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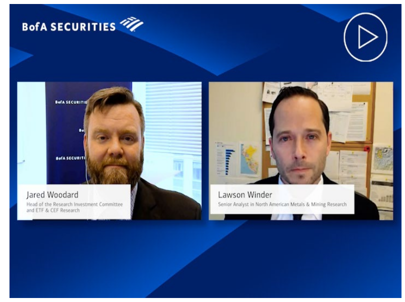
BofA SECURITIES

The RIC Report

The nuclear necessity

09 May 2023

Investment Strategy
Global



View Transcript

The third bull market for uranium

We are bullish on uranium and nuclear power. After a decade of underinvestment, a shortage is visible; our strategists forecast 20-40% upside. Global demand is also rising, with 60 new reactors being built & 100 more approved. Resource nationalism, energy security, war and inflation echo the nuclear build-out of the 1970s/80s (Exhibit 9).

Five ways to own the nuclear supply chain

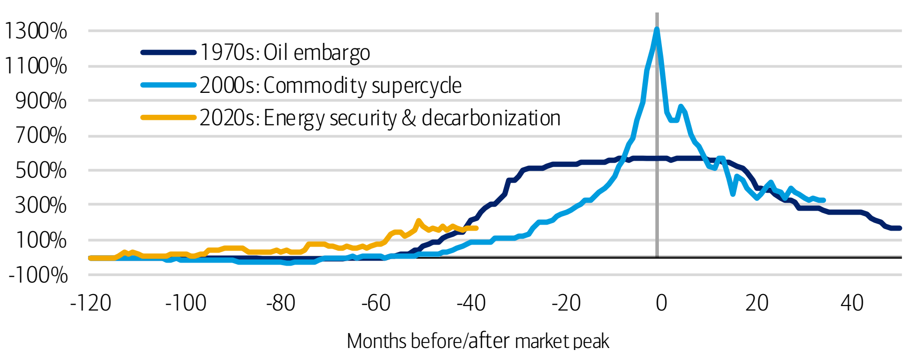
From the raw matter to the end user, BofA global analysts are bullish. Cameco (CCO) is a disciplined miner with the largest production capacity in the West. Constellation Energy (CEG) and pro-forma Vistra (VST) have the two largest US generation fleets. BWX Technologies (BWXT) is the sole provider for US Navy nuclear subs & carriers.

For diversified access to the commodity, miners, and others, the URA ETF (1-FV) trades at 1.7 times book value. See our related update report (ETF link).

The policy shifts not yet priced in

Two short-term bullish catalysts to watch: 1) G7 countries could impose sanctions on Russian uranium; 2) leaders may embrace nuclear as Net Zero deadlines loom. After all, nuclear is the cheapest clean alternative on a full-system “all in” basis ($122/MWh vs $291 wind and $413 solar – Exhibit 21). Nuclear power also returns 75x its initial energy investment vs. 28x for gas and 2x for solar (Exhibit 22). See page 2-3 for more key stats.

Exhibit 1: Uranium’s third bull market has room to run
Uranium prices around historical peaks



Source: BofA Global Research, Global Financial Data

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Research Investment Committee
BofAS

Jared Woodard
Investment & ETF Strategist
BofAS
+1 646 855 2600
jared.woodard@bofa.com

John Glascock
Investment & ETF Strategist
BofAS
+1 917 499 3423
john.glascock@bofa.com

Phoebe Block
Investment & ETF Strategist
BofAS
+1 646 241 5941
phoebe.block@bofa.com

Derek Harris
Portfolio Strategist
BofAS
+1 646 743 0218
derek.harris@bofa.com

Chris Flanagan
FI/MBS/CLO Strategist
BofAS
+1 646 855 6119
christopher.flanagan@bofa.com

See Team Page for List of Analysts

The RIC Outlook

In 1951, the Experimental Breeder reactor in Idaho became the first nuclear reactor to generate electricity. Commercial nuclear power plants followed later in the 1950s.

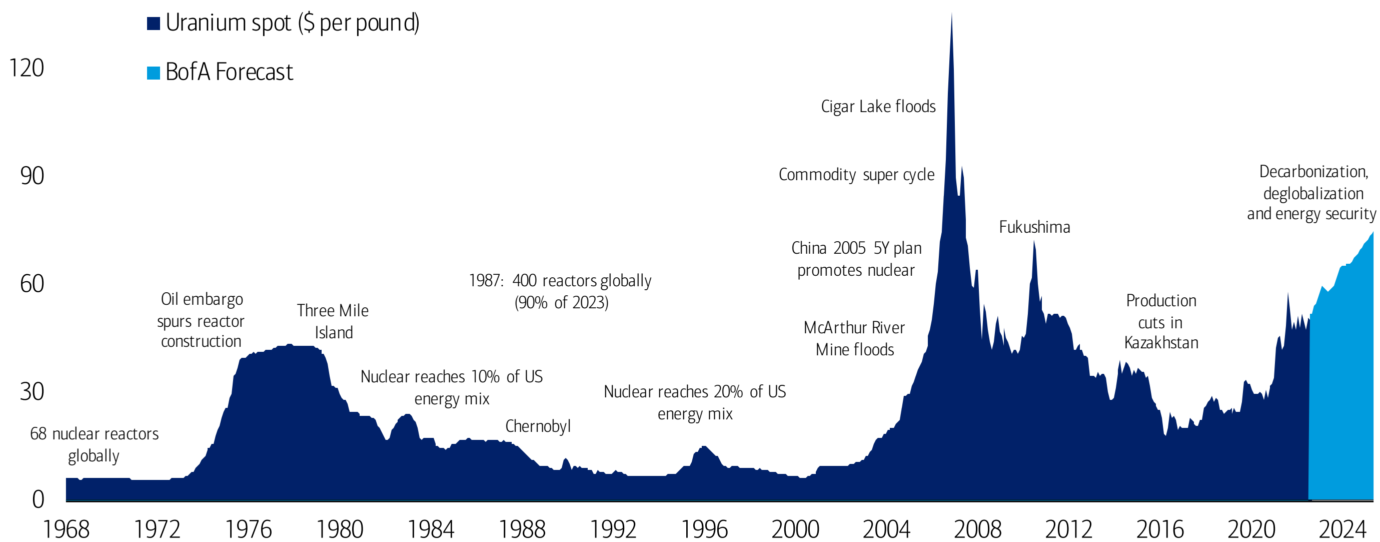
In the 1970s, OPEC oil embargos, the Iranian revolution, and rampant inflation preceded a major build-out of nuclear capacity. Uranium prices surged by 560% (Exhibit 2).

During the early 2000s, China expanded its nuclear fleet, key mines flooded, and the commodity super-cycle sent uranium prices up 1,800%.

We believe the third bull market in uranium has begun and will be fueled by 1) resource nationalism and global demands for energy security; 2) structural supply shortages; and 3) decarbonization commitments that would require a doubling of world nuclear output.

In this report, we review several investment ideas for participating in this market, the structural supply & demand outlook, and the key policy catalysts to watch for.

Exhibit 2: The history of uranium prices
Uranium spot price, $/lb



Source: BofA Research Investment Committee, BofA Global Research, Global Financial Data, Sprott Uranium Report

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Nuclear in numbers

1. **437**: the number of reactors in the world today. 90% were built in the 1970s & 80s. 60 new reactors are under construction, 100 are planned, and old reactors are being refurbished for 80 years or more of total lifetime use.[1] [2]

2. **>50%**: the nuclear share of emissions-free electricity in the US. Nuclear power is 25% of global carbon-free power and 10% of global electricity overall.[3] [4]

3. **60**: gigatons of CO_2 emissions avoided in the past 50 years due to nuclear power.[5]

4. **1-inch** pellet of uranium: equal to 120 gallons of oil, 17,000 ft^3 of natural gas, or one ton of coal. 10 pellets can power a household for a year. [6]

[1] Statista, Number of operational nuclear reactors worldwide from 1954 to 2021. June 2022.
[2] World Nuclear Association, World Nuclear Power Reactors & Uranium Requirements. May 2023.
[3] Office of Nuclear Energy, US Department of Energy Selects Partners to Engage Communities on Nuclear Energy. December 2022.
[4] General Electric, Nuclear Energy: A critical pillar of carbon-free future. June 2021.
[5] International Energy Agency, Nuclear Power in a Clean Energy System. May 2019.
[6] Visual Capitalist, The Power of a Uranium Pellet. August 2022.

5. **93%**: average "uptime" for nuclear plants. It's 35% for wind and 25% for solar.[7]

6. **75 joules**: amount of energy returned for every 1 joule of energy invested in nuclear power production; including storage, for fossil fuels it's about 30 joules, for concentrated solar it's 9, for wind & biomass 4 joules.[8]

7. **22¢/kWh**: electricity cost in France (>70% nuclear); in Germany, 40¢ (0%). In the US, it's 14¢/kWh in South Carolina (56% nuclear) or 27¢ in California (10%).[9]

8. **$122/MWh**: average cost to build & generate nuclear power on an "all-in" basis; wind plus battery storage costs $291/MWh, solar plus batteries $413 (Exhibit 20).

9. **1.3 square miles**: space required for a 1000 MW nuclear plant, about the size of Central Park in New York; a comparable solar installation would need 45-75mi^2 (the Bronx or Brooklyn); comparable wind needs 260-3360 mi^2 (all five NYC boroughs).[10]

10. **50 bananas**: living near a nuclear power station gives radiation exposure equal to the amount of naturally radioactive potassium in about 50 bananas. Living within 50 miles of a coal-fired plant gives radiation exposure that is 33x higher.[11] [12]

Five ways to own the nuclear future

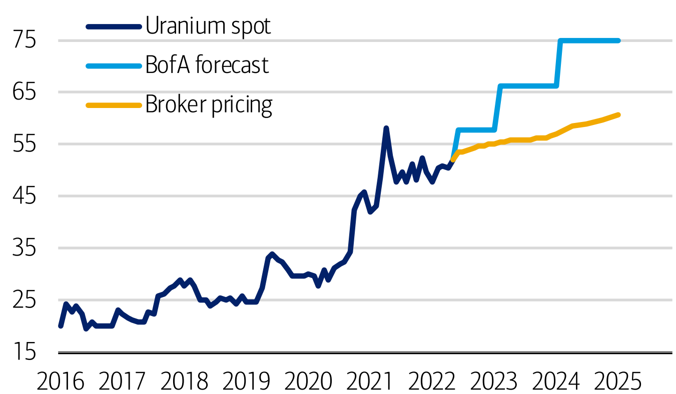
Here are several assets & sectors with substantial exposure to uranium & nuclear power.

Physical uranium

Our metals analyst, Michael Widmer, forecasts uranium prices of $75/lb. by the end of 2025 (+40% - Exhibit 3). He believes uranium will contribute to energy stability and security as the world works to decarbonize. A near-decade bear market has pushed global focus elsewhere, creating tight supply conditions.

Higher uranium prices are good for miners who sell the raw input. Some miners can also process uranium and sell the fuel. Cameco and Kazatomprom, our analysts' top picks, account for about one-third of global uranium production (Exhibit 4).

Exhibit 3: BofA sees >40% upside in uranium; 20% above the market
Uranium spot price, $/lb and BofA forecast vs broker pricing



Source: BofA Research Investment Committee, GFD, Bloomberg, Evolution Markets
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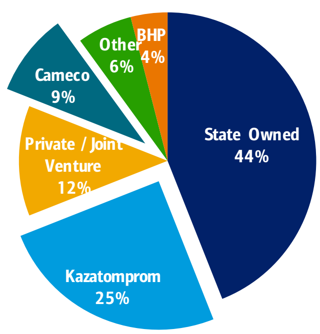
1. Miners: Cameco (CCO CN / CCJ US; PO: C$50 [+38%])

- What it does: Cameco is a Canadian company with the largest uranium mining operation in the West. The company works all along the nuclear supply chain with capacity to explore, mine, refine, and fabricate uranium used as nuclear power fuel.

- Why our analyst likes it: Lawson Winder's Buy rating on Cameco reflects a positive outlook for uranium prices. Cameco's contract book reached 215 million pounds of uranium in 1Q23, the strongest it's been since 2014. A growing pipeline of business and competition among utilities to secure long-term contracts should help bolster profitability (see latest note). Cameco's bid for a 49% stake in Westinghouse is expected to close in 3Q23 and would enhance nuclear exposure. Westinghouse just announced the launch of a small nuclear reactor (SMR) called the AP300. The reactor is expected to cost less than $1 billion and should be available by 2027.

[7] Office of Nuclear Energy, What is Generation Capacity? May 2020
[8] D. Weißbach, G. Ruprecht, A. Huke, K. Czerski, S. Gottlieb, A. Hussein, Energy intensities, EROIs, and energy payback times of electricity generating power plants. April 2013.
[9] US Energy Information Administration, Eurostat, Clean Energy Wire
[10] Nuclear Energy Institute, Land Needs for Wind, Solar Dwarf Nuclear Plant's Footprint. July 2015.
[11] US Nuclear Regulatory Commission, Personal Annual Radiation Dose Calculator. May 2021.
[12] United States Environmental Protection Agency, Natural Radioactivity in Food. July 2022.

Exhibit 4: Kazatomprom & Cameco produce 1/3rd of global uranium
Breakdown of uranium mining output by company



Source: BofA Research Investment Committee, World Nuclear Association
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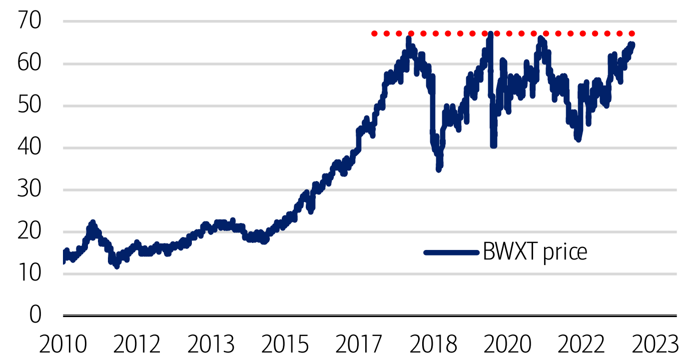
Exhibit 5: Buy BWXT
Price for BWXT



Source: BofA Research Investment Committee, Bloomberg.
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2. Component suppliers: BWX Technologies (BWXT US; PO: $75 [15% upside potential])

- What it does: BWXT is a Virginia-based company with a monopoly on supplying reactors for US Navy submarines and aircraft carriers; it also refuels about 50% of the CANDU reactors in Canada.
- Why our analyst likes it: Ron Epstein sees BWXT as an almost pure place beneficiary of the Department of Defense (DoD) Indo-Pacific Strategy. The company can benefit from Australia's nuclear submarine program and the AUKUS trilateral agreement. Sales grew 8%y/y in 4Q22 as microreactor volumes and uranium processing drive strong revenues in the company's Government Operations segment. Guidance was also strong in 1Q23 (see latest BWXT's latest note).

Power producers: Vistra & Constellation Energy

3. Vistra (VST US; PO: $30 [28% upside potential])

- What it does: Vistra is a Texas-based integrated power producer and retail company. The company announced a plan to acquire Energy Harbor (ENGH – Not Covered) in early March, which operates the second largest non-regulated nuclear fleet in the US. Vistra is restructuring the business into 'Vistra Vision' for nuclear & retail businesses and 'Vistra Tradition' for fossil assets.
- Why our analyst likes it: Julien Dumoulin-Smith thinks Vistra trades on attractive valuations (30%+ free cash flow yield) and has a compelling shareholder return story with $2.8bn in share buybacks modeled through 2025 (see latest VST note). Julien thinks more M&A is possible and additional acquisitions in the nuclear space could be viewed favorably.

