

CME Group Inc

1Q23 First Impression – Positive results

Maintain Rating: UNDERPERFORM | PO: 156.00 USD | Price: 187.79 USD

Positive overall results; beats on non-operating + pricing gains

CME Group (CME) reported higher-than-expected adjusted EPS of \$2.42 vs. consensus of \$2.35 and our estimate of \$2.34, with the beat driven by a combination of strong clearinghouse-related income and pricing gains. Given prior skepticism about the ability to push price, we view the results today in total as positive relative to expectations.

CME taking price; RPC up 10%+ q/q in energy & equities

Earlier this year, CME announced its largest price increases on record. Management had guided to a 4-5% increase in derivative RPC (implemented in February) as well as a 4% increase in market data pricing (implemented in January). So far, it appears that management is on track to exceed those targets overall. Although rates RPC is flat, equity & energy complex RPC is up 10%+ q/q, while market data revenues are 8% higher.

Posts strong 1Q volumes, but QTD is weak

Buoyed by seasonal tailwinds and elevated market volatility (primarily related to the Fed and regional banking distress in March), futures volumes reported a solid 23% increase q/q, with strength in the rates complex (up 47% q/q). However, in its aftermath, capital requirements have increased, while liquidity has declined, leading to a 42% q/q decline in rates volume and 33% decline in overall volume QTD.

Maintain Underperform rating; earnings call at 8:30am ET

We continue to see CME as expensive (23x 2024E EPS) relative to its mid-single-digit long-term organic growth. On the call, we are looking for updates on rates market quality, pricing, and the equity index complex (soft volumes + competition from options).

Exhibit 1: CME 1Q23 actuals vs. our estimates

EPS beat on pricing gains and clearinghouse-related income

| | 1Q22 | 4Q22 | 1Q23E | 1Q23A | Beat (Miss) % | QoQ | YoY |
|-------------------------------|--------|--------|--------|--------|---------------|-----|-----|
| Adjusted EPS | \$2.11 | \$1.92 | \$2.34 | \$2.42 | 3% | 26% | 15% |
| Net Revenues | 1,347 | 1,208 | 1,397 | 1,442 | 3% | 19% | 7% |
| Adjusted Expenses | 425 | 464 | 445 | 459 | -3% | -1% | 8% |
| Futures ADV (Contracts, 000s) | 25,920 | 21,805 | - | 26,873 | - | 23% | 4% |

Source: Company reports, BofA Global Research

BofA GLOBAL RESEARCH

| Estimates (Dec) (US\$) | 2021A | 2022A | 2023E | 2024E | 2025E |
|---------------------------|-------|-------|-------|-------|-------|
| EPS | 6.69 | 7.97 | 8.40 | 8.51 | 8.89 |
| GAAP EPS | 6.69 | 7.97 | 8.40 | 8.51 | 8.89 |
| EPS Change (YoY) | -0.6% | 19.1% | 5.4% | 1.3% | 4.5% |
| Consensus EPS (Bloomberg) | | | 8.60 | 8.79 | 9.22 |
| DPS | 6.85 | 8.50 | 7.80 | 8.15 | 8.35 |
| Valuation (Dec) | | | | | |
| P/E | 28.1x | 23.6x | 22.4x | 22.1x | 21.1x |
| GAAP P/E | 28.1x | 23.6x | 22.4x | 22.1x | 21.1x |
| Dividend Yield | 3.6% | 4.5% | 4.2% | 4.3% | 4.4% |

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 5 to 7. Analyst Certification on page 3. Price Objective Basis/Risk on page 3.

