Municipals Educational Series

Primer on make-whole calls

Primer

17 January 2024

Municipals
United States

Table of Contents

Yingchen Li
Municipal Research Strategist
BofAS
yingchen.li@bofa.com

Ian Rogow
Municipal Research Strategist
BofAS
ian.rogow@bofa.com

John Lombardi
Municipal Research Strategist
BofAS
jlombardi3@bofa.com

Sophie Yan
Municipal Research Strategist
BofAS
sophie.yan@bofa.com

John Reilly
Municipal Research Strategist
BofAS
john.reilly2@bofa.com

Key takeaways

- Many corporate and taxable muni bonds have make-whole calls. There is no reason to avoid a bond simply because of the MWC.
- MWCs are exercised infrequently, though issuers exercise conventional calls on bonds that also have MWCs.
- The exercise of a MWC almost always benefits the investor.

What is a make-whole call?

A make-whole call (MWC), if exercised, provides a bondholder with the greater of the par value of the bond or the price that corresponds to a specified yield spread over a particular Treasury security, plus the accrued interest. The concept behind the MWC is to attempt to allow investors to at least be "made whole" in the event that the security gets called before maturity.

The price at which the MWC is exercised will vary as the yield on the Treasury security changes: there is no theoretical limit to how high the price can go. In contrast, for a traditional call option, the call price is fixed or varies according to a pre-specified schedule.

Better price performance

Bonds that have MWCs and nontraditional calls will almost always do better when market yields decline than bonds with traditional calls alone, all else equal.

Since the issuer is unlikely to exercise a MWC, investors have much less to worry about trying to re-invest the proceeds of a called security when yields have declined, as with a traditional call. The flip side is that the coupon rate on a MWC bond is generally lower than for an otherwise similar bond with a traditional call.

Issuer can tender rather than make whole

When yields decline, issuers of MWC bonds may invoke Tender Offers in order to be able to re-finance at the lower market rates. The yield spread on a Tender Offer is typically between the current market spread and the MWC spread. The investor is not required to participate in a Tender Offer.

MWC: make-whole call

Recent Municipals Research

Municipals Weekly: More credit spread compression ahead 12 January 2024

Municipals Weekly: March's gravitational pull is strong 05 January 2024

Municipals Quarterly: 4Q23 in review 03 January 2024

Monthly Municipal ESG Monitor: November 2023 19 December 2023

Municipals Weekly: Fed to markets: "Happy Holidays!" 15 December 2023

Municipals Weekly: Ratios to retest record lows 08 December 2023

Municipals Year Ahead 2024: Run it back 01 December 2023

What is a make-whole call?

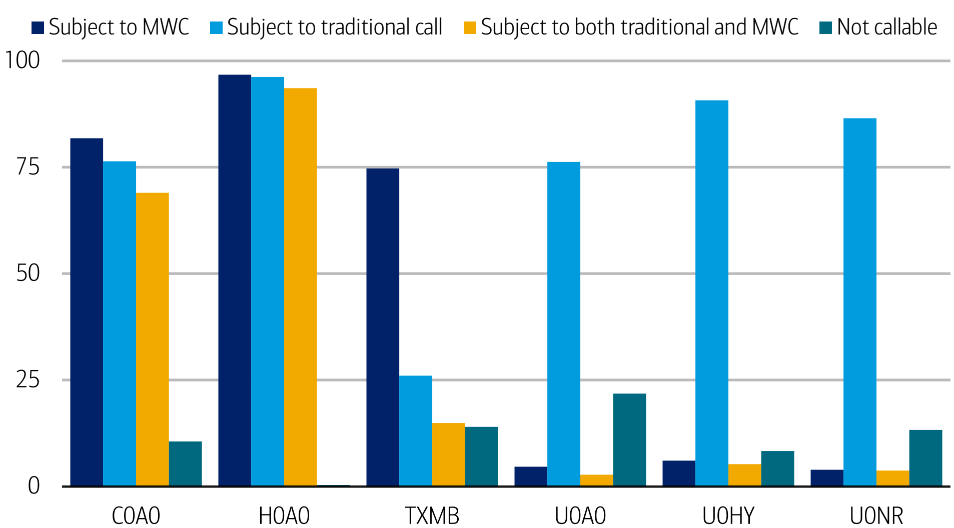
A make-whole call (MWC), if exercised, provides the bondholder with the greater of the par value of the bond or a price that corresponds to a specified yield spread over a particular Treasury security, plus the accrued interest. That price will vary as the yield on the Treasury security changes. MWCs are exercised infrequently.