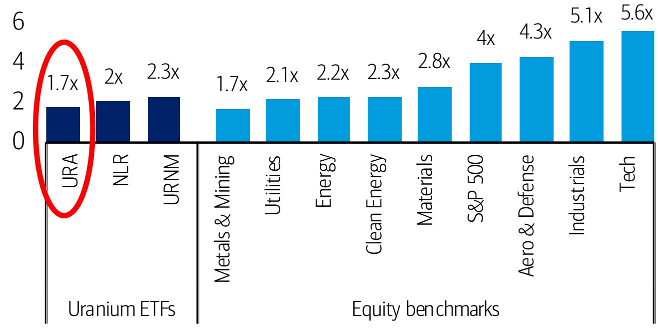
4. Constellation Energy (CEG US; PO: $81 [2% upside potential])

- What it does: Like Vistra, Constellation Energy is a generation and retail company that operates the largest nuclear fleet in the US. About 90% of its output is nuclear or other renewables with assets concentrated in the Mid-Atlantic / Northeast US.
- Why our analyst likes it: CEG has a unique nuclear generation and retail business which drives strong cash flows supported by the Federal Production Tax Credit (PTC). Paul Zimbardo lowered CEG to Neutral in February after a significant run in the share price following its spin-off from Exelon Corp in February 2022. Higher operating and fuel costs and "contracts sourced from Russia" represent areas of uncertainty. Constellation recently issued strong guidance and a +$100mn increases in each of its2023 and 2024 total gross margins. The company completed about ~$250Mn of $1,000Mn authorized share buybacks in March (see latest CEG note).

5. Nuclear ETFs: URA, the Global X Uranium ETF

- What it does: URA offers exposure to companies along the nuclear supply chain including miners like Cameco & Kazatomprom, and physical uranium vehicles like Yellow Cake PLC & the Sprott Physical Uranium Trust.
- Why we like it: Like nuclear power, URA is cheap and efficient. Trading at 1.7x book value, URA is less expensive than every other equity sector and less than half of the S&P 500 valuation (Exhibit 6). The fund is global with >50% exposure to Canada, 12% to Australia, and 10% to Kazakhstan. URA also offers exposure to some junior miners which, as Jason Fairclough told us, have asymmetric upside potential (see here for separate ETF note).

Exhibit 6: Uranium ETFs are less expensive than most
Price to book for uranium ETFs and other equity sectors



Source: BofA Research Investment Committee, Bloomberg.

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Other exposed stocks

- **Yellow Cake PLC (YCA LN / YLLXF US)** in London offers one of the only ways for investors to own physical uranium. The company has no mines or projects; YCA raises equity, buys uranium, and stores it.
- **Kazatomprom (KAP LI / NATKY US)** is based in Kazakhstan and is the largest uranium supplier in the world. KAP uses in-situ leeching where diluted acid dissolves uranium in porous sediment layers. The process is cheaper than other mining methods, allowing KAP to maintain low costs and flexibility.
- **BAE Systems (BA/ LN / BAESY US)** is a London-based defense company with exposure to every major region of the world. The company manufactures advanced aerospace and defense systems ranging from military aircraft to guided weapon systems to submarines.
- **Rolls Royce (RR/ LN / RYCEY US)** manufactures the nuclear power plant for submarines. The company is in discussions with the UK government to potential power SMRs as appetite grows.
- **Fortum (FORTUM FH)** is one of the largest producers of carbon dioxide free electricity in Europe. Fortum has a stake in Europe's largest nuclear reactor, which opened in April 2023. The Loviisa nuclear power plant was the first reactor to open in Europe in the past 16 years.
- **Centrus Energy Corp (LEU)** is the first US facility licensed for high-assay, low-enriched uranium (HALEU). Centrus began to work under a contract with the US Department of Energy (DOE) in 2019 to produce HALEU that is required for reactors selected under the DOE's Advanced Reactor Demonstration Program.
- **NuScale Power Corporation (SMR)** operates a small modular reactor (SMR) company in the US. NuScale has the first SMR license approved by the Nuclear Regulatory Commission (NRC).
- **Denison Mines (DNN)** holds a significant stake in McClean Lake uranium mill, one of the world's largest uranium processing facilities. Denison has one of the strongest portfolios of uranium deposits, with projects covering 470,000 hectacres of land in Canada, Zambia, Mali, Nambia, and Mongolia.

The secular case

Global uranium markets are expected to stay tight even as demand rises steadily.

Structural uranium supply shortage

In this month's interview, Lawson Winder explains how the 2011 Fukushima disaster spawned a decade of underinvestment. Companies like Cameco and Kazatomprom suspended huge mining operations as countries de-emphasized nuclear programs.

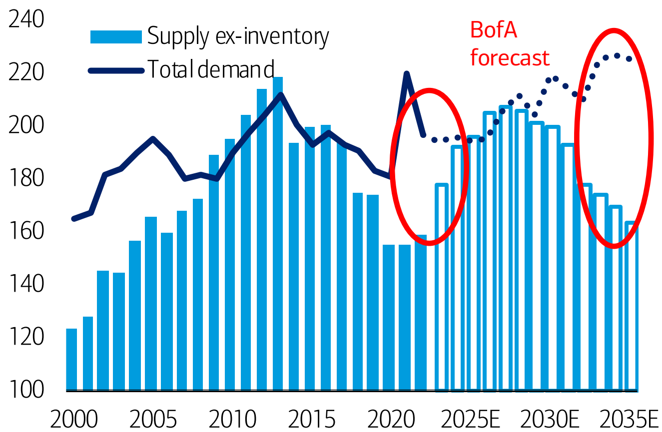
Underinvestment has plagued many metals markets and estimates suggest that the incentive price for most new uranium mining projects is between $50-70/lb. Uranium reached $50 in 2022 for the first time since 2012. Our metals strategists believe global mine production will not be able to keep pace with uranium demand and commercial inventories will be needed to plug the gap. Their forecast implies a production deficit of 60 million pounds in 2035, on par with Kazakhstan's annual output (Exhibit 7)[13].

Where supplies come from

Uranium is an abundant resource with some estimates suggesting that the Earth's crust contains 35 trillion tons. Two-thirds of uranium production today comes from Kazakhstan, Canada, and Australia. 35% of US uranium is imported from Kazakhstan with another 14% from Russia. Canada (15%) and Australia (14%) are the other main US suppliers. Australia has 1.7 million tons of reserves, accounting for almost 30% of known uranium deposits (Exhibit 8).

Exhibit 7: Uranium market is likely to be unbalanced

BofA uranium supply / demand forecast through 2035, million pounds



Source: BofA Global Research

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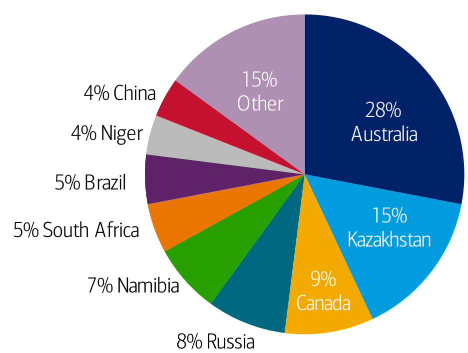
Exhibit 8: Australia, Kazakhstan, and Canada have >50% of reserves

Uranium resources by country



Source: BofA Research Investment Committee, World Nuclear Association

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Demand rising on energy security & resource nationalism

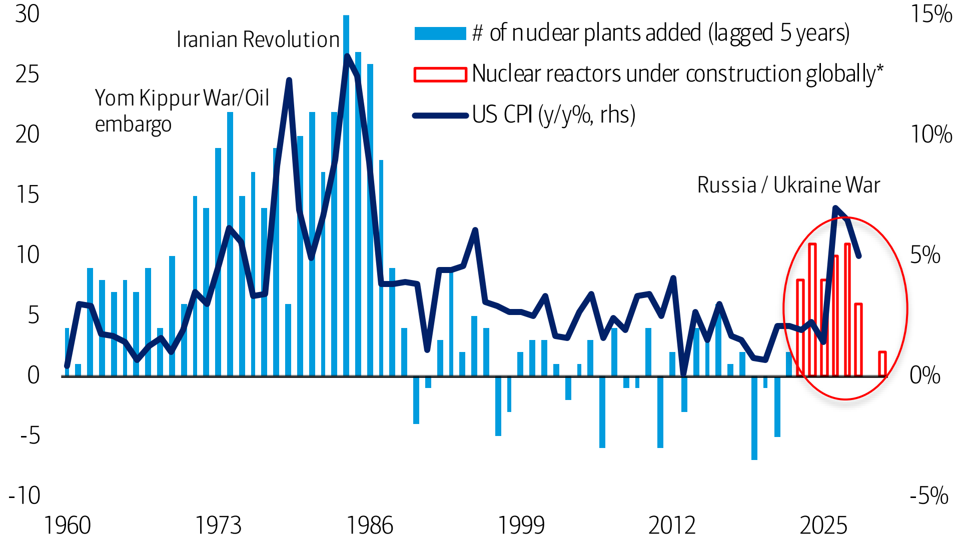
Global nuclear plant capacity grew strongly between 1955 and 1980. The 1980s alone saw 195 plant additions globally after two oil crises, rampant inflation, and concerns over energy security (Exhibit 9). Nuclear reactor building ground to a halt after the Three Mile Island incident in 1979 and Chernobyl in 1986.

Russia/Ukraine is the catalyst for energy security

Russia's invasion of Ukraine and the ensuing inflation shock in 2022 thrust back into focus the importance of reliable, secure energy supplies. About 60 nuclear plants are currently under construction, mostly in Asia and other emerging markets.

[13] In a call with BofA strategists earlier this year, Bram Vanerelst, Director/Head of Uranium at Curzon Resources, said he thinks the uranium market is undersupplied by 50-60 million pounds per year. There are risks that new mines won't start on time when the market is as tight as it's been in about a decade (see report: Key takeaways from uranium call: price ready for a breakthrough higher).

Exhibit 9: War and inflation to spark a nuclear power resurgence
US CPI vs global operational nuclear plants added on an annual basis



Source: BofA Research Investment Committee, World Nuclear Association, Statista. *Year = expected year of grid connection
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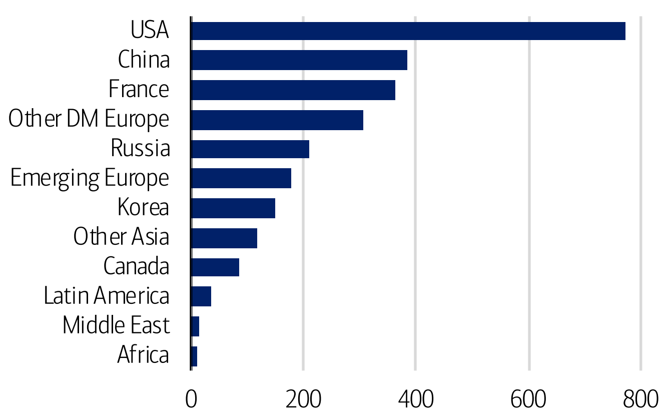
Resource nationalization is accelerating. Chile and Mexico have nationalized lithium. Norway will nationalize natural gas in the next five years and Indonesia banned exports of key battery materials in 2020. The OECD recently found that about 10% of critical raw material exports face at least one restriction measure.

Excess nuclear capacity is limited, and nuclear reactor additions will be a positive source of demand. In the US, many reactors are getting operating extensions. In 2021, the Nuclear Regulatory Commission (NRC) began investigating the impact of extending nuclear power plant licenses to 100 years. If 92 US nuclear plants extended licenses to 100 years, they could operate until at least 2069.

Exhibit 10: US, China, & France account for 58% of nuclear generation
Annual nuclear power production, TWh



Source: BofA Research Investment Committee, IAEA/PRIS
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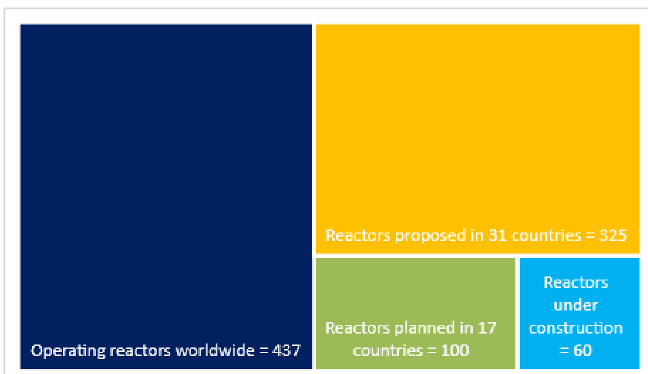
Exhibit 11: Global reactor demand could more than double
Nuclear plants at different stages of the construction process



Source: BofA Research Investment Committee, World Nuclear Organization
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The US, China, and France generate >1,500 TWh of nuclear energy (58% of the global total — Exhibit 10). The rest of the world is looking to expand. Global nuclear plants could surpass 900 if the 100 reactors planned and 325 proposed materialize (Exhibit 11). China has been driving nuclear reactor growth with 15 plants under construction and another 150 more planned or proposed.

Exhibit 12: Recent policy measures enabling a global shift to nuclear power
Summary of selected policy measures related to uranium and nuclear energy

Country	Catalyst	Description
US	Inflation Reduction Act	$30bn production tax credit for nuclear power 30% tax credit for zero emission advanced nuclear plants
	CHIPS Act	$800 million to support advanced reactors
	ADVANCE Act	Build on IRA and CHIPS act for advanced nuclear reactors
	Civil Nuclear Credit Program	$6bn in funding from Bipartisan Infrastructure Law to preserve current fleet; $1.2bn added in March
	Illinois State Senate	Lifted thirty-year ban on construction of new nuclear plants
	Tennessee	Governor proposed $50 million in funding to incentivize nuclear development and manufacturing
UK	Great British Nuclear Plan	Increase share of nuclear in UK's electricity mix from 15% to 25% by 2050
China	Decarbonization Goals	Increase share of nuclear in China's electricity mix from 5% to 18%
Finland	Launch Europe's largest reactor	First reactor in Finland in 40 years and first to launch in Europe over past 16 years
Canada	2023 Federal Budget	15% investment tax credit for nuclear projects
Japan	Green transformation	Extend life of nuclear reactors beyond 60 years in addition to building new reactors to replace old ones
India	Modi approves JV nuclear installations	Nuclear capacity to triple by 2031
South Korea	10th Electric Plan	Maintain nuclear's share of energy mix at 30%; previous administration wanted to phase out nuclear
Australia	SSN-AUKUS	Nuclear submarine partnership between Australia, UK, and the US

Source: BofA Research Investment Committee, Various news outlets and government press releases.

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India, Türkiye, France, and the UK are all exploring the option of more nuclear power. Poland plans to add nuclear capacity in the next decade and could get up to $4bn in US financing. Saudi Arabia plans to construct two nuclear reactors by 2040 and is considering small reactors for water desalination.

In the US, there are other major initiatives to expand nuclear power (Exhibit 13). California Governor Gavin Newsom expended valuable political capital keeping Diablo Canyon open in 2022. National policy initiatives like the Civil Nuclear Credit (CNC) Program could help to restart plants like Palisades in Michigan although restart is not the utilities' team base case.

The policy shifts not yet priced in

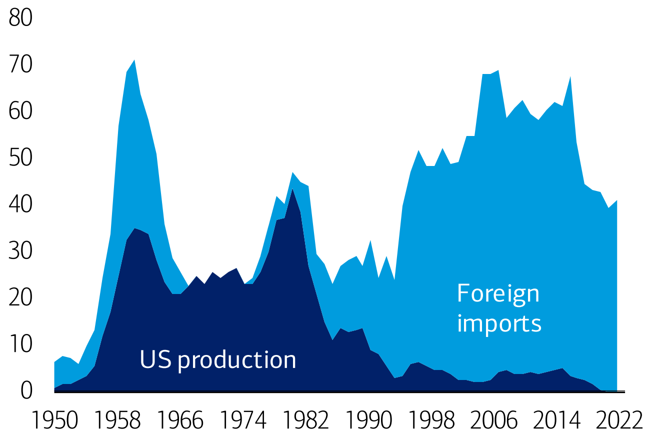
Tight markets are susceptible to even minor policy changes. Two short-term policy catalysts to watch: 1) potential G7 sanctions on Russian production; and 2) nuclear power designated as essential for decarbonization.