12549462

Timestamp: 26 April 2023 08:21AM EDT

26 April 2023

Equity

Craig Siegenthaler, CFA
Research Analyst
BofAS
+1 646 855 5004
craig.siegenthaler@bofa.com

Eli Abboud
Research Analyst
BofAS
+1 646 855 5791
eli.abboud@bofa.com

Mark McLaughlin, CFA
Research Analyst
BofAS
+1 646 855 4234
mark.mclaughlin@bofa.com

Maggie Cao
Research Analyst
BofAS
+1 646 855 5034
maggie.cao@bofa.com

Stock Data

| | |
|----------------------------|------------------------|
| Price | 187.79 USD |
| Price Objective | 156.00 USD |
| Date Established | 3-Apr-2023 |
| Investment Opinion | B-3-7 |
| 52-Week Range | 162.26 USD -222.52 USD |
| Mrkt Val / Shares Out (mn) | 67,556 USD / 359.7 |
| Average Daily Value | 335.68 USD |
| BofA Ticker / Exchange | CME / NAS |
| Bloomberg / Reuters | CME US / CME.OQ |
| ROE (2023E) | 11.2% |
| ESGMeter™ | High |

ESGMeter is not indicative of a company's future stock price performance and is not an investment recommendation or rating. ESGMeter is independent of BofA Global Research's equity investment rating, volatility risk rating, income rating, and price objective for that company. For full details, refer to "BofA ESGMeter Methodology".

RPC: revenue per contract
vs.: versus

iQprofileSM CME Group Inc

| Income Statement Data (Dec) | 2021A | 2022A | 2023E | 2024E | 2025E |
|-----------------------------|---------|---------|---------|---------|---------|
| (US\$ Millions) | | | | | |
| Total Net Revenue | 4,687 | 5,019 | 5,182 | 5,261 | 5,435 |
| % change | -4.0% | 7.1% | 3.2% | 1.5% | 3.3% |
| Compensation & Benefit | (784) | (746) | (776) | (799) | (819) |
| % change | -4.6% | -4.9% | 4.0% | 3.0% | 2.5% |
| Non-Compensation Expenses | (921) | (1,026) | (1,057) | (1,079) | (1,089) |
| % change | -6.0% | 11.5% | 3.0% | 2.1% | 0.9% |
| Total Expenses | (1,705) | (1,772) | (1,833) | (1,878) | (1,908) |
| % change | -5.4% | 4.0% | 3.4% | 2.5% | 1.6% |
| Operating Income | 2,982 | 3,247 | 3,349 | 3,383 | 3,527 |
| % change | -3.3% | 8.9% | 3.2% | 1.0% | 4.3% |
| Reported Net Income | 2,401 | 2,863 | 3,018 | 3,060 | 3,198 |
| % change | -0.4% | 19.2% | 5.4% | 1.4% | 4.5% |
| Adjusted Net Income | 2,400 | 2,863 | 3,018 | 3,060 | 3,198 |
| % change | -0.5% | 19.3% | 5.4% | 1.4% | 4.5% |

Performance Metrics (Dec)

| | 2021A | 2022A | 2023E | 2024E | 2025E |
|----------------------------------|--------|--------|-------|-------|-------|
| Operating Margin | 63.6% | 64.7% | 64.6% | 64.3% | 64.9% |
| Compensation Expense/Revenue | 16.7% | 14.9% | 15.0% | 15.2% | 15.1% |
| Non-Compensation Expense/Revenue | 19.6% | 20.4% | 20.4% | 20.5% | 20.0% |
| Dividend Payout Ratio | 102.2% | 106.5% | 92.7% | 95.7% | 93.8% |

Balance Sheet Data (Dec)

| (US\$ Millions) | 2021A | 2022A | 2023E | 2024E | 2025E |
|----------------------------|---------|---------|---------|---------|---------|
| Total Assets | 196,780 | 174,176 | 174,393 | 174,524 | 174,524 |
| Cash and Investments | 2,835 | 2,720 | 2,914 | 3,023 | 3,023 |
| Long-Term Debt | 2,696 | 3,422 | 3,422 | 3,422 | 3,422 |
| Total Shareholders' Equity | 27,399 | 26,879 | 27,096 | 27,227 | 27,227 |

Company Sector

Other Financials

Company Description

CME, which was founded in 1898, is a leading derivatives exchange that handles more than 90% of U.S. futures trading. The company owns and operates multiple regulated exchanges, including the CBOT, NYMEX, COMEX, and KCBT. CME has grown both organically and via acquisitions and offers products such as futures and options on futures across all major asset classes (interest rates, equity indexes, energy, FX, metals, agricultural commodities, etc.), market data and clearing services.