In contrast, a traditional call option allows the issuer to redeem the security at a specified price on or after a specified date. The call price is either fixed or changes according to a specified schedule. Some bonds have both MWCs and traditional calls.

The issuer can generally exercise the MWC at any time, while a traditional call option typically cannot be exercised until a specified date after the bond is issued. In both cases, the issuer holds the call option. Exhibit 4 on page 5 summarizes the differences between the two types of calls.

MWCs debuted in 1995 and has since become mainstream. Reviewing the ICE BofA US Corporate (C0A0) index shows that nearly 82% of investment grade corporate bonds by market value have a MWC. Analyzing the US High Yield Index (H0A0) reveals that 97% of its bonds have a MWC. As Exhibit 1 shows, MWCs are rare in the tax-exempt municipal market: just 5% of the ICE BofA US Municipal Securities (U0A0) index by market value and 6% of the ICE BofA US Municipal High Yield Securities (U0HY) index have MWCs. The taxable municipal market – which is more corporate-like – has significantly more bonds with a MWC: in fact, almost three-fourths of the ICE BofA Broad US Taxable Municipal Securities (TXMB) index by market value has a MWC.

Exhibit 1: Types of call options on corporate bonds and municipal bonds, high grade vs high yield (%)
While ubiquitous in the corporate bond market, MWCs are rare in the tax-exempt muni market



Note: C0A0 is the ICE BofA US Corporate Index, H0A0 is the ICE BofA US High Yield Index, TXMB is the ICE BofA Broad US Taxable Municipal Securities Index, U0A0 is the ICE BofA US Municipal Securities Index, U0HY is the ICE BofA US Municipal High Yield Securities Index and U0NR is the ICE US Non-Rated Municipal Securities Index.
Source: BofA Global Research, ICE Data Indices, LLC, Bloomberg

BofA GLOBAL RESEARCH

Example of a make-whole call

Exhibit 2 shows an example of a MWC where a company issues a 10-year bond at par with a 5.40% coupon/yield. The benchmark used for the security is usually a Treasury security that has the same maturity. In our example, the benchmark Treasury security yields 4.07%. The 5.40% yield on the corporate bond is a 133bp spread over the benchmark Treasury. The MWC feature on the corporate bond allows the issuer to redeem the security at the greater of par or a 25bp spread over the yield on the benchmark Treasury security.

Exhibit 2: Make-whole call example
A MWC often benefits the investor

10-year corporate bond issued at par	
Coupon/Yield	5.40%
10-year Treasury yield	4.07%
Corporate spread to Treasury (bp)	133
Make-whole call spread (bp)	25

Source: BofA Global Research

BofA GLOBAL RESEARCH

To illustrate how the exercise of a MWC would benefit the investor, imagine that the issuer exercised the call right away. The bond would then be called at a yield of 4.32% (the 10-year Treasury yield of 4.07% plus 25bp), which would correspond to a price of 108.57. The investor would realize an 8.57% windfall.

As we will explain in more detail later, a key element behind the potential windfall from the exercise of the MWC is that the MWC spread is well below the market spread when the bond is issued. Typically, the MWC spread is about 15%-20% of the market spread. In our example, the bond is issued at a spread of 133bp over the Treasury (5.40%-4.07%), while the MWC spread is 25bp.