1. Potential G7 sanctions on Russian production

In April 2023, five G7 countries (the US, UK, Canada, France, and Japan) announced a long-term plan to replace Russian nuclear fuels. Sanctions have not yet been formally announced on Russia's state-run Rosatom, but the framework is a step in that direction.

As Lawson notes in our interview, Russia accounts for 35-40% of global conversion and 50% of enrichment capacity. The US is almost entirely dependent on imports of uranium after domestic production peaked in the late-1970s (Exhibit 13). Our metals & mining team note that the loss of Russian uranium supply could spark a "2003-2007 style super-bull market," suggesting prices at $100/lb or above (+90% upside).

Exhibit 13: US dependent on foreign countries for uranium
Uranium for nuclear power plants by source, millions of pounds



Source: BofA Research Investment Committee, EIA

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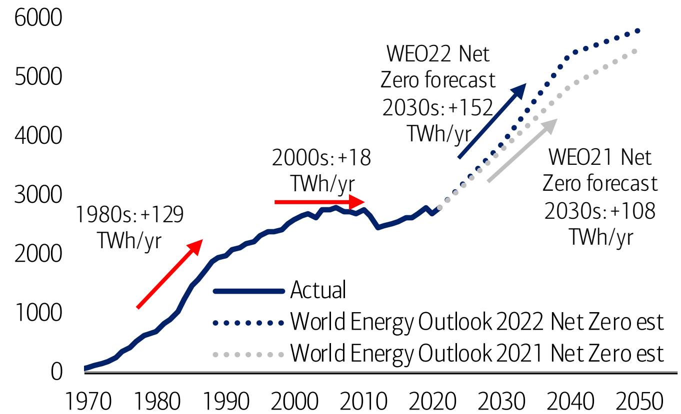
Exhibit 14: Net zero goals require doubling of nuclear power output
Total world nuclear generation, TWh



Source: BofA Research Investment Committee, IEA World Energy Outlook, BP Statistical Review of World Energy, Radiant Energy

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Sanctions would also be bullish for the miners mentioned above. Higher prices would not be bearish for regulated utilities because higher fuel prices are passed through at cost. Western conversion and enrichment capacity could also come back online if Russia is pressured.

2. Nuclear power as key for decarbonization

Some policy makers are embracing the idea that nuclear energy can help meet decarbonization goals, and many more may follow. European emissions are on track to miss the 2030 target by nearly 1 billion tons of CO2. As a result, official forecasters like the IEA and the UN are adding more nuclear energy into net zero scenarios.

The IEA's latest World Energy Outlook suggests that nuclear power output will have to nearly double by 2050 to meet net zero goals (Exhibit 11). Annual additions would need to average 152TWh per year, the fastest rate ever and above the pace expected in 2021.

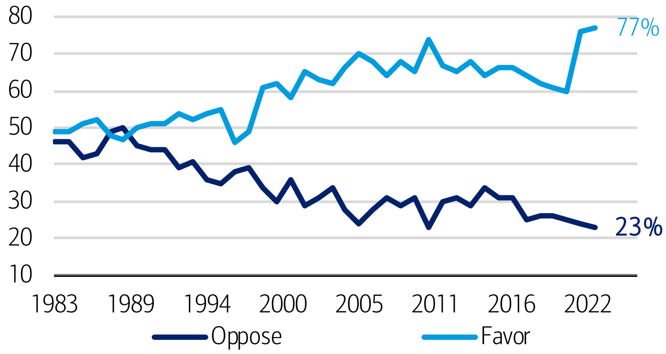
From misanthropes to isotopes

Opinion polls also reveal a bourgeoning, even strong, preference for nuclear power:

- **US:** 77% approve of nuclear energy (Exhibit 15) and 72% want more reactors;[14]
- **Japan:** a majority now supports restarting idle nuclear plants (Exhibit 16);[15]
- **Germany**: a recent poll found that only a quarter of Germans wanted the remaining nuclear plants switched off in March 2023.[16]

[14] Bisconti Research Inc, National Nuclear Energy Public Opinion Survey. June 2022.
[15] World Nuclear News, Poll finds record support for Japanese reactor restarts. February 2023.
[16] Clean Energy Wire, Two thirds of Germans against shutting down last nuclear power plants at this point. April 2023.

Exhibit 15: 77% of Americans approve of using nuclear energy
Percent who favor vs. oppose the use of nuclear energy for electricity



Source: BofA Research Investment Committee, Bisconti Research, Inc.

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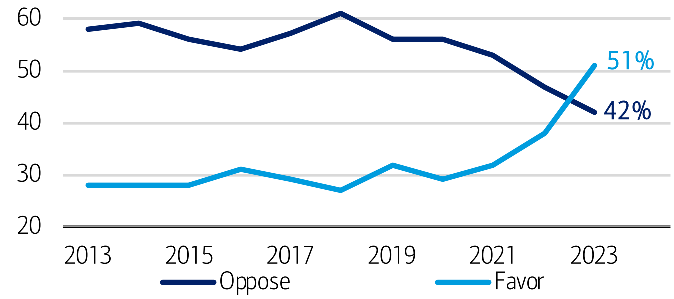
Exhibit 16: Majority of Japan supports restarting idled nuclear reactors
Views on restarting nuclear plants



Source: BofA Research Investment Committee, World Nuclear News, Asahi Shimbun. Note: Other or no responses are omitted.

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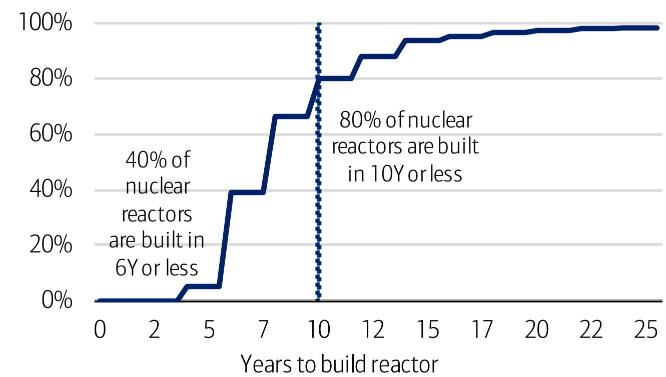
Change can happen fast

Policy initiatives and public support could see new nuclear plants materialize more quickly than typically assumed. 80% of nuclear reactors are built in a decade or less while 40% of reactors take 6 years or less to build (Exhibit 17).

Regulatory burdens can be a major source of cost overruns and slower construction times.

- A 2016 Energy Policy paper found that US costs increased from $650 per KW to as high as $11,000 due to licensing, regulatory delays, and back-fit requirements.
- The average US nuclear plant pays $60mn in costs and fees to the Nuclear Regulatory Commission.
- The NRC 32-part licensing process requires the multi-step approvals from other regulatory agencies. Environmental Impact Statements alone can take 24-36 months.

Exhibit 17: Nuclear reactors are usually built in 6-8 years
Construction time of nuclear reactors that were operable by March 2023



Source: BofA Research Investment Committee, Hannah Ritchie, "How long does it take to build a nuclear reactor", IAEA

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Most French plants were built within 5-8 years while China can build nuclear plants safely in 3-5 years. Streamlining the process could make new nuclear investments more attractive, especially in the US.

The renewable interest in nuclear power

Nuclear power is a proven technology that can provide reliable, cheap, clean, and safe power as a bridge to renewable sources if/when they become ready at a larger scale.

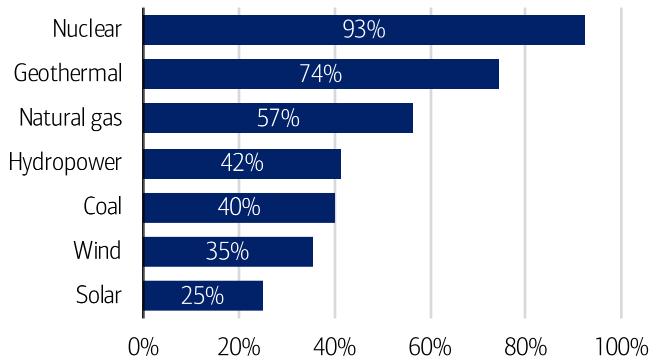
1. Reliability

Reliable baseload power is essential. Nuclear plants generate power 93% of the time, on average, vs. just 57% for natural gas and 40% for coal (Exhibit 18). Intermittent sources like wind and solar generate power 35% and 25% of the time, respectively.

"Capacity factor" is the technical term for these production limits. A capacity factor is the ratio of actual power produced to maximum potential capacity. For example, 100MWh of installed solar capacity would only generate 25MWh of power on average.

Actual grid output shows the limits of technologies with lower capacity factors. Nuclear provides consistent output while solar and wind exhibit massive swings (Exhibit 19). Renewable sources need either a backup source (e.g. natural gas or coal) or lithium-ion batteries to compensate for intermittency.

Exhibit 18: Nuclear is the most efficient energy source...
Capacity factor by energy source



Source: Research Investment Committee, Office of Nuclear Energy

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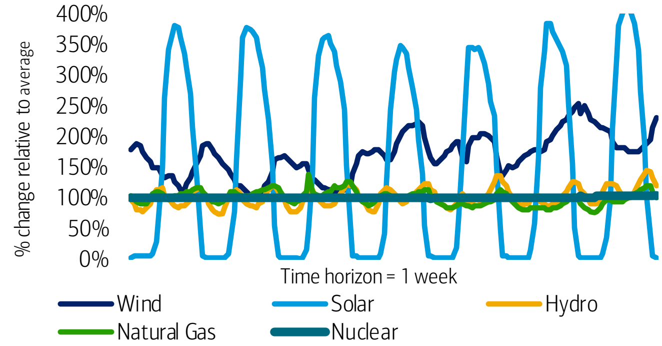
Exhibit 19: ...and provides reliable baseload power
Energy output for each power source relative to weekly average



Source: Research Investment Committee, EIA. Data from US real-time operating grid between April 25th, 2023, and May 2nd, 2023.

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2. Cost

Industry research suggests that, after accounting for efficiency, storage needs, the cost of transmission, and other broad system costs, nuclear power plants are one of the least expensive sources of energy.

"Levelized cost of energy" (LCOE) measures an energy source's lifetime costs divided by energy output and is a common standard for comparing different energy projects. Most LCOE calculations do not account for factors like natural gas or expensive battery backup power for solar or wind farms.

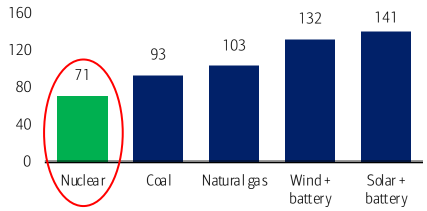
Solar and wind look more expensive than almost any alternative on an unsubsidized basis when accounting for those external factors (Exhibit 20).[17] This is especially true when accounting for the full system costs (LFSCOE) that include balancing and supply obligations (Exhibit 21). Nuclear appears to be the cheapest scalable, clean energy source by far.

Critics cite examples of cost overruns and delayed construction as some of the main reasons for choosing other technologies. Initial capital costs for nuclear are high, but energy payback, as measured by the "energy return on investment" (EROI), is in a league of its own (Exhibit 22). EROI measures the quantity of energy supplied per quantity of energy used in the supply process.

A higher number means better returns. The EROI ratio below 7x indicates that wind, biomass, and non-concentrated solar power may not be economically viable without perpetual subsidies.

[17] LCOE estimates in the recent literature vary widely for all sources. For nuclear power, the International Energy Agency cites a range from $49 to $102/MWh ($69 average) in 2020; in 2022, the US Energy Information Administration estimated $88/MWh. The Lazard estimate uses the costs from a single project, Plant Vogtle in Georgia.

Exhibit 20: Nuclear is cost-effective…
Cost of generation, different sources ($/MWh)



Source: BofA Research Investment Committee, Lazard, Entler, et al. (2018). Note: nuclear, coal, and natural gas price estimates from Entler, et al. Wind and solar cost estimates are from Lazard's 2023 Levelized Cost of Energy+ report. Wind + battery and solar + battery use estimates from California's Independent System Operator (CAISO) and assume a 4-hour lithium-ion battery storage system to account for firming costs. All cost estimates show unsubsidized costs.
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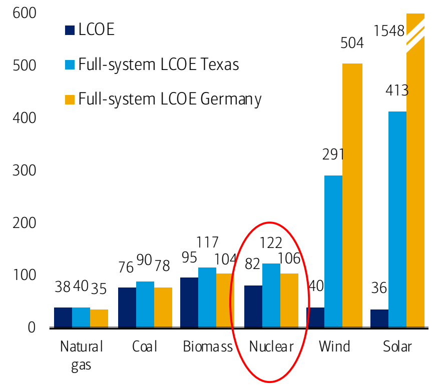
Exhibit 21: …especially on an "all-in basis"…
LCOE & LFSCOE calculations by energy source



Source: BofA Research Investment Committee, Idel 2022
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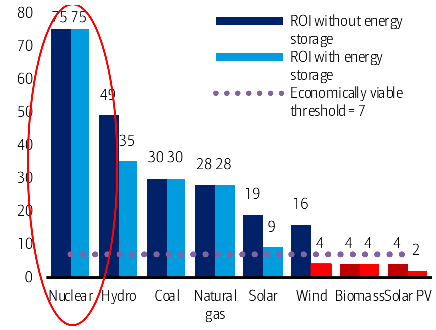
Exhibit 22: …and has the highest energy ROI
Energy returned on energy invested, by source



Source: BofA Research Investment Committee, D. Weißbach, G. Ruprecht, A. Huke, K. Czerski, S. Gottlie, A. Hussein; Red signals EROI below economically viable threshold
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3. Emissions

Nuclear power is also one of the cleanest sources of energy when evaluating lifecycle greenhouse gas (GHG) emissions (Exhibit 23). Lifecycle emissions account for pollution associated with assembling a given energy source, transporting the source to its location, and disposal of the source once it's depleted. Nuclear power looks attractive on an all-in basis because of:

- **Materials**: renewable energy sources are not depleted when used (there isn't less sunlight when a solar panel captures the energy), but the construction of wind/solar/battery capacity requires copious amounts of concrete and mined rare earth metals. Nuclear plants require about 900 tons of cement, concrete, and glass per TWh of electricity generated while solar requires >16,000 tons of material for the same energy output (Exhibit 24).

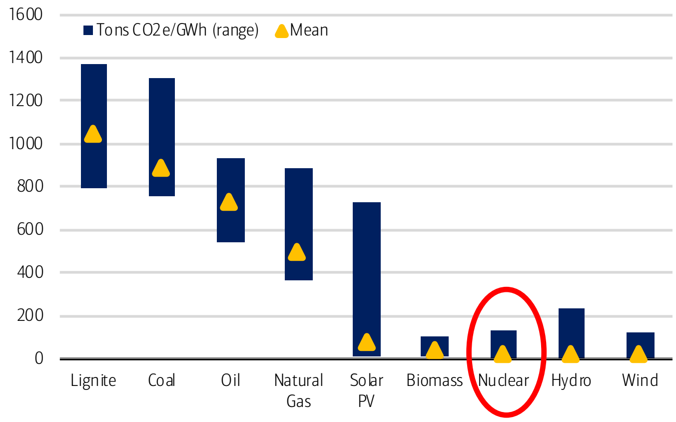
- **Longevity**: nuclear power plants can last anywhere from 40 to 100 years with proper maintenance while solar panels and wind farms are replaced after 20-30 years. A solar farm may need to be replaced as many as five times during the operable life of a nuclear plant.