Investment Rationale

CME stock is modestly overvalued relative to its long-term earnings growth and earnings quality. The current rebound in cyclical segments (rates, energy) are obscuring the tepid long-term growth rate of its largely mature businesses. The stock should trade more in line with its core peer group (NDAQ, ICE).

Quarterly Earnings Estimates

| | 2022 | 2023 |
|----|-------|-------|
| Q1 | 2.11A | 2.34E |
| Q2 | 1.97A | 1.98E |
| Q3 | 1.98A | 2.05E |
| Q4 | 1.92A | 2.03E |

Price objective basis & risk

CME Group Inc (CME)

Our primary valuation metric for US Exchanges is price to long-term earnings (2025E). We focus on long-term EPS because we prefer to normalize for any near-term factors, and it also provides credit for an additional two years of growth. We apply a 17.5x multiple on our 2025E EPS to derive our \$156 PO. Our multiple is based on the conservative assumption that CME trades in line with its peer group despite its lower growth prospects/earnings quality.

Downside risks are (1) depressed volumes, (2) lower earnings quality due to high transactional revenue composition, (3) mature markets and high market share stifling further growth, (4) trading at a premium to higher growth peers, (5) secular transition away from oil/fossil fuels where CME has high share and (6) regulatory risks (transaction tax, capital requirements).

Upside risks are (1) improving/elevated interest rate volumes due to quantitative tightening/inflation, (2) rebound in energy/metals volumes should there be a resolution in supply chain issues and the Russia/Ukraine conflict, (3) defensive qualities which drive stock outperformance in equity market drawdowns (e.g., 1Q22), and (4) potential for share gains in select markets: base metals after the LME debacle and cash after the DTCC cross-margining proposal is approved (estimated in 1Q23 versus 3Q22 prior target).

Analyst Certification

I, Craig Siegenthaler, CFA, hereby certify that the views expressed in this research report accurately reflect my personal views about the subject securities and issuers. I also certify that no part of my compensation was, is, or will be, directly or indirectly, related to the specific recommendations or view expressed in this research report.

US - Brokers, Asset Managers, & Exchanges Coverage Cluster

| Investment rating | Company | BofA Ticker | Bloomberg symbol | Analyst |
|-------------------|--------------------------------|-------------|------------------|-------------------------|
| BUY | | | | |
| | Ameriprise Financial | AMP | AMP US | Craig Siegenthaler, CFA |
| | Ares Management Corp | ARES | ARES US | Craig Siegenthaler, CFA |
| | BlackRock, Inc. | BLK | BLK US | Craig Siegenthaler, CFA |
| | Blackstone | BX | BX US | Craig Siegenthaler, CFA |
| | Blue Owl Capital | OWL | OWL US | Craig Siegenthaler, CFA |
| | Interactive Brokers | IBKR | IBKR US | Craig Siegenthaler, CFA |
| | Intercontinental Exchange | ICE | ICE US | Craig Siegenthaler, CFA |
| | KKR & Co. Inc. | KKR | KKR US | Craig Siegenthaler, CFA |
| | TPG Inc | TPG | TPG US | Craig Siegenthaler, CFA |
| | Tradeweb Markets Inc. | TW | TW US | Craig Siegenthaler, CFA |
| | Victory Capital Holdings, Inc. | VCTR | VCTR US | Craig Siegenthaler, CFA |
| NEUTRAL | | | | |
| | Affiliated Managers Group | AMG | AMG US | Craig Siegenthaler, CFA |
| | AllianceBernstein | AB | AB US | Craig Siegenthaler, CFA |
| | Apollo Global Management | APO | APO US | Craig Siegenthaler, CFA |
| | Invesco | IVZ | IVZ US | Craig Siegenthaler, CFA |
| | Janus Henderson Group | JHG | JHG US | Craig Siegenthaler, CFA |
| | Janus Henderson Group | JUHDY | JHG AU | Craig Siegenthaler, CFA |
| | LPL Financial Holdings | LPLA | LPLA US | Craig Siegenthaler, CFA |
| | Patria | PAX | PAX US | Craig Siegenthaler, CFA |



