid)
+34 91 514 3053
ruben.segura-cayuela@bofa.com

Mark Capleton
Rates Strategist
MLI (UK)
+44 20 7995 6118
mark.capleton@bofa.com

Athanasios Vamvakidis
FX Strategist
MLI (UK)
+44 020 7995 0279
athanasios.vamvakidis@bofa.com

Sphia Salim
Rates Strategist
MLI (UK)
+44 20 7996 2227
sphia.salim@bofa.com

Kamal Sharma
FX Strategist
MLI (UK)
+44 20 7996 4855
ksharma32@bofa.com

Ronald Man
Rates Strategist
MLI (UK)
+44 20 7995 1143
ronald.man@bofa.com

Michalis Rousakis
FX Strategist
MLI (UK)
+44 20 7995 0336
michalis.rousakis@bofa.com

Pac Rim

Adarsh Sinha
FX Strategist
Merrill Lynch (Hong Kong)
+852 3508 7155
adarsh.sinha@bofa.com

Janice Xue
Rates Strategist
Merrill Lynch (Hong Kong)
+852 3508 8587
janice.xue@bofa.com

Shusuke Yamada, CFA
FX/Rates Strategist
BofAS Japan
+81 3 6225 8515
shusuke.yamada@bofa.com