- **Land use**: a 1000 MW nuclear power plant would need 1.3 square miles, about the size of Central Park. The same plant powered by solar would require between 45 and 75 square miles, the size of the Bronx or Brooklyn, respectively. A 1000 MW wind farm would need 260 to 360 square miles, the combined size of New York City's five boroughs.[18]

A recent report from the United Nations Economic Commission for Europe (UNECE) confirmed the same result, that nuclear power has the lowest carbon footprint of any electricity source with the lowest lifecycle land and material use.

[18] Nuclear Energy Institute, Land Needs for Wind, Solar Dwarf Nuclear Plant's Footprint. July 2015.

Exhibit 23: Nuclear is cleaner than most other power sources...
Lifecycle greenhouse gas (GHG) emission by electricity source



Source: BofA Global Research, World-Nuclear Association

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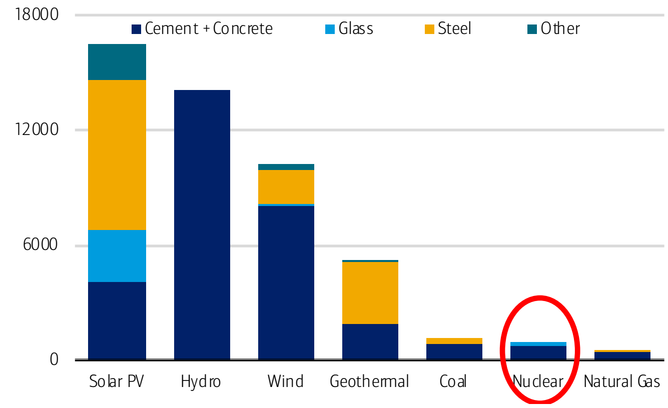
Exhibit 24: ...and has one of the lowest material requirements
Materials required for construction by energy source (tons per TWh)



Source: BofA Research Investment Committee, Quadrennial Technology Review, Sustainable Review

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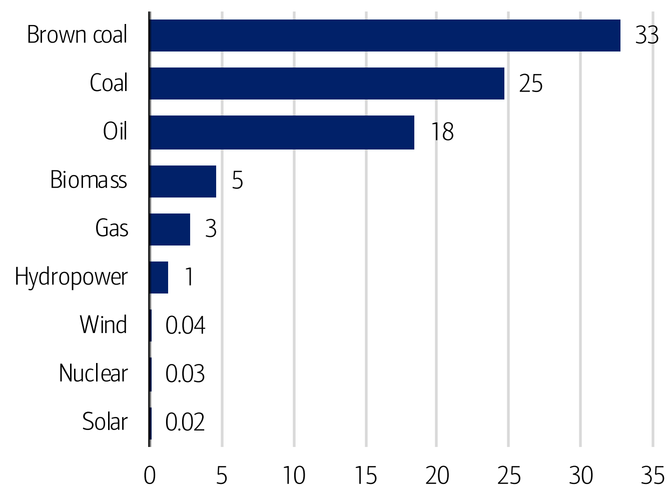
4. Safety

- **Deaths**: Nuclear energy, solar, and wind have all caused essentially no deaths from routine operation; all are orders of magnitude safer than coal and oil pollution (Exhibit 25).
- **Disasters**: Containment and engineering methods have evolved to mitigate risks. The single greatest loss of life from an energy accident was from a dam failure in 1975, but hydropower is still pursued; Chernobyl & Fukushima fears must be balanced in the context of over 18,500 cumulative reactor years without incident.
- **Radiation:** Living near a nuclear power plant for a year gives less radiation exposure than a dentist's chest X-ray. Coal ash emits 33x more radiation than nuclear plants.
- **Waste:** A 1,000 MW nuclear plant produces only 3 cubic meters of highly radioactive waste per year when recycling methods are implemented. 90% of waste can be disposed safely without long periods of storage.[19]
- **Weapons:** Uranium is an abundant resource and enrichment is an old technology. The risk of nuclear weapon proliferation would exist in the absence of nuclear power.

Exhibit 25: Nuclear power is as safe as other renewables
Deaths from accidents & air pollution per TWh of electricity produced



Source: BofA Research Investment Committee, Our World in Data, Markandya & Wilkinson (2007); Sovacool et al. (2016); UNSCEAR (2008; & 2018)

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In 2023, a study from MIT found that, since retired nuclear plants are often replaced with fossil fuel capacity, closing reactors prematurely could result in 5,200 additional deaths per year from the associated air pollution.

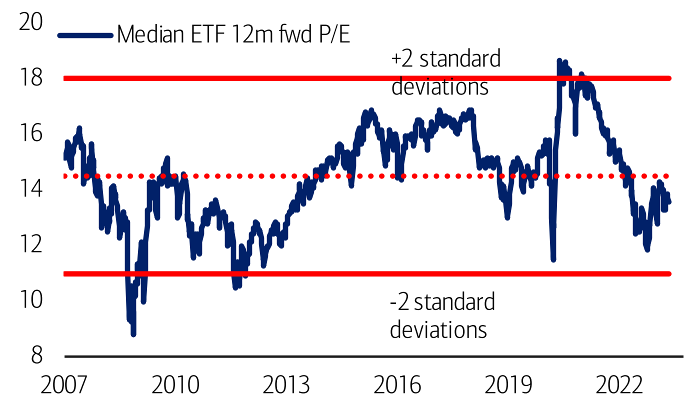
[19] World Nuclear Association, What is nuclear waste, and what do we do with it? N.d.

ETF Valuation

Valuation multiples continue to hover 16-year average

- The median equity ETF in our coverage trades at 13.6x forward earnings, little changed from March, while the historical average is 14.5x (Exhibit 26). Investors should remain selective as dispersion remains wide among funds.
- Communication Services funds have the lowest valuations but be weary of value traps (Exhibit 27). Tech, Healthcare, and Staples look the most stretched. Healthcare is now the most expensive of defensive sectors.
- Buybacks, and Int'l Dividends trade at relatively attractive valuations, but became more expensive month over month.
- LatAm, Canada, and Japan are the cheapest international equity funds. Global ex US ETFs trade in line with average. India has become cheaper but remains expensive.

Exhibit 26: Equity ETF valuations approaching historical norms
Median 12 month forward P/E ratio across BofA equity ETF coverage



Source: BofA ETF Research, Factset. Note: Median calculated using12m fwd P/E ratios for all equity ETFs in our coverage.

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Exhibit 27: Equity ETF valuations by category
ETF valuation ratios and composite score (lower is better)

	Sub-category	Composite Valuation (stdev)	12m fwd P/E	12m fwd P/B	12m fwd EV/EBITDA	12m fwd P/FCF	Top-rated fund	Bottom-rated fund	Link
US Equity Sector	Comm Services	-0.62	16.94	2.52	8.78	16.99	XLC	IYZ	Getting so defensive
	Real Estate	-0.41	15.93	2.41	16.66	17.40	XLRE	SCHH	ETFs for Cyclical Extremes
	Energy	0.09	10.29	2.05	5.84	10.64	XLE	PXI	ETFs for Cyclical Extremes
	Financials	0.31	12.56	1.54	na	na	XLF	FXO	ETFs for Cyclical Extremes
	Materials	0.45	15.47	2.39	9.23	20.25	FXZ	IYM	ETFs for Cyclical Extremes
	Discretionary	0.74	22.35	6.31	12.39	23.22	VCR	IYC	ETFs for Cyclical Extremes
	Industrials	0.74	17.88	4.18	11.92	20.24	XLI	FXR	ETFs for Cyclical Extremes
	Utilities	0.75	18.16	1.97	11.84	-73.43	XLU	RYU	Getting so defensive
	Staples	1.25	21.29	5.70	14.55	24.23	VCR	RHS	Getting so defensive
	Health Care	1.26	17.92	4.16	14.65	19.60	VHT	PTH	Getting so defensive
	Tech	1.51	23.97	7.02	16.44	25.05	XLK	QTEC	ETFs for Cyclical Extremes
Single Factor	Buybacks	-0.89	9.99	2.12	6.42	10.16	DIVB	IPKW	Follow the money with Dividend & Buyback ETFs
	Int'l Dividend	-0.72	10.32	1.51	7.58	14.24	VYMI	PID	Markets to rent and markets to own
	Dividend	-0.35	12.59	2.56	9.67	15.67	SPYD	AIVL	Follow the money with Dividend & Buyback ETFs
	Quality	0.34	18.04	5.13	12.36	19.51	COWZ	JQUA	One factor to rule them all
	Value	0.51	13.78	2.22	10.08	17.44	VTV	XSVM	Initiating coverage of value ETFs
	Growth	1.12	24.39	7.27	15.73	25.02	SCHG	IVW	Growth for contrarians
US Size	Small Cap	-0.26	18.81	1.75	10.22	20.89	CALF	FYX	Shopping Small
	Mid Cap	-0.23	14.71	2.23	10.57	18.13	SCHM	FNX	The Sweet Middle
	Large Cap equal wgt	0.25	15.89	3.18	11.45	19.22	FNDX	LRGF	The Sweet Middle
	Large Cap mkt cap	1.08	18.96	3.92	12.88	22.01	IVW	OEF	The Sweet Middle
Thematic	ESG	0.05	16.40	2.90	11.52	20.63	VOTE	ESGE	ESG ETFs get a better model and a VOTE
	Clean Energy	0.83	37.83	2.18	81.22	-22.26	ICLN	PBW	Valuations up, catalysts down: Neutral clean energy ETFs
Int'l Equity	Latin America	-1.19	8.02	1.31	4.90	9.83	ILF	ECH	Initiating coverage of Latin America equity ETFs
	China	-0.20	10.59	1.23	9.93	19.36	KBA	EWH	Markets to rent and markets to own
	DM ex-US	-0.17	12.81	1.50	8.58	18.26	HEFA	RODM	Markets to rent and markets to own
	Japan	-0.16	13.16	1.18	9.30	20.13	DBJP	JPXN	Markets to rent and markets to own
	Emerging Markets	-0.15	11.81	1.45	8.11	17.88	EMXC	EEMV	Markets to rent and markets to own
	Canada	-0.11	13.08	1.82	9.37	23.84	FLCA	ACWX	Markets to rent and markets to own
	Global Markets ex-US	-0.01	4.67	0.56	3.17	6.84	VEU	FDD	Markets to rent and markets to own
	Europe	0.04	12.49	1.69	8.42	17.31	FEZ	SMIN	Markets to rent and markets to own
	India	0.50	19.35	2.86	11.90	26.83	EPI	VNM	Markets to rent and markets to own
	Single-country EM	0.57	13.14	1.28	7.64	22.22	KSA	IYZ	Buying emerging markets on their merits

Source: BofA ETF Research, Factset. Note: All valuation metrics are based on next twelve month (NTM) I/B/E/S estimates. "Composite Valuation" is the market-cap weighted average standard deviation of each fund's P/E, P/B, EV/EBITDA, and P/FCF ratios. A higher number indicates that funds are more expensive relative to history while lower numbers suggest that funds are inexpensive.

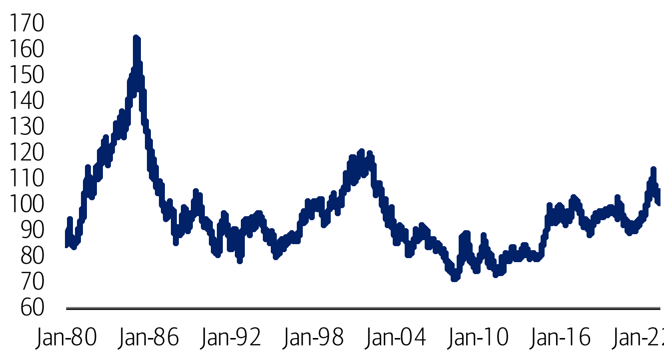
BofA GLOBAL RESEARCH

Macro & Econ Highlights

Recent headlines exaggerate risk of USD replacement

Buzz from media outlets has left investors with overblown worries of USD replacement. BofA's G10 FX Strategy Team highlights that the USD will keep its throne. In the cases where the USD has lost share, it has been from incredibly high levels and over long periods of time. For example, the share of USD Swift payments is highest relative to other currencies and has remained steady despite talks over the increasing role of CNY in the global economy. Some may point to decline USD share in Central Bank reserves, but this trend has existed for decades. Recent decline in USD can be attributed to demands for diversification amidst geopolitical risk. Finally, there is no clear successor in the event the USD does fail: the Euro has yet to rise to the challenge, BRICS lack cooperation, and digital assets could even strengthen USD's importance.

Exhibit 28: DXY index
The USD remains historically strong, despite recent weakness



Source: Bloomberg

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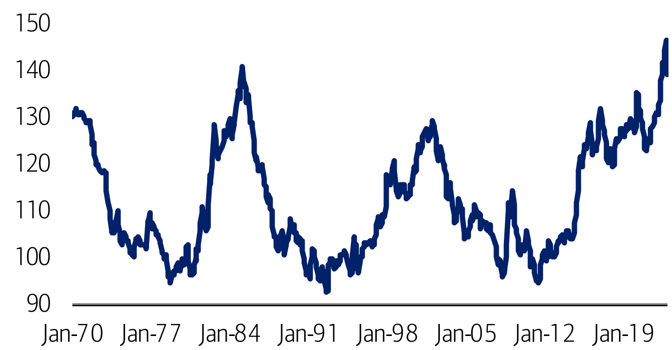
Exhibit 29: USD Real Effective Exchange Rate
In real effective terms, the USD remains historically very strong



Source: Bruegel, BIS and BofA Global Research

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Structurally higher inflation opens door for gold

BofA's ETF Research Team recently initiated on Gold ETFs and updated their views on Gold Miner ETFs. The team is favorable gold on its ability to improve risk adjusted returns in portfolios and potential for strong returns. Gold acts as a particularly strong hedge in times of crisis. They build on BofA's Metals and Mining team's bullish fundamental view, citing that lower real rates lower the opportunity cost of owning gold. For short term movements in gold, Gold Miners ETFs' high sensitivity to the yellow metal can boost returns.

Debt ceiling to heat up into Summer '23

Grab your popcorn, Ethan Harris and the Global Economic Team highlight the potential for an ugly battle over the US debt ceiling. BofA's Rates Team is matching their "x-date" expectation with Yellen's June 1st guidance. Potential for economic stress and market pressure may be the collateral to motivate a deal. Otherwise, freezing the debt ceiling would mean cutting spending by up to 10% of GDP. For more information debt ceilings, see the February report from our Rates Team.

For now, Chris Flanagan sees bank stress retreating while US debt stress advances. Looking back to 2011, bond yields and inflation breakevens plunged in late summer in the wake of brinkmanship. A similar situation stands today: full blown brinkmanship suggests downside risk to BofA's 3.25% 10Y forecast.

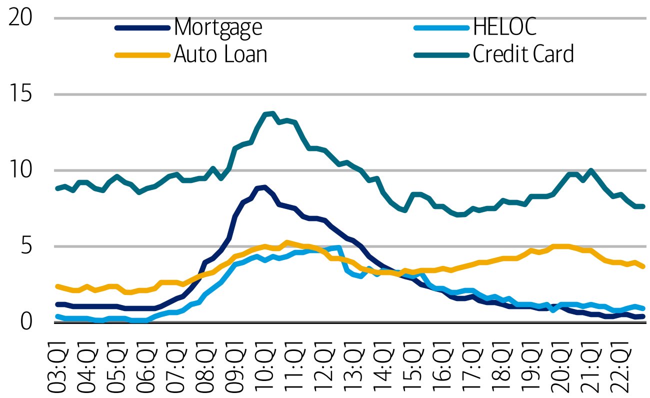
Housing: Mortgage credit strong, equity sectors to own

Pratik Gupta, Chris Flanagan, and Rafe Jadrosich examine the case for mortgage credit. They expect mortgage credit to outperform consumer and corporate debt in the event of a recession. Homeowners with sub 5% mortgages are reluctant to sell while Millennials are entering peak home buying age. Further, new home completions are only forecasted to be 1.3 million, insufficient to meet growing demand from high income renters looking to buy. This supply and demand imbalance should hold existing home supply at all-time lows.