US - Brokers, Asset Managers, & Exchanges Coverage Cluster

| Investment rating | Company | BofA Ticker | Bloomberg symbol | Analyst |
|---------------------|--------------------------|-------------|------------------|-------------------------|
| UNDERPERFORM | | | | |
| | Charles Schwab Corp. | SCHW | SCHW US | Craig Siegenthaler, CFA |
| | CME Group Inc | CME | CME US | Craig Siegenthaler, CFA |
| | Franklin Resources | BEN | BEN US | Craig Siegenthaler, CFA |
| | Nasdaq | NDAQ | NDAQ US | Craig Siegenthaler, CFA |
| | Robinhood Markets | HOOD | HOOD US | Craig Siegenthaler, CFA |
| | T. Rowe Price | TROW | TROW US | Craig Siegenthaler, CFA |
| | The Carlyle Group | CG | CG US | Craig Siegenthaler, CFA |
| RSTR | | | | |
| | Focus Financial Partners | FOCS | FOCS US | Craig Siegenthaler, CFA |

iQmethodSM Measures Definitions**Business Performance**

Return On Capital Employed

Return On Equity

Operating Margin

Earnings Growth

Free Cash Flow

Numerator

NOPAT = (EBIT + Interest Income) × (1 – Tax Rate) + Goodwill Amortization

Net Income

Operating Profit

Expected 5 Year CAGR From Latest Actual

Cash Flow From Operations – Total Capex

Denominator

Total Assets – Current Liabilities + ST Debt + Accumulated Goodwill

Amortization

Shareholders' Equity

Sales

N/A

N/A

Quality of Earnings

Cash Realization Ratio

Asset Replacement Ratio

Tax Rate

Net Debt-To-Equity Ratio

Interest Cover

Numerator

Cash Flow From Operations

Capex

Tax Charge

Net Debt = Total Debt – Cash & Equivalents

EBIT

Denominator

Net Income

Depreciation

Pre-Tax Income

Total Equity

Interest Expense

Valuation Toolkit

Price / Earnings Ratio

Price / Book Value

Dividend Yield

Free Cash Flow Yield

Enterprise Value / Sales

Numerator

Current Share Price

Current Share Price

Annualised Declared Cash Dividend

Cash Flow From Operations – Total Capex

EV = Current Share Price × Current Shares + Minority Equity + Net Debt +

Other LT Liabilities

Enterprise Value

Denominator

Diluted Earnings Per Share (Basis As Specified)

Shareholders' Equity / Current Basic Shares

Current Share Price

Market Cap = Current Share Price × Current Basic Shares

Sales

EV / EBITDA

Basic EBIT + Depreciation + Amortization

iQmethodSM is the set of BofA Global Research standard measures that serve to maintain global consistency under three broad headings: Business Performance, Quality of Earnings, and valuations. The key features of *iQmethod* are: A consistently structured, detailed, and transparent methodology. Guidelines to maximize the effectiveness of the comparative valuation process, and to identify some common pitfalls.

