

# Asia FI & FX Strategy Watch

## Asia FX: The real risk of a nominal stability

### The dark side of FX stability

FX volatility in Asia has collapsed as policy makers intervene to reduce FX uncertainty, secure investment flows, and shadow the Fed. This is usually viewed as a good thing, with Asia inflation performance beating EM peers and Asian bond market duration less vulnerable with Asia's monetary policy anchored to the Fed.

Nonetheless, this policy brings with it negative side-effects and unintended consequences. Reducing the ability of the nominal or market exchange rate to adjust to fundamental shocks means that the prices in the underlying economy must adjust.

For example, holding interest rates high to shadow the Fed as well as stabilize the exchange rate, when the underlying economy is weak, would lead to an Asian country's domestic inflation falling and a real depreciation in the purchasing power of their currency. There is growing evidence this is happening in several Asian countries.

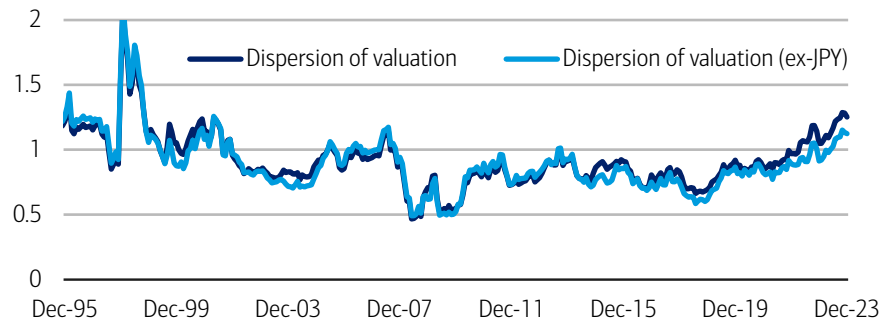
### Asia FX valuation divergence widens to historic levels

This dilemma is complicated by the fact that there are also several countries, where Asian currencies are experiencing a real appreciation as their rates of inflation exceed trading partners, because of keeping their market exchange rate steady over the years. This is resulting in a potential overvaluation of their currency (see INR and PHP).

Consequently, Asia FX policy intervention is resulting in a widening divergence in valuations not seen since the Asian financial crisis of 1997 and Global Financial Crisis of 2000. Exhibit 1 shows this dispersion (standard deviation) of current Asian real effective exchange rates from their 30-year average over time. The tail risk is that this FX policy and divergence of valuations will be put to the test if the Fed is unable to ease in June.

#### Exhibit 1: The dispersion of Asia FX valuations is historically high due to FX policies.

The standard deviation of Asian real exchange rates deviating from their long-term average



Source: BofA Global Research estimates, Bloomberg, BIS

BofA GLOBAL RESEARCH

21 February 2024

GEM FI & FX Strategy  
Asia

**Claudio Piron**  
Emerging Asia FI/FX Strategist  
Merrill Lynch (Singapore)  
+65 6678 0401  
[claudio.piron@bofa.com](mailto:claudio.piron@bofa.com)

#### Glossary:

PBoC: People's Bank of China  
CFETS: China Foreign Exchange Trading System  
REER: Real effective exchange rate  
BIS: Bank International Settlements

#### Currencies

CNY	Chinese renminbi
HKD	Hong Kong dollar
IDR	Indonesian rupiah
INR	Indian rupee
JPY	Japanese yen
KRW	South Korean won
MYR	Malaysian Ringgit
PHP	Philippine peso
SGD	Singapore dollar
THB	Thai Baht

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 6 to 8.**

12661325

Timestamp: 20 February 2024 04:00PM EST

## Nominal fixations belie real consequences.

One of the notable features of the Asia FX complex for the past couple of years is the notable collapse in FX volatility. This is especially so for CNY, INR, IDR, and KRW, where central banks are especially focused on dampening volatility.