Flipping to equities, [BofA's 8th annual housing survey] finds that Millennials are looking to buy sooner than later, and affordability remains top of mind. 66% of Millennials in the survey suggested they could buy a home in the next two years. If this is realized, housing prices could go up and there are strong tail winds for renovation stocks. The report highlights 19 stocks across retail & consumer and homebuilders & building that are poised to benefit as Millennials enter the housing market.

Exhibit 30: Share of Seriously Delinquent (D90+%) loans across debt type

Mortgage Credit remains pristine across consumer debt types



Source: New York Fed Consumer Credit Panel, Equifax

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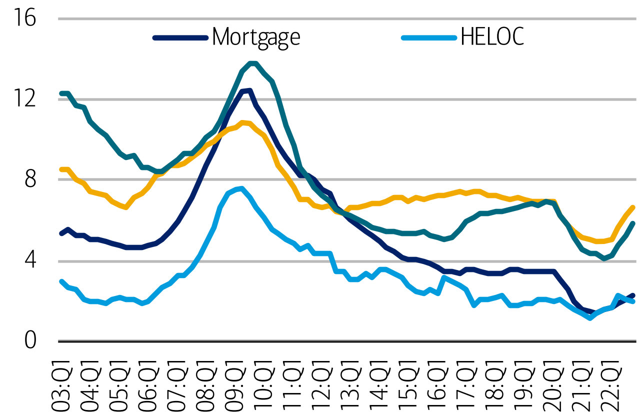
Exhibit 31: Transition into Delinquency (D30+) by Loan Type

Mortgage Delinquency transition rates remain close to record lows



Source: New York Fed Consumer Credit Panel, Equifax

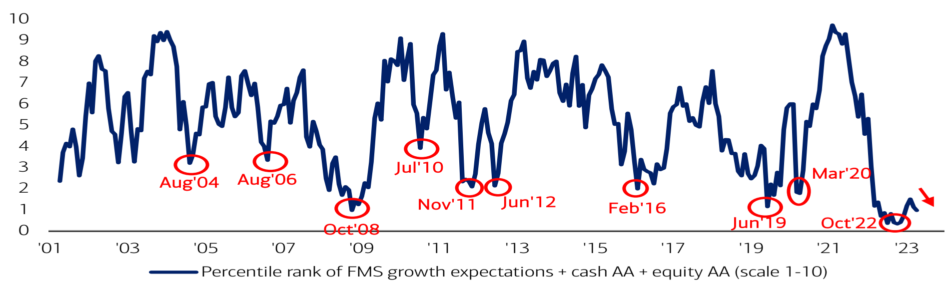
BofA GLOBAL RESEARCH

April FMS shows bears emerging from hibernation

[April's Fund Manager Survey] was the most bearish read of 2023 as the credit crunch weighs on the bullish posture from the start of the year. Bond allocations have move to highest levels since 2009. 72% of investors predict lower short-term rates, the most since November 2008. At the same time, cash levels held steady at 5.5% in April, unchanged from March. Michael Hartnett sees contrarian support for risk assets if a recession takes longer than anticipated. He also suggests fading the S&P 500 at 4200.

Chart 1: Sentiment turns more bearish in April, most pessimistic thus far in '23

Percentile rank of FMS growth expectations + cash AA + equity AA



Source: BofA Global Fund Manager Survey.

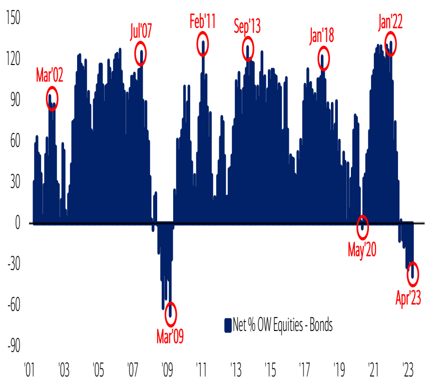
BofA GLOBAL RESEARCH

Equity & Thematic Highlights

Into a highly anticipated recession, own cyclicals

While fund managers have the highest allocation to bonds since the Global Financial Crisis, Savita Subramanian highlights 10 reasons to own cyclical stocks this quarter. The Fed has leverage to guide a soft landing following the fastest hiking cycle ever. Further, venture capital/private equity firms are sitting on plenty of dry powder. Stock allocation is as low as prior recession levels while the economy has yet to officially enter recession territory. Cyclicals specifically have been purged by funds even though BofA's proprietary Japan Factory Automation index has inflected higher, a positive sign for cyclicals. Japan's Factory Automation Index has a high hit-rate timing a cyclical rebound since 1993 and capital good stocks usually rise 35% in the 18 months post index trough.

Chart 2: FMS most overweight bonds vs. stocks since Global Financial Crisis (GFC)
Net % overweight equities vs bonds



Source: BofA Global Fund Manager Survey
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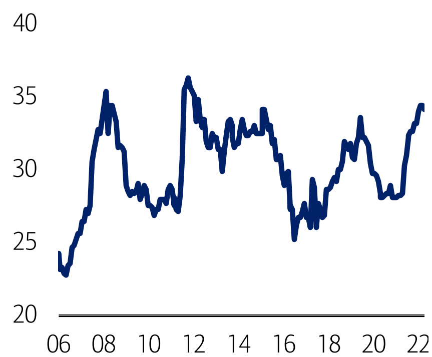
Exhibit 32: Asset allocators' bond love at peak levels
Average recommended allocation to bonds by Wall Street strategists (as of 3/2023)



Source: BofA US Equity & Quant Strategy
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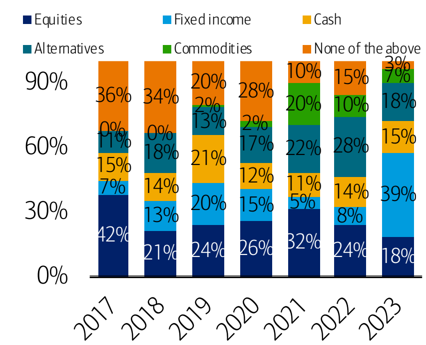
Exhibit 33: Individuals shun stocks, add to bonds (GWIM Survey (note))
How are you currently changing your asset allocation? Moving more into...



Source: Wealth Management Marketing Research, BofA US Equity & US Quant Strategy
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Fertilizer supply to remain disrupted, valuation attractive

Following record pricing last spring, weak corn futures, and anticipation of favorable weather conditions, North American fertilizer stocks have been sliding for the last year. Steven Byrne and the Chemicals team remains constructive for three reasons. 1.) Channel inventories are likely tight going into spring following distributors deferring purchases for the last 9 months 2.) They see stable fertilizer pricing now for all three nutrients at double 2020 levels 3.) Ammonia production costs in the US are $300/mt cheaper than the EU. A result, earnings should remain stable, but current 5x EBITDA multiples suggest peak earnings. As a result, 5x EBITDA is too low and supports their constructive view.

Latest Defense primer: Defense electronics & cyberspace

As the Department of Defense places a strong emphasis on preparedness for cyber warfare, there has been significant investment into defense electronics R&D. Ron Epstein highlights two key trends in defense electronics investment: 1.) reshoring from China in favor of US specialized firms 2.) Outsourcing component production where possible, resulting in more cost-effective technology. Rapidly changing technologies and increasing cyber threats are likely to spur continued spending on IT services. Booz Allen Hamilton, CACI, Palantir and Leidos are highlighted as the most concentrated exposure to government cyber operations.

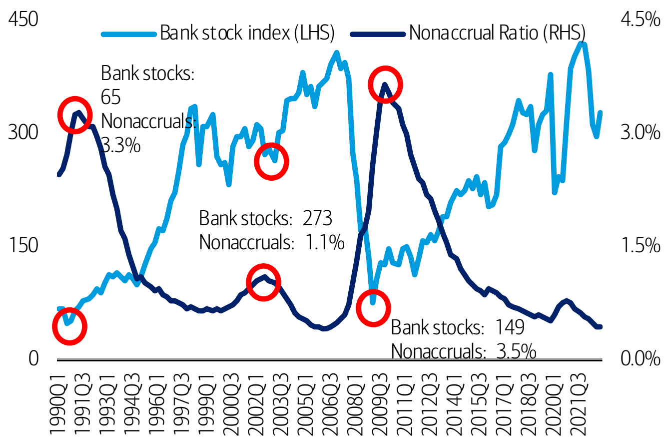
Schwab lower on LT headwinds despite NT catalysts

Craig Siegenthaler lowers his PO on Chares Schwab from $51 to $46 on concerns over lower deposit balance growth in the future. Specifically, registered investment advisors may leave much less cash in SCHW deposit accounts given that money markets funds and ST bonds have higher yields. Similarly, there may be concerns for those with assets in excess of the $250k FDIC insured limit. He also sees the business models of Fidelity, Robinhood, and Interactive Brokers challenging Schwab. These long-term risks outweigh two near term catalysts: deceleration in cash sorting and AFS securities sale.

US banks and the long road ahead

Ebrahim Poonawala sees rolling headwinds for US banks through earnings and beyond. A slew of challenges remains: Deposit repricing, credit cycle, lower interest rates, QT, and regulatory challenges. At the same time, there is potential for a short squeeze as dividend yields of 5-6% (vs 2.5%) pre pandemic become hard to ignore. Better than expected 1Q earnings, JPM acquiring FRC, improved regulatory visibility, and a resilient US economy could also challenge the bear case enough to trigger a short squeeze led rally in the short term. Historically, though, banks bottom with rate cuts which are potentially several quarters ahead. Poonwala sees the recessions as not priced in and recommends starting selective among large caps: Buy-rated Goldman Sachs (GS), Wells Fargo (WFC), BNY Mellon (BK); among regionals: M&T (MTB), Fifth Third (FITB), East West (EWBC), Synovus (SNV).

Exhibit 34: Bank stocks have bottomed at nonaccrual loans peak
Bank stock index vs. Nonaccrual ratios



Source: BofA Global Research, Bloomberg

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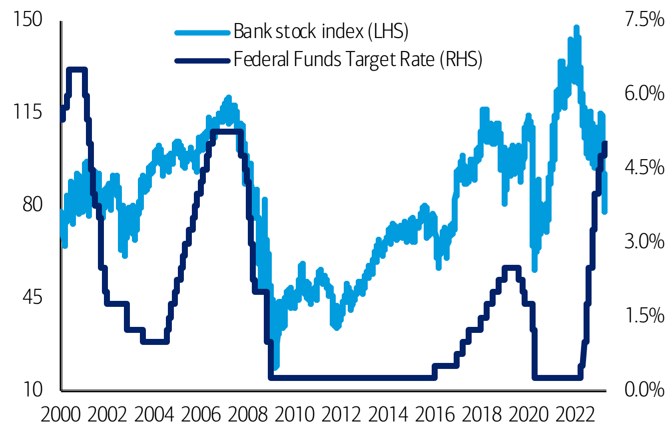
Exhibit 35: Bank stocks historically peak late in the rate hike cycle
Bank stock index vs. Federal funds rate



Source: BofA Global Research, Bloomberg

BofA GLOBAL RESEARCH

Checking up on healthcare as recession looms

BofA's Equity and Quant Strategy team reiterates their marketweight view on Health Care ahead of BofA's Health Care conference (May 9-11). The team sees 5 advantages and 4 drawbacks to owning the common recession trade. Positives include: 1) defensive, 2) earnings growth, 3) Downturn outperformer, 4) fundamentals, and 5) inexpensive. However, drawbacks are significant. The sector is the obvious recession trade and has become crowded. Other risks are that the current secular backdrop favors cyclicals, health care represents a third of IPO deals, and there are risks to Medicare spend as the debt ceiling approaches. In this report Andrew Bressler provides an in-depth policy outlook highlighting the battle over Medicare spend, IRA drug reforms, the end of the Public Health Emergency period. In a separate report, the Jill Carey Hall highlights top 16 SMID health care stock picks.

The Equity and Quant Strategy team also updated their week 4 earnings tracker. Q1 is tracking a 5% beat, but there has been a muted response. Sectors with the strongest results, like Health Care, are crowded, explaining the flat or negative responses to beats.

BofA Global Research house view

In this section we present the near-term outlook of our macro & market strategists. The table below summarizes the key calls and arguments from our analysts, and the table on the next page contrasts our latest forecasts with the market consensus.

Exhibit 36: BofA Global Research House View

Near-term outlook of our BofA macro & market strategists across key regions and asset classes

Core view (3-6 months)		Rationale
Investment Strategy	Bearish	
		Michael Hartnett says sell-the-rip in stocks to SPX 4.1-4.2k as no equity capitulation and market too greedy for rate cuts, not fearful enough of recession...long inflation assets contrarian again after Q1 whipping but Michael says "sell the last Fed hike" the correct strategy as in the inflationary 1970s/80s. Long US yield curve steepeners (lower short-end on recession, high long end on inflation & US government debt), short credit (greatest vulnerability to "hard landing"), short US$, long gold, long Rest-of-World vs short US..
Economics	Bearish	
		Michael Gapen expects the US economy to slip into recession in 3Q 2023. Cooling down the red hot labor market and strong service inflation will require a further tightening of financial conditions. This likely comes from both tighter bank lending standards and one more 25 bp Fed hike, following by an on-hold policy into next year. This will put downward pressure on demand and lead to a modest drop in GDP and an increase in the unemployment rate to close to 5% by end-2023. The decline in demand, rise in unemployment, and improving supply chains should help return inflation towards its 2% target over the medium term.
Rates & FX	Neutral	
		The near-term developments we will be focused on, to gauge both the degree of stress and the short-to-medium term impacts, will be: 1) usage of liquidity sources including the Federal Home Loan Bank system (FHLB) and Fed facilities; 2) any significant changes in the Fed's reverse repo facility (RRP); 3) the evolution of bank balance sheets shown in the Fed's weekly H8 data (which provides information with a one-week lag); and 4) the overall macro data, particularly jobs, inflation and business/consumer confidence.

