

BofA Global Research Podcasts

Crypto tokens, differentiating the useful from the useless and utility of stablecoins

This is a redacted version of a report published on February 22, 2022.

BofA SECURITIES **BofA Research Podcasts: Crypto tokens, differentiating the useful from the useless and utility of stablecoins****01 March 2022**Cryptocurrency & Digital Assets
Global**Thomas (T.J.) Thornton**
Head of Rsch Mktg & Analytics
BofAS**Alkesh Shah**
Crypto&Digital Assets Strategy
BofAS**Cryptocurrencies – Not just for speculating**

Cryptocurrencies have received a lot of focus in recent years as crypto market values have turned some small investors into wealthy investors. But with the number of tokens proliferating and numbering over 17,000, it's clear that many will not create wealth and it's critical to understand which tokens offer usefulness and potential longevity. Alkesh Shah joins us to discuss some of his new analysis and how daily active users, transaction count and developer activity can help indicate which blockchain platforms will grow and which will shrink. Regulation will play a key factor in the mass adoption of stablecoins and how consumers can exchange their coins for dollars. Alkesh also discusses the use of NFTs and how they can grow from digital art to an ownership contract or an event ticket. *BofA Global Research Podcasts can now be found on public podcast platforms including Spotify, Apple Podcasts, Google Podcasts and Amazon Music. These podcasts are first released to clients and then to the platforms.*

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 7 to 8.

12388752

Timestamp: 01 March 2022 03:21PM EST

Full Podcast Transcript

T.J. Thornton, Head of Product Marketing and Predictive Analytics: Hello, and welcome to BofA Global Research Podcast, where we discuss what's rising from growth industries to rising risks and opportunities in global markets. I'm T.J. Thornton, Head of Product Marketing and Predictive Analytics at BofA Global Research, and we're recording this episode on Tuesday, February 8, 2022.

"You're starting to see it in insurance, but you're seeing it in supply chain management and loyalty cards. You're seeing applications hitting each industry, but really every industry ultimately can use digital assets as a form of application development and as platforms that can make them more frictionless, so cheaper transactions and really much easier to use for their customers and their developers." -Alkesh Shah

Price swings in cryptocurrencies and certainly the recent declines have gotten a lot of focus, but aside from looking at price and technical levels, how else can digital assets be analyzed, and how do you compare tokens to one another and what about NFTs? Here today to talk about this is Alkesh Shah, Head of Global Cryptocurrencies and Digital Assets Strategy in Global Research. Thanks Alkesh for joining us today.

Alkesh Shah, Head of Global Cryptocurrencies and Digital Assets Strategy:

Thanks for having me on T.J.

T.J. Thornton: Okay. Alkesh a lot of people talk about crypto market values, which is a useful way to think about what's big now, but you note in your recent report out this morning that only five tokens in the top 20 by market value in January of 2018 remain in the top 20 today. Can you talk about some of the ways to assess which tokens might be big in the future?

Alkesh Shah: There's limited ways that people are really analyzing these tokens today, and we are working on creating a framework so that we can really apply analytics here. So, if you take a step back, there's 15 to 20k tokens out there, and very little analysis is done on those 15 to 20k, and you can actually create a new token for just a few hundred dollars. I could create Alkesh coin in 72 hours for \$300, but I'm not sure how much demand there's going to be. What we've done is we've found those tokens that actually have blockchains that are either operating systems that you can build applications on top of, or are applications that people are actually using. So, by looking at that ecosystem of developers, users, transactions, and finding clear use cases for blockchains, we can bring that universe of tokens that really are growing in value down to maybe a hundred tokens.

T.J. Thornton: Okay. Now, Alkesh, you discussed the importance of a token's DAUs or Daily Average Users and the number of transactions. Are we seeing increased or decreased usage across digital assets, especially with the selloff, and what does that mean?

Alkesh Shah: So, as we think about blockchains as operating systems, and I'm putting Bitcoin to the side because Bitcoin is more of a supply/demand commodity, but the newer blockchains that have really been created over the last few years Ethereum, Solana, Avalanche, Polkadot, Polygon usage is key to see which ones will survive, which ones are going to grow and which ones are going to shrink. Our view is that by analyzing the daily active users, the transactions, as indicators of use and looking where there's growth, that's where the value is going to rise because that's where people are going, that's what people are using and that's where applications are being built.

T.J. Thornton: Okay, and on-chain analytics gets discussed a lot. It's a tool that's unique to crypto because of the blockchain transparency. What can it tell us, and how do you actually do the analysis?