Initially, this intervention was motivated by a desire to prevent Asia FX depreciation from aggravating higher inflation through increasing import prices, especially of commodities. More recently, the motivation has shifted to dampening FX volatility to protect already fragile foreign investor sentiment amid US-China tensions and secure foreign direct investment and portfolio inflows.

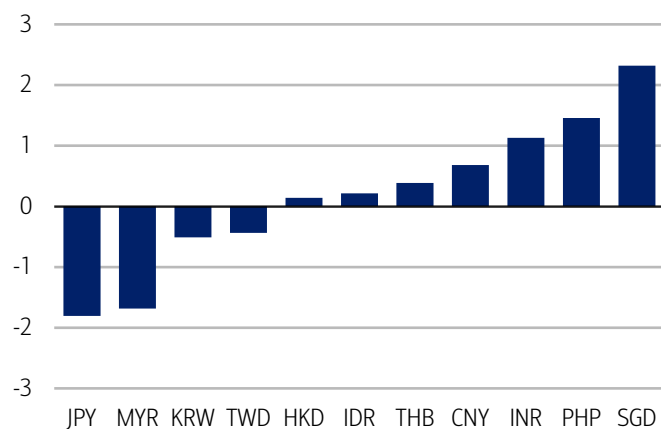
One of the consequences of this FX policy fixation on the stability of the nominal value of the exchange rate is that economic shocks must be absorbed through an adjustment in the real exchange, rather than the nominal exchange rate. The risk is that this could result in a fundamental misalignment of the currency and its external competitiveness.

For example, an EM country could be running high inflation, raising the cost of its production, but not allowing its currency to depreciate to compensate for this – resulting in FX overvaluation (see India/Philippines). Alternatively, a country could be running weak domestic growth and disinflation, but keeping its currency stable rather than nominally appreciating, resulting in currency depreciation and undervaluation. This in turn creates an overdependency on the export sector to support growth to the detriment of the domestic economy.

Exhibit 2 shows the current real effective exchange rate of Asian countries, subtracting from their 30-year average and divided by their standard deviation. This gives us the valuation of the currency in purchasing power parity terms against its trade-weighted partners. We can see that JPY and MYR look significantly undervalued and INR, PHP and SGD look significantly overvalued.

We can also look at how extreme this divergence in currency valuations shown in Exhibit 2 has evolved over time by taking the standard-deviation of this cross section in currencies over time. This is shown in Exhibit 3 and shows that Asian currencies are the most divergent in over 20 years (with or without the extreme undervaluation of the JPY included). The implication is that Asia's FX policy intervention is potentially becoming problematic in creating diverging over and under-valuations in the region.

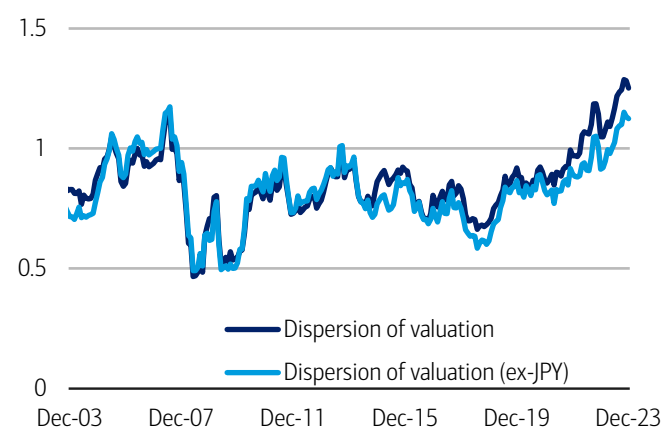
**Exhibit 2: REER values relative to 30-year average - standard deviation**  
SGD, PHP, INR appears rich, MYR and KRW appear very cheap



Source: BofA Global Research estimates, BIS

BofA GLOBAL RESEARCH

**Exhibit 3: The dispersion of Asia FX valuations is historically high**  
This would suggest relative value opportunities may emerge in long run