Region	Ticker	Core view (3-6 months)	Rationale
Equities	MXWD	Neutral	
North America	MXNA	Bearish	Savita Subramanian targets 4000 on the S&P 500 by YE23, but thinks the market could go as low as 3000 based on risks like a recession, more earnings cuts, and softening cyclical indicators. A Fed easing cycle amid tightening credit conditions (i.e. recession) has been the worst backdrop for stocks. She forecasts S&P 500 EPS of $200 in 2023 (-9% YoY), half the typical EPS drop in a recession. Valuation indicates +5% price returns/yr over the next decade, pushing S&P to 6000+ by 2032. In 2023, she likes Quality amid slowing growth and the end of easy money.
Eurozone	MXEM	Bearish	Sebastian Raedler expects the lagged impact of aggressive monetary tightening to lead to a sharp loss of growth momentum over the coming months. This is set to translate into wider risk premia and accelerating EPS downgrades, consistent with 20% downside for the Stoxx 600 to a trough of 365 by early Q4, when we expect the global macro cycle to trough. Once growth momentum starts to rebound, we expect this to translate into a renewed rise in the Stoxx 600 to our year-end target of 410
UK	MXGB	Bearish	Sebastian Raedler remains negative on UK relative to European equities, given his expectation for energy sector underperformance, with energy a key overweight in the UK index. On an absolute basis, he sees scope for the FTSE 100 to decline to 6,500 by Q4 (16% downside from current levels) before a rally back to 7,200 by year-end, as a growth acceleration helps equities and the oil price rebounds
Japan	MXJP	Neutral	Masashi Akutsu expects the revaluation of Japan stocks to gain momentum, thanks to both cyclical and structural factors. Transition to an inflation regime and corporate restructuring would be key. We recommend a barbell strategy combining domestic demand-oriented sectors with China-related stocks post fiscal-year results amid the macro backdrop.
Fixed Income	GFIM	Neutral	
Government	W0G1	Neutral	Debt limit market concern will likely increase in coming weeks & be shown via a more acute hump in the UST bill curve, mid-June UST coupon cheapening, and potential risk off later in May. Resolution likely at last minute; push to Sept 30 possible. Worse case outcomes can't be ruled out. These dynamics sustain our core views: duration = long bias, tactically with 10yT between 3.25-3.75%; curve = steepening bias, we prefer 5s30s vs 2s10s at this point in the cycle. Forwards easier to beat in duration vs curve. Our preference is still to express duration longs in real rates over nominals due to underpriced upside inflation risk premium. Fed will likely pause after May hike: history says, "buy the last hike".
Investment Grade	G0LC	Neutral	We are constructive on IG corporate bond spreads. Our 6M spread target is 130bps, 18bps tighter from the current level of 148bps. In the near term we expect the three risks keeping spreads wider in May to ease in June: heavy supply, bank stress and the upcoming US debt limit x-date. Longer term the key positive catalysts should be 1) spreads normalizing from the recent bank stress, 2) the expected end of the Fed hiking cycle, 3) a confirmation we avoid a deep US recession. Demand for IG corporate bonds have been strong so far in 2023, and we expect that to continue.
High Yield	HW00	Neutral	This re-acceleration in liquidity drain remains our key ongoing risk consideration, as the reason why we expect HY spreads to eventually overshoot our fair value target of 500bp. We continue to think of 550 as a likely scenario and 600bp as a possible one.
EM debt	DXEM	Bearish	Sovereign: Asset class is not attracting inflows, leading to negative net issuance. Spreads are relatively tight except for low-rated credits with higher idiosyncrasies. Main risks are wider spreads due to US recession or higher US rates due to US inflation failing to converge to target. Corp: Neutral. Country selection even more important with recent volatility in Argentina, Colombia and China. IG still strong, More cautious on EM HY.
Securitized Products	G0LL	Bullish	Spread widening across agency MBS and securitized products credit in wake of SVB collapse has created value in the sector. OW agency MBS, AAA ABS, AAA CLO and non-agency MBS. Remain defensive in CMBS but be prepared to take advantage of distressed opportunities.
Commodities	MLCXTR	Bullish	
Energy	MLCXENTR	Bullish	Francisco Blanch projects $80 Brent in 2023 as low shale growth, OPEC+ discipline, and China's reopening counteract resilient Russian output. Over the medium term, he still sees Brent prices averaging between $60 and $80/bbl to keep the global oil market in balance.
Industrial Metals	MLCXIMTR	Bullish	Michael Widmer notes that Copper has rallied into 2023, as China's government has accelerated opening up the economy. Yet, demand has so far not accelerated. The next leg higher should come once underlying data and demand in China improve; spending on the energy transition should help too.
Precious Metals	MLCXPMTR	Bullish	As Michael Widmer notes, the end to the Fed hiking cycle, and USD weakness should bring investors back at a time central bank gold demand has been very strong. We maintain our year-end gold target of $2,200/oz.
Cash	G0B1	Bullish	

Exhibit 37: BofA Year-end 2023 Forecasts vs. Consensus

BofA and consensus year-end 2023 forecasts

FX and Rates

FX	Latest Value	BofA	Consensus	3 year range	High/Low	Rates	Latest Value	BofA	Consensus	3 year range	High/Low
EUR-USD	1.09	**1.10**	1.12		1.22 0.98	US 10-year	3.54	**3.25**	3.44		4.05 0.53
USD-JPY	130	**140**	125		149 103	Germany 10-year	2.32	**2.20**	2.31		2.65 -0.63
EUR-JPY	142	**154**	140		150 120	Japan 10-year	0.48	**0.80**	0.64		0.51 0.01
GBP-USD	1.24	**1.21**	1.26		1.42 1.12	UK 10-year	3.34	**4.00**	3.3		4.09 0.10
USD-CNY	6.75	**6.70**	6.7		7.31 6.31	China 10-year	2.92	**3.65**	3.06		3.28 2.64

Equities and Commodities

Equities	Latest Value	BofA	Consensus	3 year range	High/Low	Commodities	Latest Value	BofA	Consensus	3 year range	High/Low
S&P 500	4,018	**4,000**	4,025		4766 3044	WTI Crude - $/bbl	78	**75**	85		115 35
2023 EPS	223	**200**	219		238 140	Brent Crude - $/bbl	85	**80**	90		123 35
Stoxx 600	454	**410**	533		488 342	Gold $/oz	1,923	**2,200**	1,975		1990 1634
FTSE 100	7,785	**7,400**	9,093		7876 5577						
Nikkei 225	27,433	**30,000**	32,519		29453 21710						

GDP and CPI Inflation

GDP growth	Latest Value	BofA	Consensus		High/Low	CPI inflation	Latest Value	BofA	Consensus		High/Low
US	1.1	**1.0**	1.1		35.3 -29.9	US	5.0	**4.0**	4.2		9.1 0.1
Euro area	1.3	**0.6**	0.6		14.2 -14.2	Euro area	7.0	**5.4**	5.6		10.6 -0.3
Japan	0.4	**1.0**	1.0		7.7 -9.9	Japan	3.5	**3.4**	2.4		4.4 -1.2
UK	0.1	**-0.1**	-0.2		16.6 -21.0	UK	10.1	**6.7**	6.6		11.1 0.2
China	4.5	**6.3**	5.6		18.7 0.4	China	0.7	**1.7**	2.1		2.8 -0.5

Source: BofA Global Research, Bloomberg, Datastream; FX, rates, equities and commodities data as of 4/30/2023; GDP data of 2/28/2023. CPI data for CPI through 4/30/2023; Equity consensus price and EPS forecasts as of 4/30/2023.

BofA GLOBAL RESEARCH

BofA US equity sector views

Exhibit 38: BofA US Equity Strategy sector views
Bull & bear case by sector

Sector	Weight in S&P 500	BofA View	Bull case	Bear case
Energy	4.4%	O/W	No supply response in oil Higher-for-longer – avg. $100/bbl Brent in 2023 (house view) War has prioritized energy security over ESG Inflation-protected yield Biggest earnings growth in 2022 / highest earnings revision ratio; #1 in tactical framework ESG purge behind us; represents ESG “improver”, beneficiary of IRA tax breaks Energy just doubled in the index, but LOs & HFs still underweight	Usually underperforms in recessions Lowest Quality sector One of the highest direct emissions profile + secular headwinds from renewables Historically been hurt by stronger dollar, but relationship has moderated. Event risk: Russia / Ukraine ceasefire.
Consumer Staples	7.4%	O/W	No matter what, we still have to eat. Defensive. Positioning remains low Benefits from consumers trading down Pricing power remains intact Quality and dividend yield. Outperforms when rates fall	Valuations getting more expensive Some signs of a draw-down in deposits
Financials	12.9%	O/W	Rare example of inexpensive high quality Mispriced risk: Lower EPS vol than S&P 500 but high price beta Higher interest rates vs. prior cycle LO still underweight Funding costs for fintech have increased, lowering the risk of disintermediation	Multiples sensitive to yield curve slope Disinflationary pressures from disruptors (passive, fin-tech) Recession has been negative for financials historically
Materials	2.6%	O/W	China re-opening. Most exposed sector to China Inexpensive & underweight by long only funds Infrastructure/capex beneficiary Capital/supply discipline	Recession led by weakening goods consumption Hurt by a strong dollar Low quality
Industrials	8.6%	M/W	Beneficiary of capex Half cyclical, half Quality / re-shoring and automation beneficiary Underweight by long-only funds	Peak PMI Overweight by ESG funds Increasingly expensive valuations, rising earnings volatility
Health Care	14.7%	M/W	Inexpensive defensive sector Secular growth: second fastest growing sector since 1986 Strong fundamentals / activist campaigns leading to alpha Social factors of ESG could drive increased corporate HC spending	Crowded Headline risk on drug pricing pressure although regulatory risk has subsidized
Real Estate	2.5%	M/W	Inflation-protected yield Strong fundamentals / record low earnings volatility / domestic Shift from financial asset inflation to real asset inflation	Typically underperforms in recessions Biggest exposure to refinancing risk Less underweight by long only funds, but still very underweight Most hurt by rising real rates.
Communication Services	8.3%	M/W	Valuations / expectations have reset TMT = Disruptors / secular winners Lower duration	Still crowded, albeit less so than before Weakening fundamentals Weakening Data Privacy/Employee Satisfaction scores in ESG Regulatory risk + anti-monopolistic risk
Utilities	2.9%	M/W	Helped by moderating inflation and rates (BofA call) Resilient fundamentals / defensive hedge / highest Quality sector	Dividend yield vs. 10-yr yield below post-GFC avg. Ranks poorly in our tactical quant framework Valuations above LT avg. Valuation, crowding
Technology	25.8%	U/W	Secular themes (cloud, telecommuting, robotics, etc.) and onshoring automation & capex Long-only positioning risk has largely subsided Clean balance sheets, strong margins	Recession – Tech has been just as cyclical as the S&P 500 Peak globalization – Tech is the poster child of globalization Regulatory / anti-monopolistic overhang From Trade War to Tech War / Tech may not be as green as it seems Human capital and cybersecurity factors (most important for IT) deteriorating
Consumer Discretionary	9.9%	U/W	Fed pivot – historically outperformed during easing cycles Canaries (Homebuilders) stopped underperforming Secular shift into e-commerce / EVs (AMZN + TSLA: ~40% of the sector)	Augmented wealth effect from broadened investor base + consumption hit from high oil/rent. Housing affordability collapsed – leading indicator The most labor-intensive sector amid still elevated unskilled wages. Expensive on all valuation measures we track.

Note: O/W = overweight, M/W = marketweight, U/W = underweight. Weights in S&P 500 as of 3/31/2023 and may not add to 100% due to rounding. **Source:** BofA US Equity & Quant Strategy

BofA GLOBAL RESEARCH

Global cross-asset returns

March 2023 Review

- After a March's strong rebound, global equity indices' momentum slowed in April. US indices were mostly flat, with the exception of the DJIA (+2.6%). FTSE had the best returns (+5.2%). Hang Seng (-2.4%) and EM (-1.1%) ended in the red.
- This month, large caps outperformed (+1.2%). In a reversal from last month, value saw stronger returns than growth. Large cap growth underperformed value by -0.5% and midcap growth underperformed value by -1.5%. Breaking the trend, small cap growth outperformed value by 1.3%.
- Communication services (+3.8%) was the best performing sector this month, followed closely by Consumer Staples (+3.6%). Earnings and recession fears were top of mind for investors. Discretionary, industrials, and materials were negative on the month. Rebounding from last month, financials were up 3.2%.
- Preferreds (+1.9%) and HY (+1.0%) led fixed income returns in March. 5Y and 10Y treasuries both gained 0.7%, while 2Y and 10Y were more muted at +0.2%.
- Gold continued to be one of the best performing commodities (+1.5%), even with March's strong rally. The dollar fell -0.8%.

Exhibit 39: Equity Indexes

Total return (%)

	As of 30 April 2023						
Asset class	1mo	3mo	12mo	YTD	3yr[2]	5yr[2]	10yr[2]
Equity Indices (%, US dollar terms)							
S&P 500	1.6	2.7	2.7	9.2	14.5	11.4	12.2
Dow Jones Industrial Avg.	2.6	0.6	5.6	3.5	14.2	9.5	11.2
NASDAQ Comp	0.1	5.8	0.0	17.1	12.1	12.6	15.1
MSCI All Country World	1.5	1.7	2.6	9.0	12.6	7.6	8.5
FTSE 100	5.3	4.7	8.1	11.3	14.1	3.0	3.8
DJ Euro Stoxx 50	3.2	7.2	23.2	19.5	17.2	4.8	5.7
MSCI EAFE	2.9	3.4	9.0	11.8	12.2	4.1	5.3
TOPIX	0.2	0.9	7.2	6.0	5.9	0.9	4.7
Hang Seng	-2.4	-8.7	-2.4	0.4	-4.3	-5.4	2.1
MSCI Emerging Markets	-1.1	-4.7	-6.1	2.9	4.7	-0.7	2.2
Size & Style (%, US dollar terms)							
Russell 1000	1.2	2.0	1.8	8.8	14.2	11.1	12.0
Russell 1000 Growth	1.0	6.6	2.3	15.5	13.6	13.8	14.5
Russell 1000 Value	1.5	-2.5	1.2	2.5	14.4	7.7	9.1
Russell Midcap	-0.5	-4.4	-1.7	3.5	13.8	8.0	9.9
Russell Midcap Growth	-1.4	-1.1	1.6	7.6	9.2	9.0	10.8
Russell Midcap Value	0.0	-6.2	-3.5	1.3	15.8	6.4	8.7
Russell 2000	-1.8	-8.1	-3.6	0.9	11.9	4.2	7.9
Russell 2000 Growth	-1.2	-4.6	0.7	4.8	7.8	4.0	8.4
Russell 2000 Value	-2.5	-11.6	-8.0	-3.1	15.4	3.7	7.0
S&P 500 Sectors (%, US dollar terms)							
Consumer Discretionary	-0.9	0.0	-8.5	15.0	7.3	8.0	11.7
Consumer Staples	3.6	5.4	2.2	4.5	13.5	12.4	9.7
Energy	3.3	-4.2	19.2	-1.5	37.6	8.3	4.9
Financials	3.2	-8.8	-1.8	-2.6	15.8	6.1	10.4
Health Care	3.1	0.5	4.2	-1.4	12.0	12.2	12.9
Industrials	-1.2	-1.4	7.0	2.2	17.9	8.8	11.1
Information Technology	0.5	11.9	8.1	22.4	19.3	19.7	20.1
Materials	-0.1	-4.4	-3.0	4.1	18.1	9.5	9.7
Real Estate	1.0	-6.3	-15.9	2.9	7.1	7.8	6.7
Communication Services	3.8	9.2	1.1	25.0	6.1	7.4	4.9
Utilities	1.9	0.6	-0.2	-1.4	9.9	9.5	8.9

Source: BofA Global Research, S&P, MSCI, Bloomberg. Notes: * Performance is gross of foreign dividend withholding taxes, 23yr, 5yr, and 10yr returns are annualized.

BofA GLOBAL RESEARCH

Exhibit 40: Bond/currency/commodity/hedge fund indexes

Total return (%)

	As of 30 April 2023						
Asset class	1mo	3mo	12mo	YTD	3yr[2]	5yr[2]	10yr[2]
BofA Global Research Bond Indices (%, US dollar terms)							
2-Year Treasury	0.2	1.0	0.4	1.6	-1.0	1.0	0.7
5-Year Treasury	0.7	1.1	-0.1	3.0	-3.2	1.2	0.6
10-Year Treasury	0.7	1.4	-1.7	4.5	-6.2	1.0	0.5
30-Year Treasury	0.2	0.0	-11.5	6.2	-14.6	-0.8	0.4
US Broad Market Index	0.6	0.6	-0.6	3.6	-3.2	1.2	1.3
TIPS	0.1	1.6	-4.5	3.6	0.6	3.0	1.4
Municipals*	-0.1	-0.4	2.6	2.7	0.8	2.1	2.3
US Corporate Bonds	0.8	0.4	0.6	4.3	-1.7	2.0	2.3
US High Yield Bonds	1.0	0.8	1.0	4.7	4.9	3.1	3.9
Emerging Mkt Corp Bonds	0.8	0.0	0.2	3.1	-0.6	0.8	1.9
Emerging Mkt Sov Bonds	0.8	-0.3	-0.6	2.9	-1.3	-1.0	1.0
Preferreds	1.9	-6.4	-1.4	6.4	-1.0	2.3	3.7
Foreign exchange							
DXY Index	-0.8	-0.4	-1.3	-1.8	0.9	2.1	2.2
GBP/USD	1.9	2.0	-0.1	4.0	-0.1	-1.8	-2.1
EUR/USD	1.7	1.4	4.5	2.9	0.2	-1.8	-1.8
USD/JPY	2.6	4.8	5.1	4.0	8.3	4.5	3.4
Commodities** (%, US dollar terms)							
CRB Index	0.2	-3.6	-13.0	-3.5	31.8	5.8	-0.7
Gold	1.5	3.6	4.6	9.5	5.7	8.7	3.1
WTI Crude Oil	1.5	-2.6	-26.7	-4.3	59.7	2.3	-1.9
Brent Crude Oil	-0.3	-5.9	-27.3	-7.4	46.6	1.1	-2.5
Alternative Investments† (%, US dollar terms)							
Hedge Fund - CS Tremont[1]	-0.7	0.2	-0.9	0.2	8.6	4.2	3.9
Hedge Fund - HFRI Fund of Funds[1]	-0.7	0.7	-1.9	0.7	7.2	3.1	3.2

Source: S&P, MSCI, Bloomberg, FactSet, BofA Bond Indices (US Treasury Current 10yr, Current 2yr, Inflation-Linked; Muni Master, US Corp Master, US HY Master II, EM Corp Plus Index; EM External Debt Sovereign Index; US Preferred Stock Index).