Alkesh Shah: A lot of people think blockchain is this murky sort of area where everything is anonymous and you don't really know what's happening, but actually



everything in the blockchain is public, so you can track the flows of different trades of different funds as they move through wallets. When we look at token flows and stablecoin flows through wallets and also wallets that are held on exchanges, what we can see is that if a token moves out of a wallet and goes to an exchange, it's likely because somebody wants to either sell the token or do something with it, but since they might be selling it, there could be some sell pressure. On the other hand, when stablecoins are transferred to an exchange wallet, usually those are used to really do trading or staking, so that could be an increase in buy pressure for tokens generally. By tracking these flows, you can actually see where there could be future selling or buying pressure, as well as where there might be a reversal of trends, if a token has gone up a lot or gone down a lot.

T.J. Thornton: Okay. Got it. And quick follow up there. Is there a typical lead time between when somebody say transfers a token to an exchange wallet and when they actually sell it? Do they tend to transfer an amount and then sell a smaller amount overtime, and therefore it can be a leading indicator?

Alkesh Shah: We probably still need to do more work on that, but usually if somebody has a wallet that's outside of the exchange and they move it onto the exchange, they're probably going to transact fairly quickly, as opposed to just leaving it there since they probably are looking for yield, they're looking to buy something with that token that they put onto the exchange. We think the lead time is fairly short, but we still need to do some work.

T.J. Thornton: Okay and you and the data team have also looked at alternative data like token mentions on Reddit and Twitter. What do you find and do these mentions of specific coins, merely track price, or could a big spike in mentions actually be a contrarian signal?

Alkesh Shah: It really works both ways. It's a reinforcing loop, meaning that if somebody's really excited about token, and it could be because the tokens providing a really good application use case as we've been talking about in terms of building an ecosystem, or it could be that people are just excited about a meme - like shiba because it's cool, but it helps us figure out on the positive side as that's going on, but at the same time, it's also works on the negative side. So, you do get exaggerated moves, up and down depending on sentiment. And what I mean by the negative side is somebody is disappointed by a blockchain or token, or if they're turning against a meme, then it reinforces on the downside as well. So, really this is useful for is to see where you're going to get more and more momentum, either to the upside or the downside, but you do have to do another layer of work to figure out if the sentiment's positive or the sentiment's negative.

T.J. Thornton: Okay. Well, Bitcoin is often viewed as an inflation hedge or store of value. What has your analysis shown about how much of an inflation hedge it actually is? If it's not one now, do you think that it could become one in the future?

Alkesh Shah: So Bitcoin has been an amazing risk asset. It's gone from nothing to \$800bn of value for those 19 million coins in 10 years - so one of the best risk assets in history. Our analytical work shows no support for a store of value because it's just gone up. A store of value tends to be flat or as an inflation hedge, and that might possibly be we haven't had a lot of inflation over the last number of years, so we haven't been able to do that work to see whether it is an inflation hedge. It could be, we don't know, but really Bitcoin, as well as other cryptocurrencies, act very much like risk assets and as an emerging growth sector broadly. So, speculative risk asset, doing extremely well, supply demand dynamics are really what drive Bitcoin, and with supply relatively fixed and demand continuing to grow, we actually think it'll continue to rise as a risk asset, intermediate and long-term.



T.J. Thornton: So Alkesh you've written that you expect blockchains to differentiate themselves over time through optimization for specific use cases. Can you explain what you mean by this, and what are the implications for token prices?

Alkesh Shah: Sure. So, if you think about, again, blockchains as operating systems, really they're built on three legs. They're built on either they're scalable, they're decentralized, or they're very secure and there's a tradeoff among all three, depending on the blockchain. And so since blockchains after Bitcoin, Bitcoin is a fixed blockchain with a fixed application, but since then the other blockchains that are acting like operating systems like Ethereum, like Solana, like Avalanche, they actually stress one of those legs over the others to provide different types of use cases. That's really, what's differentiating these blockchains, depending on if they're able to attract the applications that leverage that differentiation, and then those applications can actually get the users, then the value of that blockchain operating system can rise. But they actually have to provide that differentiation. They have to attract the developers to build on their operating system or blockchain, and get the users on for that value to actually happen. But we are definitely seeing blockchain differentiation happening. Ethereum was the first one that operated as an operating system, and it has thousands of applications built on it, and it's so successful, that it's become congested, but it really tried to do everything for everyone. And these new blockchain operating systems that have really been formed, only over the last couple of years, are providing more and more differentiation, so that financial applications may be built on a blockchain that's faster. NFT creation may be built on a blockchain that's cheaper, and so you're definitely seeing that differentiation occur.