Source: BofA Global Research estimates, BIS

BofA GLOBAL RESEARCH

A natural criticism of the above valuation analysis is its pure focus on purchasing power parity. That the same basket of traded goods should be the same price in each country over time after adjusting for the exchange rate. Moreover, in Singapore's case, the monetary authority uses targeted trade-weighted exchange rate appreciation as its monetary policy tool to target inflation. Nonetheless, the overall valuation findings (with the exception of SGD, which appears fairly valued) are consistent with our more sophisticated equilibrium exchange rate model (COMPASS – see [World at a Glance: The wait for Fed](#)) that adjusts for the productivity, wealth and the savings equilibrium (current account) of the economy.

## What are the consequences?

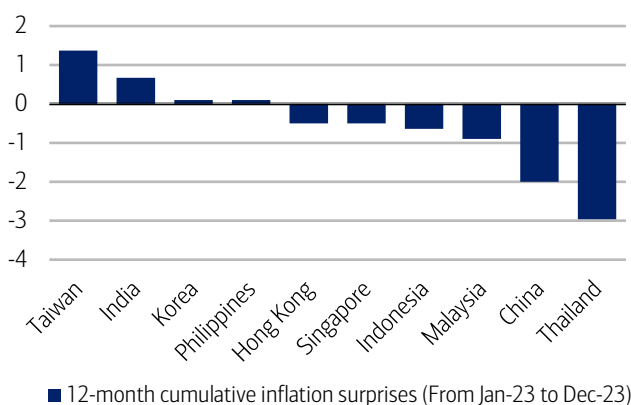
There are two key market implications of this pursuit of FX stability. The first is already evidenced by subdued inflation and dampened bond betas to US duration. Exhibit 4 shows the cumulative forecast error over the past year by the market consensus forecasts compiled by Bloomberg. Consumer price inflation was especially weaker than expected for Thailand, China, and Malaysia. Only Taiwan surprised to the upside largely due to adverse weather shocks affecting food prices. Additionally, Exhibit 5 shows that producer prices inflation is generally running below consumer price inflation, an indication that pipeline inflation pressures are running weak.

This is all indicative of overall policy conditions being too tight because of currencies being prevented from depreciating fully and interest rates being kept high as Asian central banks hold their breath for the Fed to cut interest rates.

This FX smoothing policy is resulting in low FX implied volatility in Asia relative to other EM peers and that Asia's duration sensitivity to the US rates sell-off is also less relative to its EM peers. Indeed, Asia's inflation surprises have been consistently below EM inflation surprises over the past 5-years. Asia's 10yr yield beta's to the US have also been below one and lower relative to their EM peers with local factors and policy still playing an important role in stabilizing the long end.