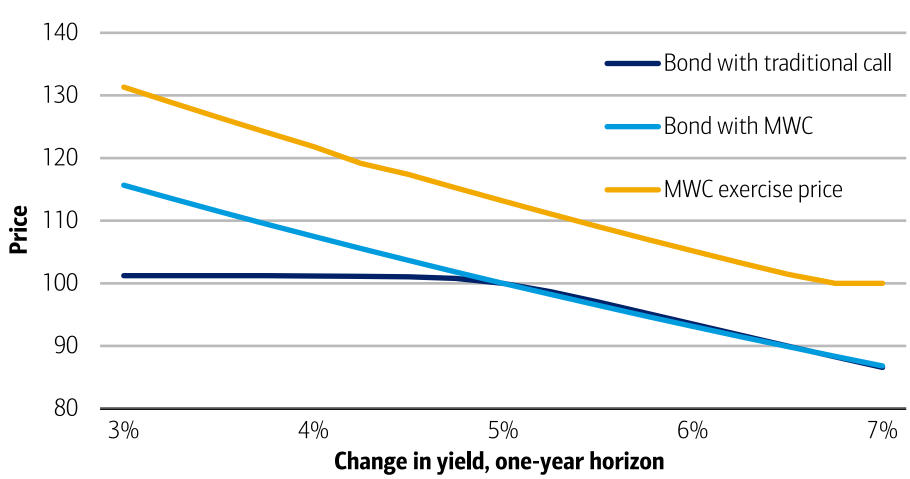
In contrast, a 10-year bond with a traditional call usually might not become callable until a few years after issuance. The call price might be at par (100), or slightly above. In cases where the initial call price is above par, the call price usually declines over time according to a set schedule.

In short, in the unlikely event that a MWC is exercised, the investor benefits from the decline in market yields. Under most plausible scenarios, the investor is at least “made whole”.

Advantages of MWCs for investors

Exhibit 3 illustrates how prices would change with yields for a MWC bond that does not also have a traditional call, and for a bond with a traditional call with a near-term call date. It also shows what the MWC exercise price would be under different assumptions for changes in market yields.

Exhibit 3: Prices as yields change: MWC vs. traditional call
More upside to MWC price



Source: BofA Global Research, Bloomberg

BofA GLOBAL RESEARCH

The MWC bond illustrated in the Exhibit above has 10 years remaining to maturity and a 5.00% coupon. The bond with the traditional call is also priced at par with a 5.00% coupon, but can be called within three months. As before, we assume that the bond was issued at a 133bp yield spread over the relevant Treasury security and that the MWC spread is 25bp over the Treasury. The Exhibit shows the prices that correspond to changes in yield of two percentage points in 12 months.

As market yields change, the price of the MWC bond moves the same way as a bond without a call option. That's because the MWC imposes no limit on the price of the bond. The price of the bond will keep rising as yields decline.

In contrast, for a bond with a traditional call, the price will not stray far above the call price, especially when the call date is near or has arrived. That feature means that bonds that have traditional calls have negative convexity. The potential price rise for a given decline in yields is less than the potential price decline for the same rise in yields.

It is worth underlining that the call features of many of the more recently issued bonds that have both conventional calls and MWCs do not become callable until a few months before maturity. These bonds generally trade similar to non-callable bonds, at least until the call date draws near.

The uppermost line in Exhibit 3 shows the MWC exercise price, assuming that the yield on the benchmark Treasury security moves by the same magnitude as the yield on the corporate bond (i.e., spreads remain constant). Under this assumption, the MWC exercise price is always higher than the market price of both the bond with the traditional call and the MWC. Specifically, the MWC price is the greater of the price that corresponds to a yield of 25bp above the yield on the benchmark Treasury security, or par.

More certainty about the yield over the life of the bond

A MWC bond gives the investor more certainty about the cash flows than a traditional call. A traditional call will likely be exercised when market yields decline. The investor would then face having to re-invest the returned principal at the lower market rates, and therefore, will likely realize a lower yield than the stated yield to maturity.

Comparatively, as the MWC is much less likely to be exercised, the investor has more certainty about receiving the coupon stream until the bond matures. As Exhibit 3 shows, if the MWC is exercised, the investor gains a larger payout than with the traditional call.

An exercise of the call usually benefits the investor

The typical MWC structure almost always benefits the investor in the unlikely event that the MWC is exercised, as the MWC spread is typically well below the market spread.

Returning to the example in Exhibit 3, suppose that one year after issuance the issuer elects to exercise the MWC due, perhaps, to a merger. If the Treasury yield has fallen from 4.07% to 3.07%, the MWC price is the one that corresponds to a 3.32% yield – the 3.07% Treasury yield plus the 25bp MWC spread. The corresponding price for what is now a nine-year security is 115.80, a good-sized premium over the par price of 100. In our example, the MWC price is also substantially above the market price.