Notes: * Not tax adjusted. **BoE calculated effective FX indices. [1]Data lagged by one month; 23yr, 5yr, and 10yr returns are annualized; CS AUM-weighted, HFRI equal-weighted; †AI data not comparable to other asset classes because of reporting delays, lack of standardized reporting, and survivorship and self-selection biases. Crude oil prices are spot USD.

BofA GLOBAL RESEARCH

Exhibit 41: Stocks mentioned
Ticker, name, analyst, rating, price, PO

BofA Ticker	Name	Analyst	Rating	Current price	Price Objective
BAH	Booz Allen Hamilton Holding Corp	Epstein,Ronald J.	NEUTRAL	$93.08	$105.00
CACI	CACI International	Perez Mora,Mariana	BUY	$305.69	$365.00
PLTR	Palantir Technologies	Perez Mora,Mariana	BUY	$7.41	$13.00
LDOS	Leidos Holdings	Perez Mora,Mariana	BUY	$80.83	$125.00
GS	The Goldman Sachs Group Inc.	Poonawala,Ebrahim	BUY	$327.02	$398.00
WFC	Wells Fargo & Company	Poonawala,Ebrahim	BUY	$37.94	$47.00
BK	The Bank of New York Mellon Corporation	Poonawala,Ebrahim	BUY	$41.17	$54.00
MTB	M&T Bank Corp	Poonawala,Ebrahim	BUY	$118.58	$145.00
FITB	Fifth Third Bancorp	Poonawala,Ebrahim	BUY	$24.92	$32.00
EWBC	East West Bancorp, Incorporated	Poonawala,Ebrahim	BUY	$44.21	$65.00
SNV	Synovus Financial Corp.	Poonawala,Ebrahim	BUY	$28.06	$36.00
SCHW	Charles Schwab Corp.	Siegenthaler,Craig	UNDERPERFORM	$49.24	$46.00
JPM	JPMorgan Chase & Co.	Poonawala,Ebrahim	BUY	$136.74	$158.00
FRC	First Republic Bank			$3.51	
CCJ	Cameco Corporation	Winder,Lawson	BUY	$27.56	$38.00
XWREF	Kazatomprom	Fairclough,Jason	BUY	$28.20	$40.00
CEG	Constellation Energy Corp	Zimbardo,Paul	NEUTRAL	$79.49	$81.00
VST	Vistra Energy	Dumoulin-Smith,Julien	BUY	$23.42	$30.00
BWXT	BWX Technologies, Inc.	Epstein,Ronald J.	BUY	$65.23	$75.00
BAESF	BAE SYSTEMS	Heelan,Benjamin	BUY	$990.20	$1,150.00
YLLXF	Yellow Cake Plc	Fairclough,Jason	BUY	$383.20	$570.00
FOJCF	Fortum	Smyk,Ekaterina	NEUTRAL	$13.60	$16.50

Source: BofA Global Research

BofA GLOBAL RESEARCH

Exhibit 42: ETFs mentioned
Ticker, name, rating, price

Ticker	Name	Rating	Price
XLC	SPDR Comm Serv Sel Sector ETF	1-UF	58.79
XLRE	Real Estate Select Sector SPDR	1-NV	37.17
XLE	Energy Select Sector SPDR Fund	1-FV	80.51
XLF	Financial Select Sector SPDR Fund	1-FV	32.43
FXZ	First Trust Materials AlphaDEX Fund	1-NV	61.87
VCR	Vanguard Consumer Discretionary ETF	1-UF	249.44
XLI	Industrial Select Sector SPDR Fund	1-NV	99.02
XLU	Utilities Select Sector SPDR Fund	1-NV	68.83
VCR	Vanguard Consumer Discretionary ETF	1-UF	249.44
VHT	Vanguard Health Care ETF	1-FV	245.36
XLK	Technology Select Sector SPDR Fund	1-UF	150.66
DIVB	iShares ETFs	1-FV	36.59
VYMI	Vanguard International High	1-FV	64.43
SPYD	SPDR Portfolio S&P 500 High Dividend ETF	1-FV	36.93
COWZ	Pacer US Cash Flow Cows 100 ETF	1-FV	45.85
VTV	Vanguard Value ETF	1-FV	138.23
SCHG	Schwab U.S. L Cap Growth ETF	1-FV	66.18
CALF	Pacer US Small Cap Cash Cows ETF	1-FV	36.92
SCHM	Schwab U.S. Mid-Cap ETF	1-FV	66.57
FNDX	Schwab Fundamental U.S. Large	1-NV	54.77
IVV	iShares Core S&P 500 ETF	1-NV	413.91
VOTE	Engine No1 Transform 500 ETF	1-NV	47.91
ICLN	iShares Global Clean Energy ETF	1-NV	18.59
ILF	iShares Latin America 40 ETF	1-FV	24.95
KBA	KraneShares Bosera MSCI China A ETF	1-UF	25.44
HEFA	iShares Currency Hedged MSCI EAFE ETF	1-NV	30.21
DBJP	Xtrackers MSCI Japan Hedged Equity ETF	1-FV	54.98
EMXC	iShares EM ex China	1-FV	50.29
FLCA	Franklin FTSE Canada ETF	1-FV	31.98
VEU	Vanguard FTSE All-World ex-US ETF	1-NV	54.71
FEX	First Trust Large Cap Core AlphaDEX Fund		79.09
EPI	WisdomTree India Earnings Fund	1-FV	33.27
KSA	iShares MSCI Saudi Arabia ETF	1-FV	40.92
IYZ	iShares DJ US Telecom Sector Index Fund	3-UF	21.67

Exhibit 42: ETFs mentioned
Ticker, name, rating, price

Ticker	Name	Rating	Price
SCHH	Schwab US REIT ETF	3-NV	19.40
PXI	Invesco DWA Energy Momentum ETF	3-FV	37.14
FXO	First Trust Financial AlphaDEX Fund	2-FV	35.25
IYM	iShares U.S. Basic Materials ETF	2-NV	128.97
IYC	iShares U.S. Consumer Services ETF	3-UF	64.20
FXR	First Trust Industrials/Producer Durables AlphaDEX Fund	3-NV	54.59
RYU	Invesco S&P 500 Equal Weight U	3-NV	114.80
RHS	Invesco S&P 500 Equal Weight Cons Staples	3-FV	174.73
PTH	Invesco DWA Healthcare Momentum ETF	3-FV	122.13
QTEC	First Trust NASDAQ-100 Technology Sector Index	3-UF	123.49
IPKW	Invesco ETFs	3-FV	34.39
PID	Invesco International Dividend Achievers ETF	3-FV	18.31
AIVL	WisdomTree US AI Enhanced Valu	3-FV	91.04
JQUA	JPMorgan US Quality Factor ETF	2-FV	41.39
XSVM	Invesco S&P SmallCap Value ETF	2-FV	43.12
IVW	iShares S&P 500 Growth ETF	3-FV	64.64
FYX	First Trust Small Cap Core AlphaDEX ETF	3-FV	76.53
FNX	First Trust Mid Cap Core AlphaDEX Fund	3-FV	88.20
LRGF	iShares Edge MSCI Multifactor	3-NV	41.21
OEF	iShares S&P 100 ETF	3-NV	189.89
ESGE	iShares ESG Aware MSCI EM ETF	3-NV	31.37
PBW	Invesco WilderHill Clean Energy ETF	3-NV	35.70
ECH	iShares MSCI Chile ETF	3-FV	29.84
EWH	iShares MSCI Hong Kong ETF	3-UF	20.59
RODM	Hartford Multifactor Developed Markets ex-US ETF	3-NV	27.27
JPXN	iShares JPX Nikkei 400 Index ETF	3-FV	63.38
EEMV	iShares MSCI Emerging Markets Min Vol Factor ETF	3-FV	56.50
ACWX	iShares MSCI ACWI ex US ETF	3-NV	49.96
FDD	First Trust STOXX European Select Dividend Index Fund	3-NV	12.08
SMIN	iShares MSCI India Small-Cap ETF	2-FV	53.18
VNM	VanEck Vietnam ETF	3-FV	12.06

Source: BofA Global Research

BofA GLOBAL RESEARCH

Price objective basis & risk

Booz Allen Hamilton (BAH)

Our PO of $105 is based on a 1.0x relative EV/EBITDA multiple to the BofA multiple for the defense primes on CY23 estimates. This equals a 14.8x EV/EBITDA multiple on CY24e. We think a relative multiple in the middle of the historical range of 0.9-1.4x fairly factors in strong US National Security demand for innovative technologies and solutions, renewed capital deployment strategy including more M&A (vs. prior focus on shareholder friendly), as well as delayed awards related to a possible continuing resolution.

Risks to the upside are a better-than-anticipated upturn in the federal budget, faster-than-expected normalization from post-COVID environment, inexpensive and well integrated M&A activity and unexpected capital return to shareholders in the form of buybacks or special dividends.

Risks to the downside are cuts to the DoD budget vs. anticipated, which could negatively impact our estimates. Should BAH run into any problems with integrating M&A, containing its costs or a heightened competitive environment there could be downside risk to our estimates. Further disruption from COVID effects also a risk.

BWX Technologies, Inc. (BWXT)

Our PO of $75 is based on a 16.0x EV/EBITDA multiple on 2024 estimates. This implies a 1.1x relative multiple on the defense primes' 14.5x weighted average multiple, in line with historical average. The premium is supported by the company's exposure to the US Navy, its monopoly on nuclear powered ships, as well as its diversification efforts underway.

Downside risks to our PO are losing US government contracts, changes in contracting terms that could pressure margins, and program procurement changes that result in market share loss. The US government is BWXT's largest customer and drives the majority of BWXT's revenues.

Upside risks to our PO are additional upside from the AUKUS trilateral agreement, better than expected operating performance and margins, increased demand for nuclear aftermarket for power plants, and higher than expected share in missile tubes for the Virginia-class submarines and Ohio-class submarines. Additionally, acquisitions could provide upside to our estimates.

CACI International (CACI)

Our PO of $365 is based on a 0.9x relative EV/EBITDA multiple to the defense primes on CY24 estimates. This equals 13x EV/EBITDA. In our view, the company's renewed capital deployment strategy (opportunistic share repurchases) offsets the discount related to the lack of dividend (vs. peer group). The company continues to execute its tech strategy, disciplined approach to M&A, and is well positioned with respect to DoD priorities. However, the discount vs. primes reflects supply chain pressures in the near term and headline risk from political control impacting defense spending (relatively harder for short-term cycle companies).

Downside risks are cuts to the DoD budget vs. anticipated, problems finding acquisition targets, integrating M&A, hiring the right personnel, containing its costs, estimating costs and executing on fixed price contracts, sustaining reputational risk and future awards.

Upside risks are a better than anticipated federal budget allocated to innovative technologies and modernization, inexpensive and well integrated M&A activity, unexpected capital return to shareholders in the form of dividends, market share gains in the mission technology arena, better than expected margin expansion.

Cameco Corporation (YCCO / CCJ)

Our US$38 (C$50) PO is based on 1.25x our NPV, and 13x 2023E & 12.5x 2024E EV/EBITDA (all three equally weighted). We use a CADUSD FX rate of 1.32. The 1.25x P/NAV is above the longer term avg around 0.9x but below peak of 1.35x. We think 1.25x is justified given Cameco's world-class tier one assets in favorable jurisdictions (Canada) partially offset by the fact one of those tier-one assets has been voluntarily idled (we expect restart in 2023E).

Downside risks:1) slower-than-expected global energy demand growth, 2) continued push-out of a Japanese nuclear fleet restart, 3) any worsening in sentiment toward nuclear or more favorable sentiment toward alternative power fuel sources, and 4) any production problems at Cameco's only operating mine, Cigar Lake. Upside risks: 1) additional potential mine disruptions that may further improve supply-demand dynamics, 2) better pace of reactor development in key future demand countries (China, Japan, and India), 3) more stringent carbon emissions restrictions in key countries, encouraging nuclear power as an environmentally friendly base line energy source, 4) a material rise in NatGas prices making nuclear power generation competitive in the US.

Charles Schwab Corp. (SCHW)
Our price objective (PO) for SCHW is $46 and is derived from a price to earnings method. We apply a 10x multiple on our 2025E EPS to obtain our PO. We use 10x given (1) elevated sorting will continue through mid-2023, (2) "bank" risks would weigh on SCHW's multiple and (3) forecast net new assets to slow over the near-term.

Risks to our PO are an extension of the Fed hiking cycle positively affecting SCHW's securities portfolio reinvestment opportunity and muted sorting activity.

Constellation Energy Corp (CEG)
Our $81 Price Objective is based on a 11.0% 2025E equity Free Cash Flow yield (FCF yield) on an unhedged/'open' basis. The 11.0% FCF yield represents a weighted average of 9.6% (first quartile) for the support FCF and 15.1% (third quartile) for merchant FCF, utilizing energy comparables.

Risks to achievement of the Price Objective and rating are: 1) changes in energy & capacity prices, 2) retail margins, renewals, win rate, & overall market share, 3) operating, capital, and fuel costs, 4) capital allocation decisions including M&A, growth, and share repurchases, 5) nuclear operational performance, incidents, or accidents, 6) legislative and regulatory changes, 7) nuclear fuel costs & availability, 8) change in environmental standards for generation assets, 9) management turnover, 10) pension & nuclear decommissioning trust returns, 11) credit rating agency requirements, and 12) interest rates.

East West Bancorp, Incorporated (EWBC)
Our $65 PO incorporates recession risk. We apply a 50% weighting to our 2023 P/E multiple, with the remaining 50% evenly split between 2024 P/E and 2023 P/TBV multiples. We assign 8.0x/6.5x/1.9x multiples respectively, below peer multiples (9.5x/8.5x/1.3x) due to risk of outsized EPS pressure in the current rate environment.

Upside risks to our PO are a faster-than-expected economic recovery, higher interest rates. Downside risks to our PO are a worsening in the macro-economic outlook, decline in interest rates.

Fifth Third Bank (FITB)
Our $32 PO incorporates recession risk. We apply a 50% weighting to our 2023 P/E multiple, with the remaining 50% evenly split between 2024 P/E and 2023 P/TBV multiples. We assign 10.0x/7.0x/2.4x multiples, respectively, consistent with its historical relationship with the return profile and in line with peer average (9.8x/7.8x/1.8x).

Downside risks to our PO are a prolonged low interest rate environment, slower-than-guided loan growth on weaker economic activity, and/or a deterioration in credit quality.

Upside risks to our PO are a better-than-expected improvement in the macro environment, stronger-than-anticipated balance sheet growth, and/or better expense management.