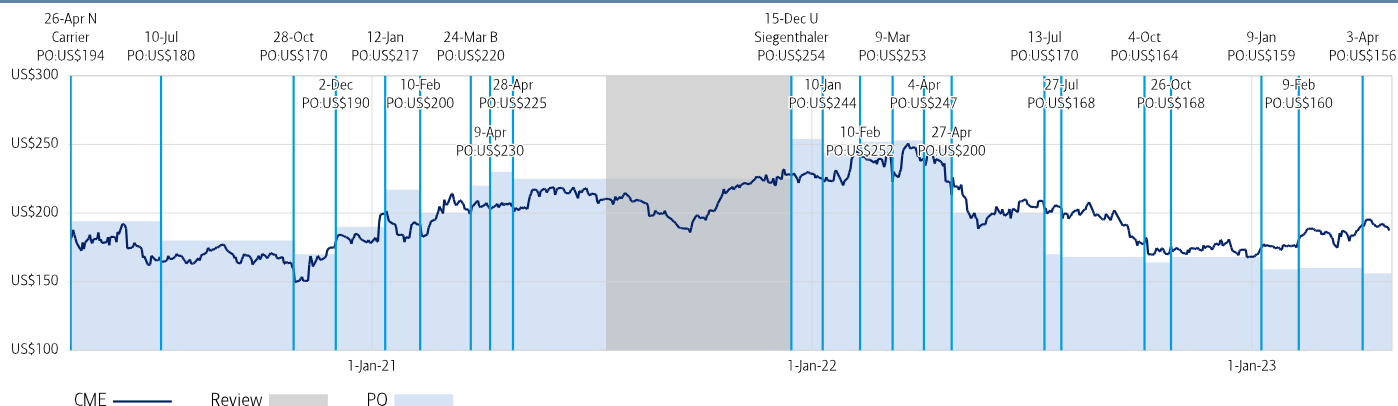
iQdatabase[®] is our real-time global research database that is sourced directly from our equity analysts' earnings models and includes forecasted as well as historical data for income statements, balance sheets, and cash flow statements for companies covered by BofA Global Research.

iQprofileSM, *iQmethodSM* are service marks of Bank of America Corporation. *iQdatabase[®]* is a registered service mark of Bank of America Corporation.

Disclosures

Important Disclosures

CME Group Inc (CME) Price Chart



B: Buy, N: Neutral, U: Underperform, PO: Price Objective, NA: No longer valid, NR: No Rating

The Investment Opinion System is contained at the end of the report under the heading "Fundamental Equity Opinion Key". Dark grey shading indicates the security is restricted with the opinion suspended. Medium grey shading indicates the security is under review with the opinion withdrawn. Light grey shading indicates the security is not covered. Chart is current as of a date no more than one trading day prior to the date of the report.

Equity Investment Rating Distribution: Financial Services Group (as of 31 Mar 2023)

| Coverage Universe | Count | Percent | Inv. Banking Relationships ^{R1} | Count | Percent |
|-------------------|-------|---------|--|-------|---------|
| Buy | 152 | 52.41% | Buy | 92 | 60.53% |
| Hold | 73 | 25.17% | Hold | 44 | 60.27% |
| Sell | 65 | 22.41% | Sell | 41 | 63.08% |

Equity Investment Rating Distribution: Global Group (as of 31 Mar 2023)

| Coverage Universe | Count | Percent | Inv. Banking Relationships ^{R1} | Count | Percent |
|-------------------|-------|---------|--|-------|---------|
| Buy | 1869 | 53.01% | Buy | 1030 | 55.11% |
| Hold | 827 | 23.45% | Hold | 476 | 57.56% |
| Sell | 830 | 23.54% | Sell | 389 | 46.87% |

^{R1} Issuers that were investment banking clients of BofA Securities or one of its affiliates within the past 12 months. For purposes of this Investment Rating Distribution, the coverage universe includes only stocks. A stock rated Neutral is included as a Hold, and a stock rated Underperform is included as a Sell.