Even if Treasury yields were to rise substantially, the investor would not lose out if the MWC is exercised. For example, if the Treasury yield rises to 5.50%, the MWC yield would be 5.75%. That would translate to a price below par, but the MWC exercise price is the higher of par or the price implied by the MWC yield. The Exhibit shows that the MWC exercise price does not fall below par.

Could the MWC exercise be below the market price?

Under all plausible circumstances, the MWC price will be higher than the price at which a bond with a traditional call would be exercised. But could the MWC exercise price ever be less than the market price? Yes, but only if spreads narrow substantially.

In our example, the MWC spread is 25bp, well below the 133bp spread in the market when the bond was issued. The MWC exercise price affords the investor the price gain that would be associated with a 108bp spread narrowing – the original 133bp spread minus the 25bp MWC spread.

Only if the actual spread narrowed substantially, from 133bp to less than 25bp in our example, would the market price exceed the MWC exercise price. For example, if the Treasury yield stayed at 4.07% and the corporate bond yield tumbled to 4.30% a year after issuance, the market price would exceed the MWC exercise price.

Lower coupons on MWC bonds

The flip side of these favorable characteristics that MWCs have for investors is that the issuer can generally pay a lower coupon rate than what would prevail for a bond with a traditional call.

Why do issuers use MWC provisions?

The example in Exhibit 3 demonstrated why issuers rarely exercise a MWC, as doing so would mean buying the security at much higher than the market price. So why do companies issue bonds with MWCs?

MWCs provide issuers with added flexibility in managing their capital structures to allow for unforeseen events, such as takeovers, mergers, material asset sales, or changes in the equity structure. The desire to remove restrictive bond covenants can also prompt debt refinancing.

MWC options could also be less costly for the issuer than traditional call options. Issuers usually have to pay a higher coupon in order to compensate the investor for the drawbacks of a traditional call. As mentioned, those drawbacks include the limited upside on the price and the prospect of having to re-invest the proceeds of the called bond when interest rates have declined.

In declining rate environments, issuers have invoked Tender Offers for bonds that have MWCs. The yield spread to Treasuries on the Tender Offer is usually narrower than the market spread, but wider than what would apply with a MWC. Investors are not required to participate in Tender Offers. See Exhibit 4.

Exhibit 4: Characteristics of traditional versus MWC bonds
MWCs are rarely exercised

Criteria	Traditional call	MWC
Call price	• Call price fixed.	• Call price rises (falls) as benchmark Treasury yield falls (rises) but will not fall below par.
Limits on market price	• Market price constrained by call price.	• Call imposes no constraint on market price.
Consequences of the call for an investor	• Proceeds would likely have to be re-invested at a lower rate than the yield of the original bond, reducing the yield over the stated maturity.	• The investor usually receives a premium over the market price.
When can the call be exercised?	• Callable according to specified schedule and usually issued with call protection for set period.	• Callable at any time, though usually exercised during a restructuring such as a merger, takeover, or changes in equity structure.
Convexity	• Negative convexity: a given rise in yields will reduce the price by more than the same decline in yields will raise the price. Upside in price is limited by call price.	• Positive convexity: a given rise in yields reduces the price by less than the same decline in yields will raise the price.
How often is the call exercised?	• Call usually exercised if market rates fall enough below the coupon rate, and the call date has passed.	• Call rarely exercised.
Coupon rate	• Issuers generally pay a higher coupon rate than for a non-callable bond to compensate for the call.	• Generally same coupon rate as for a non-callable bond.
Who holds the call option?	• Issuer decides whether to exercise call.	• Issuer decides whether to exercise call.

Source: BofA Global Research

BofA GLOBAL RESEARCH

Options Risk Statement

Options and other related derivatives instruments are considered unsuitable for many investors. **Options strategy is by definition governed by a finite duration. The most severe risks associated with general options trading are total loss of capital invested and delivery/assignment risk, all which can occur in a short period.**

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 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 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.

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