T.J. Thornton: Okay, great. Could some of those apps move away from Ethereum, as other blockchains do become more efficient, maybe faster?

Alkesh Shah: Sure, and we don't view this as a zero sum game. We actually think there's going to be more and more applications across more and more use cases across every single industry. Right now you can see applications, certainly in the financial area, payments area; you're seeing it in art. You're starting to see it in insurance, but you're seeing it in supply chain management loyalty cards. You're seeing applications hitting each industry, but really every industry ultimately can use digital assets as a form of application development and as platforms that can make them more frictionless, so cheaper transactions and really much easier to use for their customers and their developers.

T.J. Thornton: Okay and another big topic: regulation. You've written that regulation, particularly around stablecoins, could be a catalyst to mass adoption, so why do you think that this is the case?

Alkesh Shah: So, stablecoins are a really interesting application of these blockchain operating systems. Stablecoins are built on the blockchain operating systems, mainly Ethereum today, but they may move on to other operating systems over time. And what really makes stablecoins interesting is they're pegged to a currency. It's usually the dollar, but there's stablecoins pegged to gold, there's stablecoins pegged to other stablecoins. But what's good about stablecoins is because they're pegged to a fiat currency and usually the dollar, they're stable, meaning they're not volatile. Which means that you can actually use it for a payment, so that if you're sending money overseas, you can actually use a stablecoin, and if you send a dollar worth of stablecoins, it's received as a dollar. Why would you do it with a stablecoin, as opposed to just sending a dollar? Is that the fee to send a dollar is around 5%, whereas using a stablecoin, it's relatively free cause it's going from smartphone wallet to smartphone wallet. Also, to send a dollar across the border, it can take two to five days to settle, whereas with a stablecoin, it happens within minutes, maybe even within seconds. And so that's why stablecoins, certainly for transfer of funds, is very interesting. At the same time, it's also something that if you're going to go to the metaverse and you are going to buy something, virtually, having a stablecoin is really much more useful than converting fiat currency into



whatever currency that metaverse happens to use. It could be corporate metaverse, it could be anything, but ultimately we're all probably going to do some transactions over the metaverse over the next five to 10 years, and that's why regulation really needs to come in here because if transactions of stablecoins have reached about a trillion dollars a month this year, that's up from a trillion and a half dollars, a quarter for stablecoin transactions. It's something that people are really using. When you think about the next billion people that are going to do cryptocurrency trading, payments, using it just to buy stuff in stores, you really need to make sure that if somebody markets a stablecoin as a dollar, that it's backed actually by a dollar, and if you want your dollar refunded, you could actually get it.

T.J. Thornton: Okay and another interesting aspect to stablecoins, one that you wrote about today, is that some of them actually have increased in value and can also pay a yield. So, you're saying they don't just track say the U.S. dollar, and why is it that they can fluctuate in value and pay something?

Alkesh Shah: What's interesting about stablecoins is when you use a stablecoin in an exchange, you're using it to buy other things, and when there's volatility in the market, you might want to go to your stablecoin for safety. And so therefore demand for stablecoins can rise, which because they're pegged to a dollar and they have to shift, there's a little bit of a lag, so they could be worth a little bit more than a dollar at times when demand is very high, they could go a little bit below a dollar. But they're relatively at a dollar. In terms of yield though, what's interesting is that you can actually stake your stablecoins to provide liquidity for other markets and for other exchanges. By doing that, you tie up your stablecoin for a while, just like a money market instrument, you know how for a CD, if you lock it up for six months, you make a little bit more than a savings account, not a lot more, but a little bit more. In this case with stablecoins, because liquidity is so important for lending and other parts of the digital asset universe, you can make 2 to 5% on average with a stablecoin as a yield with relatively low risk because of over collateralization, which is why it's attracting so much and why we're reaching that trillion and a half dollars of transactions a quarter last year and close to a trillion dollars a month this year.

T.J. Thornton: Okay - last question, NFTs. You've written that they're much more than weird looking JPEGs that sell for millions of dollars. So, what are some of the other use cases for NFTs? And I know you did some analysis in this piece too, have they gained in popularity very recently, even as we've seen this decline in crypto?