### Exhibit 4: Most Asian inflation CPI prints surprise to downside.

Chart represents the cumulative forecast errors over past 12months

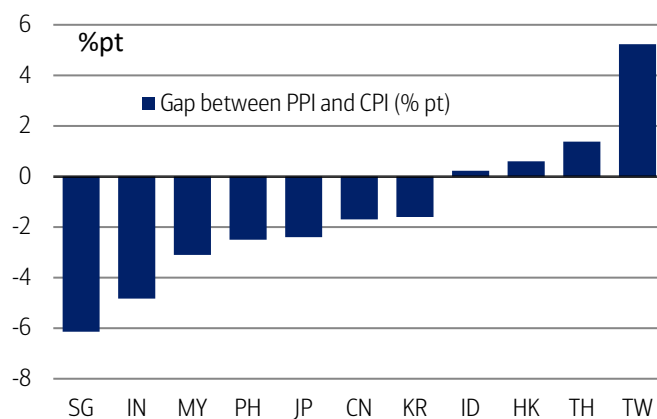


Source: BofA Global Research, Bloomberg

BofA GLOBAL RESEARCH

### Exhibit 5: Producer price pass through into Asia looks disinflationary.

Producer prices are also falling at faster pace than consumer prices



Source: BofA Global Research, Bloomberg

BofA GLOBAL RESEARCH

The second implication is yet to be determined. One risk is that deflationary pressure in countries could continue to build, ultimately pressuring capitulation and a competitive devaluation in the longer run. This could happen either by central banks stepping back from FX policy smoothing, cutting interest rates or portfolio outflows building. The second is that the disinflationary, undervalued currencies, could switch to reflationary policies, especially if the Fed were to cut interest rates and China were to engage in

more forceful fiscal stimulus. This makes the expectations for a June cut by the Fed especially critical.

## A final look at the big picture

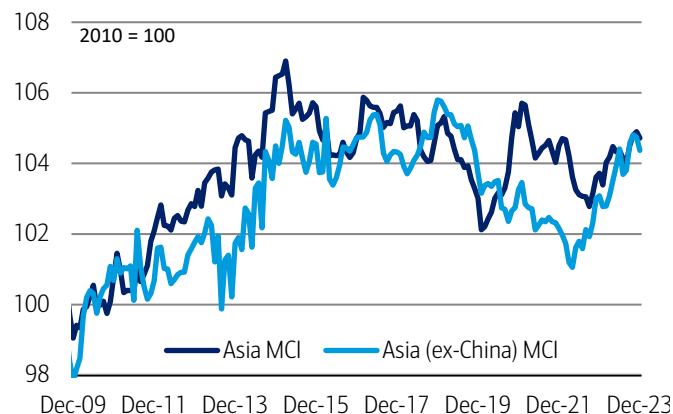
The above analysis focuses on the trade-weighted inflation adjusted exchange rates. Here, we put it together with the real short term interest rate (3-month), weighted by the trade-exposure of the economy (capped at 75%) and then by GDP weights to get an overall measure of monetary conditions in Asia and Asia ex-China – see Exhibit 6. This shows that monetary conditions in combined real FX and interest rate terms have tightened rapidly since end 2021 and the peak of COVID and the initiation of the Fed tightening cycle in 2022.

Indeed, looking at the changes of individual country monetary condition indices since end-2021, shows there has been a significant tightening in the Philippines, Indonesia, and Thailand, due to rising real interest rates. Indeed, PHP, IDR and THB may become vulnerable to depreciation pressure if they are unable to ease monetary policy in H2 amid disappointing growth dynamics and a further depreciation of the CNY real effective exchange rate.

Only in the case of HK, has the real adjustment in the exchange rate due to weaker inflation and a high trade weight in the monetary conditions index, been able to offset a rise in real interest rates.