FUNDAMENTAL EQUITY OPINION KEY: Opinions include a Volatility Risk Rating, an Investment Rating and an Income Rating. **VOLATILITY RISK RATINGS**, indicators of potential price fluctuation, are: A - Low, B - Medium and C - High. **INVESTMENT RATINGS** reflect the analyst's assessment of both a stock's absolute total return potential as well as its attractiveness for investment relative to other stocks within its *Coverage Cluster* (defined below). There are three investment ratings: 1 - Buy stocks are expected to have a total return of at least 10% and are the most attractive stocks in the coverage cluster; 2 - Neutral stocks are expected to remain flat or increase in value and are less attractive than Buy rated stocks and 3 - Underperform stocks are the least attractive stocks in a coverage cluster. Analysts assign investment ratings considering, among other things, the 0-12 month total return expectation for a stock and the firm's guidelines for ratings dispersions (shown in the table below). The current price objective for a stock should be referenced to better understand the total return expectation at any given time. The price objective reflects the analyst's view of the potential price appreciation (depreciation).

| Investment rating | Total return expectation (within 12-month period of date of initial rating) | Ratings dispersion guidelines for coverage cluster ^{R2} |
|-------------------|---|--|
| Buy | ≥ 10% | ≤ 70% |
| Neutral | ≥ 0% | ≤ 30% |
| Underperform | N/A | ≥ 20% |

^{R2} Ratings dispersions may vary from time to time where BofA Global Research believes it better reflects the investment prospects of stocks in a Coverage Cluster.

INCOME RATINGS, indicators of potential cash dividends, are: 7 - same/higher (dividend considered to be secure), 8 - same/lower (dividend not considered to be secure) and 9 - pays no cash dividend. *Coverage Cluster* is comprised of stocks covered by a single analyst or two or more analysts sharing a common industry, sector, region or other classification(s). A stock's coverage cluster is included in the most recent BofA Global Research report referencing the stock.

Price Charts for the securities referenced in this research report are available on the [Price Charts website](#), or call 1-800-MERRILL to have them mailed.

BofAS or one of its affiliates acts as a market maker for the equity securities recommended in the report: CME Group Inc.

The issuer is or was, within the last 12 months, an investment banking client of BofAS and/or one or more of its affiliates: CME Group.

BofAS or an affiliate has received compensation from the issuer for non-investment banking services or products within the past 12 months: CME Group.

The issuer is or was, within the last 12 months, a non-securities business client of BofAS and/or one or more of its affiliates: CME Group.

BofAS or an affiliate has received compensation for investment banking services from this issuer within the past 12 months: CME Group.

BofAS or an affiliate expects to receive or intends to seek compensation for investment banking services from this issuer or an affiliate of the issuer within the next three months: CME Group.

BofAS or one of its affiliates is willing to sell to, or buy from, clients the common equity of the issuer on a principal basis: CME Group Inc.

The issuer is or was, within the last 12 months, a securities business client (non-investment banking) of BofAS and/or one or more of its affiliates: CME Group.

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 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.

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.

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.

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; 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 (HKSCF); Merrill Lynch (Singapore): Merrill Lynch (Singapore) Pte Ltd, regulated by the Monetary Authority of Singapore (MAS); Merrill Lynch (Canada): Merrill Lynch Canada Inc, regulated by the Investment Industry Regulatory Organization of Canada; Merrill Lynch (Mexico): Merrill Lynch Mexico, SA de CV, Casa de Bolsa, regulated by the Comisión Nacional Bancaria y de Valores; Merrill Lynch (Argentina): Merrill Lynch Argentina SA, regulated by Comisión Nacional de Valores; BofAS Japan: BofA Securities Japan Co., Ltd., regulated by the Financial Services Agency; Merrill Lynch (Seoul): Merrill Lynch International, LLC Seoul Branch, regulated by the Financial Supervisory Service; Merrill Lynch (Taiwan): Merrill Lynch Securities (Taiwan) Ltd., regulated by the Securities and Futures Bureau; BofAS India: BofA Securities India Limited, regulated by the Securities and Exchange Board of India (SEBI); Merrill Lynch (Israel): Merrill Lynch Israel Limited, regulated by Israel Securities Authority; Merrill Lynch (DIFC): Merrill Lynch International (DIFC Branch), regulated by the Dubai Financial Services Authority (DFSA); Merrill Lynch (Brazil): Merrill Lynch S.A. Corretora de Títulos e Valores Mobiliários, regulated by Comissão de Valores Mobiliários; Merrill Lynch KSA Company: Merrill Lynch Kingdom of Saudi Arabia Company, regulated by the Capital Market Authority.