Alkesh Shah: NFTs definitely have gotten much more interesting. They've been around since 2018, when there were just a bunch of NFTs that had cute cats. But then really last year with the sale of a digital art piece for \$69mn at Christie's, everybody wanted to get involved. And so first as digital art, it's also still important. There are funny looking apes and so on, but what's really interesting is that they've been able to add applications to NFTs. They've made NFTs dynamic. What that means is that you can turn NFT into an event ticket and that event ticket, every time you go to the event; it actually is smart enough to know whether or not you can have access to backstage, whether or not maybe you can get a free t-shirt when you're there, so it can actually provide some perks. At the same time, NFTs can also, again, because you can now stick applications on them, you can have a musician sell an NFT as ownership to a song and have the royalty stream, part of it come back to the musician, and part of it go to the person who bought the NFT. So, then it becomes an ownership stake, but also a royalty stream, and then finally, one of the really interesting cases for NFTs is using it as an insurance contract. Now you can connect a real live data link into an NFT. Say a farmer buys the NFT, and if the temperature goes above a certain range or below a certain range, the insurance policy is immediately paid out to the farmer. You don't need an insurance adjuster. The insurance company doesn't have to constantly rewrite insurance contracts, and so NFTs have a number of use cases because they are, and the technical term is smart contract enabled,

but once you do you that you actually can do so many more things, besides digital art, but the digital art world is also very important.

T.J. Thornton: Okay - Alkesh thank you very much for an excellent conversation. I hope to have more of these because we only just touched on so many interesting topics. Appreciate your time.

Alkesh Shah: Great. Thanks a lot for having me.

T.J. Thornton: There are 17,000 tokens out there. It's cheap and easy to create new ones, but only a small percentage of them actually have use cases, and that's why Alkesh has analysis of daily average users, transactions and even the number of developers on a platform is so important to understand which actually have promise. And staying on the theme of usefulness, payments companies could integrate stablecoins into their networks to allow for cheaper payments and cross-border transactions; a better regulatory framework probably helps there. And NFTs aren't just pixelated art; they can prove you have insurance coverage, backstage access at a concert and many other things. NFT sales volume on a major exchange actually doubled in January versus December. Thanks very much for joining us today.



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.

Other Important Disclosures

From time to time research analysts conduct site visits of covered issuers. BofA Global Research policies prohibit research analysts from accepting payment or reimbursement for travel expenses from the issuer for such visits.

Prices are indicative and for information purposes only. Except as otherwise stated in the report, for the purpose of any recommendation in relation to: 1) 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; or 2) 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.

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.

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.

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). Note that BofA Securities Europe SA has registered address at 51 rue la Boétie, 75008 Paris, is registered under no. 842 602 690 RCS Paris, and its share capital can be found on [BofASE's disclaimer webpage](#); BofA Europe (Milan): Bank of America Europe Designated Activity Company, Milan Branch, regulated by the Bank of Italy, the European Central Bank (ECB) and the Central Bank of Ireland (CBI); BofA Europe (Frankfurt): Bank of America Europe Designated Activity Company, Frankfurt Branch regulated by BaFin, the ECB and the CBI; BofA Europe (Madrid): Bank of America Europe Designated Activity Company, Sucursal en España, regulated by the Bank of Spain, the ECB and the CBI; Merrill Lynch (Australia): Merrill Lynch Equities (Australia) Limited, regulated by the Australian Securities and Investments Commission; Merrill Lynch (Hong Kong): Merrill Lynch (Asia Pacific) Limited, regulated by the Hong Kong Securities and Futures Commission (HKSF); Merrill Lynch (Singapore): Merrill Lynch (Singapore) Pte Ltd, regulated by the Monetary Authority of Singapore (MAS); Merrill Lynch (Canada): Merrill Lynch Canada Inc, regulated by the Investment Industry Regulatory Organization of Canada; Merrill Lynch (Mexico): Merrill Lynch Mexico, SA de CV, Casa de Bolsa, regulated by the Comisión Nacional Bancaria y de Valores; Merrill Lynch (Argentina): Merrill Lynch Argentina SA, regulated by Comisión Nacional de Valores; 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 (Indonesia): PT Merrill Lynch Sekuritas Indonesia, regulated by Otoritas Jasa Keuangan (OJK); Merrill Lynch (Israel): Merrill Lynch Israel Limited, regulated by Israel Securities Authority; Merrill Lynch (Russia): OOO Merrill Lynch Securities, Moscow, regulated by the Central Bank of the Russian Federation; 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.