### Exhibit 6: Asia's monetary conditions are tightening, not easing.

Nominal FX stability is putting downward pressure on prices

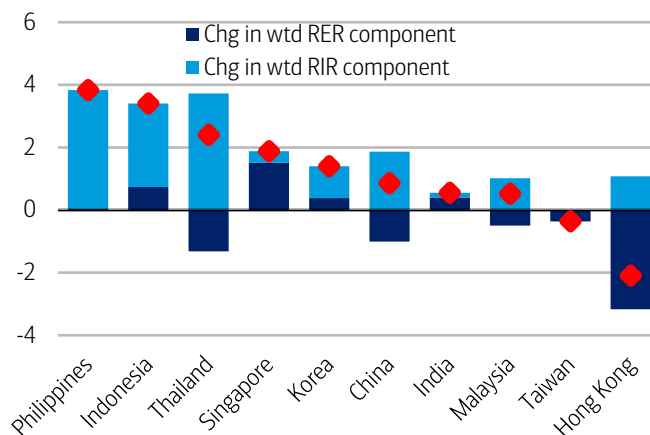


Source: BofA Global Research estimates

BofA GLOBAL RESEARCH

### Exhibit 7: Monetary conditions appear tightest in PHP, IDR and THB

Only HK is seeing easing in monetary conditions through real depreciation



Source: BofA Global Research estimates

BofA GLOBAL RESEARCH

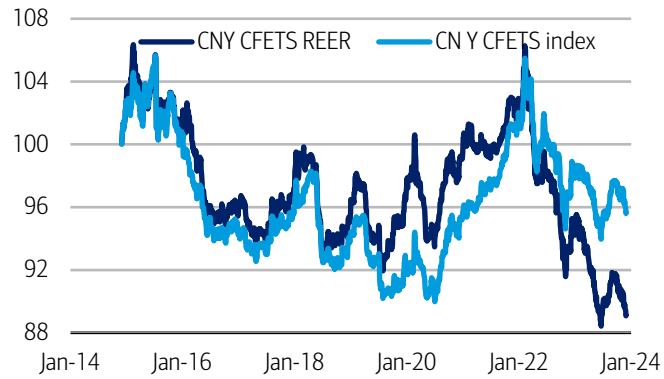
## Final piece of the puzzle - RMB

Overall, Exhibit 2 shows that the current CNY real valuation is in line with its 30-year average and there are no overt signs of pressure. However, it is worth noting the recent rate of change of real depreciation, especially against the PBoC's CFETS 24-currency basket, is more significant than the nominal depreciation.

Since the March 2022 peak, the CNY has depreciated 7% in nominal CFETS terms, but in real inflation adjusted terms the depreciation is 15%. Exhibit 9 shows the relative disinflation in China CPI relative to its trade partners have overwhelmed the nominal market moves to depreciate the trade-weighted exchange rate further. If this pace of depreciation continues into H2, it could spill over into depreciation pressure in other Asian currencies, especially if the Fed fails to ease interest rates in June.

**Exhibit 8: China RMB CFETS index also adjusted for inflation.**

China's disinflation is having a material impact on real FX valuation

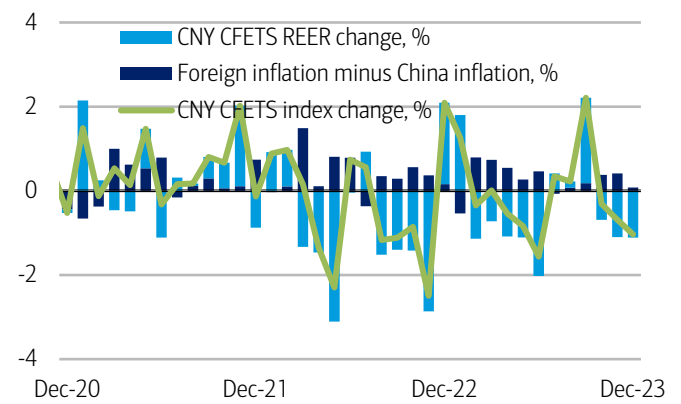


Source: BofA Global Research estimates, Bloomberg

BofA GLOBAL RESEARCH

**Exhibit 9: China real CFETS decomposed by inflation vs nominal index**

China's disinflation is diverging from inflation amongst its peers



Source: BofA Global Research estimates, Bloomberg

BofA GLOBAL RESEARCH

**Special Disclosures**

Some of the securities discussed herein should only be considered for inclusion in accounts qualified for high risk investment.

# Disclosures

## Important Disclosures

Due to the nature of strategic analysis, the issuers or securities recommended or discussed in this report are not continuously followed. Accordingly, investors must regard this report as providing stand-alone analysis and should not expect continuing analysis or additional reports relating to such issuers and/or securities.

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.bofam.com/BofASEdisclaimer](http://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 Canadian Investment Regulatory Organization; 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 HKSF; 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.

Certain investment strategies and financial instruments discussed herein may only be appropriate for consideration in accounts qualified for high risk investment.

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 2024 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 or 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.