This information has been approved for publication and is distributed in the United Kingdom (UK) to professional clients and eligible counterparties (as each is defined in the rules of the FCA and the PRA) by MLI (UK), which is authorized by the PRA and regulated by the FCA and the PRA - details about the extent of our regulation by the FCA and PRA are available from us on request; has been approved for publication and is distributed in the European Economic Area (EEA) by BofASE (France), which is authorized by the ACPR and regulated by the ACPR and the AMF; has been considered and distributed in Japan by BofAS Japan, a registered securities dealer under the Financial Instruments and Exchange Act in Japan, or its permitted affiliates; is issued and distributed in Hong Kong by Merrill Lynch (Hong Kong) which is regulated by HKSCF; 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.

This report may contain a short-term trading idea or recommendation, which highlights a specific near-term catalyst or event impacting the issuer or the market that is anticipated to have a short-term price impact on the equity securities of the issuer. Short-term trading ideas and recommendations are different from and do not affect a stock's fundamental equity rating, which reflects both a longer term total return expectation and attractiveness for investment relative to other stocks within its Coverage Cluster. Short-term trading ideas and recommendations may be more or less positive than a stock's fundamental equity rating.

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 herein. Investors in such securities and instruments, including ADRs, effectively assume currency risk.

BoFA or one of its affiliates is a regular issuer of traded financial instruments linked to securities that may have been recommended in this report. BoFA 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 BoFA for the provision of research services for a separate fee, and in connection therewith BoFA may be deemed to be acting as an investment adviser, such status relates, if at all, solely to the person with whom BoFA has contracted directly and does not extend beyond the delivery of this report (unless otherwise agreed specifically in writing by BoFA). If such recipient uses the services of BoFA in connection with the sale or purchase of a security referred to herein, BoFA may act as principal for its own account or as agent for another person. BoFA 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.

BoFA ESGMeter Methodology:

ESGMeter is a proprietary metric based on quantitative analysis and fundamental analyst inputs that reflects our assessment of a company's Environmental, Social and Governance-related attributes. The ESGMeter is intended to indicate a company's likelihood of experiencing stronger financial stability (higher return on equity and lower earnings and price volatility) over the next three years relative to peer group. There are three ESGMeter levels - Low, Medium, and High - which indicate whether a company has attributes most likely to translate into superior financial stability (in the case of a High level) or weaker financial stability (in the case of a Low level) over the next three years relative to its peer group. A Medium level suggests that a company exhibits ESG characteristics that are likely associated with financial stability results in line with its peer group over the next three years. Full details of our methodology, financial stability definition and disclaimers are available at [BoFA ESGMeter methodology](#). ESGMeter is not indicative of a company's future stock price performance and is not an investment recommendation or rating.

ESGMeter is independent of the BoFA Global Research fundamental equity analyst's investment rating, volatility risk rating, income rating or price objective for that company.

Copyright and General Information:

Copyright 2023 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 BoFA 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.

Subject to the quiet period applicable under laws of the various jurisdictions in which we distribute research reports and other legal and BoFA Securities policy-related restrictions on the publication of research reports, fundamental equity reports are produced on a regular basis as necessary to keep the investment recommendation current.

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 BoFA 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.