Digital assets, including cryptocurrencies and digital tokens, are a new technological innovation and are extremely speculative assets. Digital assets are volatile, have variable liquidity and may be subject to manipulation or fraud. Digital asset markets are relatively nascent and are not regulated in a manner similar to U.S. securities markets. Digital assets do not have a standardized exchange, like a stock market. Any future regulatory developments could limit or affect the viability of digital assets.

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.

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 2022 Bank of America Corporation. All rights reserved. iQDatabase® is a registered service mark of Bank of America Corporation. This information is prepared for the use of BofA Securities clients and may not be redistributed, retransmitted or disclosed, in whole or in part, or in any form or manner, without the express written consent of BofA Securities. BofA Global Research information is distributed simultaneously to internal and client websites and other portals by BofA Securities and is not publicly-available material. Any unauthorized use or disclosure is prohibited. Receipt and review of this information constitutes your agreement not to redistribute, retransmit, or disclose to others the contents, opinions, conclusion, or information contained herein (including any investment recommendations, estimates or price targets) without first obtaining express permission from an authorized officer of BofA Securities.

Materials prepared by BofA Global Research personnel are based on public information. Facts and views presented in this material have not been reviewed by, and may not reflect information known to, professionals in other business areas of BofA Securities, including investment banking personnel. BofA Securities has established information barriers between BofA Global Research and certain business groups. As a result, BofA Securities does not disclose certain client relationships with, or compensation received from, such issuers. To the extent this material discusses any legal proceeding or issues, it has not been prepared as nor is it intended to express any legal conclusion, opinion or advice. Investors should consult their own legal advisers as to issues of law relating to the subject matter of this material. BofA Global Research personnel's knowledge of legal proceedings in which any BofA Securities entity and/or its directors, officers and employees may be plaintiffs, defendants, co-defendants or co-plaintiffs with or involving issuers mentioned in this material is based on public information. Facts and views presented in this material that relate to any such proceedings have not been reviewed by, discussed with, and may not reflect information known to, professionals in other business areas of BofA Securities in connection with the legal proceedings or matters relevant to such proceedings.

This information has been prepared independently of any issuer of securities mentioned herein and not in connection with any proposed offering of securities or as agent of any issuer of any securities. None of BofAS any of its affiliates or their research analysts has any authority whatsoever to make any representation or warranty on behalf of the issuer(s). BofA Global Research policy prohibits research personnel from disclosing a recommendation, investment rating, or investment thesis for review by an issuer prior to the publication of a research report containing such rating, recommendation or investment thesis.

Any information relating to the tax status of financial instruments discussed herein is not intended to provide tax advice or to be used by anyone to provide tax advice. Investors are urged to seek tax advice based on their particular circumstances from an independent tax professional.

The information herein (other than disclosure information relating to BofA Securities and its affiliates) was obtained from various sources and we do not guarantee its accuracy. This information may contain links to third-party websites. BofA Securities is not responsible for the content of any third-party website or any linked content contained in a third-party website. Content contained on such third-party websites is not part of this information and is not incorporated by reference. The inclusion of a link does not imply any endorsement by or any affiliation with BofA Securities. Access to any third-party website is at your own risk, and you should always review the terms and privacy policies at third-party websites before submitting any personal information to them. BofA Securities is not responsible for such terms and privacy policies and expressly disclaims any liability for them.

All opinions, projections and estimates constitute the judgment of the author as of the date of publication and are subject to change without notice. Prices also are subject to change without notice. BofA Securities is under no obligation to update this information and BofA Securities ability to publish information on the subject issuer(s) in the future is subject to applicable quiet periods. You should therefore assume that BofA Securities will not update any fact, circumstance or opinion contained herein.

Certain outstanding reports or investment opinions relating to securities, financial instruments and/or issuers may no longer be current. Always refer to the most recent research report relating to an issuer prior to making an investment decision.

In some cases, an issuer may be classified as Restricted or may be Under Review or Extended Review. In each case, investors should consider any investment opinion relating to such issuer (or its security and/or financial instruments) to be suspended or withdrawn and should not rely on the analyses and investment opinion(s) pertaining to such issuer (or its securities and/or financial instruments) nor should the analyses or opinion(s) be considered a solicitation of any kind. Sales persons and financial advisors affiliated with BofAS or any of its affiliates may not solicit purchases of securities or financial instruments that are Restricted or Under Review and may only solicit securities under Extended Review in accordance with firm policies.

Neither BofA Securities nor any officer or employee of BofA Securities accepts any liability whatsoever for any direct, indirect or consequential damages or losses arising from any use of this information.