Goldman Sachs (GS)
Our $398 PO incorporates recession risk. We apply a 50% weighting to our 2023 P/E multiple, with the remaining 50% evenly split between 2024 P/E and 2023 P/TBV multiples. We assign 19.0x/17.0x/6.2x multiples, respectively, above peers (14.2x/13.0x/1.8x) due to lower credit risk relative to peers into a potential recession.

Risks to the upside is stronger capital markets activity.
Risks to the downside are a weaker economy/capital markets, macro or geo-political issues, competition, structural pressures, tougher global regulation, and litigation.

JPMorgan Chase & Co. (JPM)
Our $158 PO incorporates recession risk. We apply a 50% weighting to our 2023 P/E multiple, with the remaining 50% evenly split between 2024 P/E and 2023 P/TBV multiples. We assign 14.2x/13.0x/1.9x multiples respectively, above large-cap peers (9.8x/7.8x/1.8x) due to the bank's best-in-class revenue generation.

Downside risks to our price objective are macro risks, such as slower-than-expected rate increases, additional regulatory requirements, and scrutiny of the financials industry.

Upside risks are better-than-expected credit quality (i.e., lower loan losses) and better interest rate defensibility.

Leidos Holdings (LDOS)
Our PO of $125 is based on a 0.93x relative EV/EBITDA multiple to the defense primes on 2024 estimates. This equals a 14x EV/EBITDA multiple. We believe LDOS should trade at a slight discount to the defense primes as strong US National Security demand for innovative technologies and solutions and solid free cash flow generation are offset by a lumpy award environment, supply chain pressures in the near term, pressure on pricing from competitive dynamics, mounting concerns over labor inflation, and headline risk from political control impacting defense spending (relatively harder for short-term cycle companies).

Downside risks to our PO are: cuts to the US Government budget vs. anticipated, increased competition from non-traditional players, problems integrating M&A, hiring the right personnel, containing its costs, estimating costs and executing on fixed price contracts, sustaining reputational risk and future awards.

Upside risks to our PO are: a better than anticipated federal budget allocated to innovative technologies and modernization, inexpensive and well integrated M&A activity, unexpected capital return to shareholders in the form of dividends or share buybacks, market share gains, better than expected margin expansion.

M&T Bank (MTB)
Our $145 PO incorporates recession risk. We apply a 50% weighting to our 2023 P/E multiple, with the remaining 50% evenly split between 2024 P/E and 2023 P/TBV multiples. We assign 9.5x/7.5x/1.8x multiples respectively, in line with peer multiples (9.8x/7.8x/1.8x) due to lack of an obvious catalyst.

Downside risks to our PO are moderating CRE, runoff from resi mortgage acquired, and attrition from rate-sensitive trust deposits.

Upside risks are stronger than expected cost/revenue synergies from the PBCT deal and better than expected economic recovery.

Palantir Technologies (PLTR)
Our PO of $13 is based on a DCF of Base, Bull, and Bear cases for different revenue and cash scenarios through 2040. Given PLTR negative earnings and adjusted FCF (stock-based compensation, SBC, as a proxy for cash outflows), we view a LT cash flow analysis as the best way to value the equity. Our DCF factors in a 13% discount rate and assigns 50% weighting to Base, 25% to Bull, and 25% to Bear. Our PO represents a 0.5x EV/Sales/Growth multiple to 2024e or a sum of the parts of 0.6x on Government (above Defense IT Svs on higher EBITDA mgns - EV/EBITDA/Growth of 2x vs. Svs of 2-3x) and 0.5x on Commercial (in line with Software Infrastructure large caps). We think that higher-than-peers' SBC, outsized founders' voting power, and a less conventional investment and sales strategy are balanced by a beneficial position to national security and US government/allies' modernization efforts, a leading role in artificial intelligence (AI)-powered platforms, and opportunistic partnerships.

Downside risks to our PO are lower-than-expected AI-platforms market growth, faster than expected commoditization, higher success from competitors to catch up with technologies, and/or continued resistance from government customers to use commercial off the shelf solutions.

Upside risks to our PO are stronger-than-expected growth of the AI-platforms market, higher-than-expected PLTR penetration, better-than-expected profitability, and/or successful agreements and investments.

Synovus Financial Corp. (SNV)
Our $36 PO incorporates recession risk. We apply a 50% weighting to our 2023 P/E multiple, with the remaining 50% evenly split between 2024 P/E and 2023 P/TBV multiples. We assigned 9.0x/7.5x/1.2x multiples, respectively, below peers (9.5x/8.0x/1.3x).

Downside risks to our price objective are potentially slower-than-expected economic growth in their footprint or a potential takeout price that is lower than where the stock is trading today. Upside risks to our price objective are sooner than expected pickup in the overall economy and SNV being acquired above our price objective.

The Bank of New York Mellon Corporation (BK)
Our $54 PO incorporates recession risk. We apply a 50% weighting to our 2023 P/E multiple, with the remaining 50% evenly split between 2024 P/E and 2023 P/TBV multiples. We assign 11.0x/9.5x/2.5x multiples respectively, above large-cap peers (9.8x/7.8x/1.8x) given cyclical and self-help factors.

Risks to the upside is stronger equity/bond markets.
Risks to the downside are a severe selloff in equity/bond markets that that could put downward pressure on fee growth and M&A that could temper capital return.

Vistra Energy (VST)
Our $30 price objective is based on a 2025E SOTP valuation. For Vistra Vision, we arrive at a 6.0x blended EV/EBITDA. We apply a 6.5x EV/FCF multiple to nuclear, which we believe fairly represents the risk/reward profile of the assets. For Renewables and Storage, we apply a 10x EV/FCF multiple given the accelerating nature of the end markets. For Retail, we apply a 6.5x EV/FCF multiple, consistent with peers. For Vistra Tradition, we arrive at a 3.9x blended EV/EBITDA multiple. We apply a 5.5x EV/FCF multiple to Gas Generation given favorable spark spreads and end market demand dynamics and a 1.0x EV/FCF multiple to Coal Generation which we believe appropriately captures the limited long-term value of the assets.

Positive and negative risks: 1) changes to regulatory, political, or legislative standards, 2) wholesale power, natural gas, & capacity prices, 3) competitive & regulatory change to retail businesses, principally in Texas, 4) operational performance, 5) development of new renewables and storage assets, 6) natural disasters, 7) interest rates, 8) nuclear fuel access/cost, and 10) retail market attrition.

Wells Fargo & Company (WFC)
Our $47 PO incorporates recession risk. We apply a 50% weighting to our 2023 P/E multiple, with the remaining 50% evenly split between 2024 P/E and 2023 P/TBV multiples. We assign 12.0x/11.5x/1.2x multiples respectively, compared with large-cap peers (9.8x/7.8x/1.8x).

Downside risks to our price objective are a worse than expected economic downturn that lead to significantly higher than expected credit losses, elevated expense trajectory, slower-than-expected resolution of its consent orders. Upside risks are better-than-expected credit quality (i.e., lower loan losses) and material expense management that improve visibility on future earnings.

Analyst Certification

We, Jared Woodard, Craig Siegnethaler, Julien Dumoulin-Smith, Ebraham Poonawala, Mariana Perez Mora, Lawson Winder, CFA, Paul Zimbardo and Ronald J. Epstein, hereby certify that the views expressed in this research report accurately reflect our personal views about the subject securities and issuers. We also certify that no part of our compensation was, is, or will be, directly or indirectly, related to the specific recommendations or views expressed in this research report.

Special Disclosures

BofA Securities is currently acting as a financial advisor to WisdomTree Inc in connection with a cooperation agreement with stockholders ETFS Capital Limited ("ETFSC") and Lion Point Capital LP to further enhance the composition of the Company's Board of Directors and corporate governance, which was announced on May 26, 2022.

BofA Securities is acting as a financial advisor to Blackrock Long Term Private Capital SCSp, in connection with its proposed acquisition of Alacrity Solutions Group LLC, which was announced on February 2, 2023.

Disclosures

Important Disclosures

Equity Investment Rating Distribution: Aerospace/Defense Electronics Group (as of 31 Mar 2023)

Coverage Universe	Count	Percent	Inv. Banking Relationships R1	Count	Percent
Buy	25	51.02%	Buy	18	72.00%
Hold	14	28.57%	Hold	13	92.86%
Sell	10	20.41%	Sell	4	40.00%

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

Coverage Universe	Count	Percent	Inv. Banking Relationships R1	Count	Percent
Buy	88	50.87%	Buy	72	81.82%
Hold	40	23.12%	Hold	29	72.50%
Sell	45	26.01%	Sell	34	75.56%

Equity Investment Rating Distribution: Engineering & Construction Group (as of 31 Mar 2023)

Coverage Universe	Count	Percent	Inv. Banking Relationships R1	Count	Percent
Buy	8	42.11%	Buy	6	75.00%
Hold	8	42.11%	Hold	4	50.00%
Sell	3	15.79%	Sell	2	66.67%

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: Non-Ferrous Metals/Mining & Minerals Group (as of 31 Mar 2023)

Coverage Universe	Count	Percent	Inv. Banking Relationships R1	Count	Percent
Buy	55	57.89%	Buy	24	43.64%
Hold	21	22.11%	Hold	11	52.38%
Sell	19	20.00%	Sell	10	52.63%

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

Coverage Universe	Count	Percent	Inv. Banking Relationships R1	Count	Percent
Buy	229	53.88%	Buy	107	46.72%
Hold	105	24.71%	Hold	50	47.62%
Sell	91	21.41%	Sell	29	31.87%

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

Coverage Universe	Count	Percent	Inv. Banking Relationships R1	Count	Percent
Buy	78	50.65%	Buy	53	67.95%
Hold	40	25.97%	Hold	28	70.00%
Sell	36	23.38%	Sell	24	66.67%

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.

Exchange-Traded Funds Investment Rating Distribution: Global Group (as of 31 Mar 2023)

Coverage Universe	Count	Percent	Inv. Banking Relationships R2	Count	Percent
Buy	66	19.76%	Buy	43	65.15%
Hold	259	77.54%	Hold	199	76.83%
Sell	9	2.69%	Sell	6	66.67%

R2 Exchange-traded funds (ETFs), or the ETF providers, 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 ETFs. An ETF rated 1-FV is included as a Buy; an ETF rated 2-FV, 3-FV, 1-NV, 2-NV, 3-NV, 1-UF or 2-UF is included as a Hold; and an ETF rated 3-UF 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[R3]
Buy	≥ 10%	≤ 70%
Neutral	≥ 0%	≤ 30%
Underperform	N/A	≥ 20%

[R3] 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.

EXCHANGE-TRADED FUNDS (ETF) INVESTMENT OPINION KEY: Opinions reflect both an Outlook Rating and a Category Rating. OUTLOOK RATINGS reflect the analyst's assessment of the ETF's attractiveness relative to other ETFs within its category (including sector, region, asset class, thematic, and others). There are three outlook ratings: 1 - the ETF is more attractive than covered peers in the same category over the next 12 months; 2 - the ETF is similarly attractive to covered peers in the same category over the next 12 months; and 3 - the ETF is less attractive than covered peers in the same category over the next 12 months. CATEGORY RATINGS, indicators of the analyst's view of the ETF's category and which incorporate published views of BofA Global Research department analysts, are: FV - Favorable view, NV - Neutral view and UF - Unfavorable view.

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.

One or more analysts contributing to this report owns stock of the covered issuer: Cameco Corporation, JP Morgan Chase

BofAS or one of its affiliates acts as a market maker for the equity securities recommended in the report: 1st Trust Financ ETF, 1st Trust Indus Fund, 1st Trust Mater ETF, 1st Trust MidCap ETF, 1st Trust Techn ETF, BNY Mellon, Booz Allen Hamilton, BWX Technologies, CACI International, Cameco Corp., Charles Schwab, Constellation Energy, East-West, Eng Transform500 ETF, Fifth Third Bank, FirstTrust SmCap ETF, Franklin Canada ETF, FT STX EUROPE ETF, Global X Uranium ETF, Goldman Sachs, Hartford Dev Mkt ETF, Inv DWA EnrgMomentum, Invesco Cons ETF, Invesco DWA ETF, Invesco Intl Div, Invesco Int'lBuyback, Invesco S&P EWU ETF, Invesco Wh Cln Ener, iShares ACWI ex US, iShares Chile ETF, iShares Cons Srv ETF, iShares Core S&P ETF, iShares Currency ETF, iShares Div&Buyback, iShares Edg MSCI ETF, iShares EM ex China, iShares EM Min Vol, iShares Global Clean, iShares India SC ETF, iShares JPX-NIKK ETF, iShares LATAM 40 ETF, iShares Material ETF, iShares MSCI HK ETF, iShares S&P 100 ETF, iShares S&P 500 ETF, iShares Saudi Arabia, iShares US Qual ETF, iShares-DJ Telecom, iSharesESG MSCI EM, Ivsco SCap Value ETF, JP Morgan Chase, JP US Qual ETF, KraneS CHINA ETF, Leidos Holdings, M&T Bank, Pacer US S Cap C Cow, Pacer USCashCows ETF, Palantir, Schwab L Cap Grw, Schwab US Large ETF, Schwab US MidCap ETF, Schwab US REIT ETF, SPDR Comm Serv ETF, SPDR Energy ETF, SPDR EuroStoxx50 ETF, SPDR Financ ETF, SPDR High Div ETF, SPDR Industr ETF, SPDR REIT ETF, SPDR Tech ETF, SPDR Utilities ETF, Synovus, VanEck Vietnam ETF, Vanguard Con St ETF, Vanguard Cons ETF, Vanguard Healthc ETF, Vanguard Intl Div, Vanguard Util ETF, Vanguard Value ETF, Vanguard World ex US, Vistra Energy, Wells Fargo, WT Ex-Val ETF, WTree India Earnings, Xtrackers JPN Hd ETF.

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The issuer is or was, within the last 12 months, an investment banking client of BofAS and/or one or more of its affiliates: Bank of New York Mel, BlackRock, Inc., Booz Allen, CACI Int Inc, Charles Schwab, Constellation Energy, Deutsche Bank, East-West, Fifth Third, Franklin Resources, Goldman Sachs, Invesco, JP Morgan Chase, Leidos Holdings, M&T Bank, State Street, Synovus, The Hartford, Vistra Energy, Wells Fargo, WisdomTree.

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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: Bank of New York Mel, BlackRock, Inc., Booz Allen, BWX Technologies, CACI Int Inc, Cameco Corporation, Charles Schwab, Constellation Energy, Deutsche Bank, East-West, Fifth Third, Franklin Resources, Goldman Sachs, Invesco, JP Morgan Chase, Krane Funds Advisors, Leidos Holdings, M&T Bank, MiraeAsset Sec, Pacer Advisors, Palantir, State Street, Synovus, The Hartford, Vaneck, Vanguard Group Inc, Vistra Energy, Wells Fargo, WisdomTree.

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Research Analysts

Research Investment Committee

Jared Woodard
Investment & ETF Strategist
BofAS
jared.woodard@bofa.com

John Glascock
Investment & ETF Strategist
BofAS
john.glascock@bofa.com

Phoebe Block
Investment & ETF Strategist
BofAS
phoebe.block@bofa.com

Derek Harris
Portfolio Strategist
BofAS
derek.harris@bofa.com

Chris Flanagan
FI/MBS/CLO Strategist
BofAS
christopher.flanagan@bofa.com

Global Economics & Strategy

Savita Subramanian
Equity & Quant Strategist
BofAS
savita.subramanian@bofa.com

Ethan S. Harris
Global Economist
BofAS
ethan.harris@bofa.com

Mark Cabana, CFA
Rates Strategist
BofAS
mark.cabana@bofa.com

Lawson Winder, CFA >>
Research Analyst
Merrill Lynch (Canada)
lawson.winder@bofa.com

Michael Hartnett
Investment Strategist
BofAS
michael.hartnett@bofa.com

Jill Carey Hall, CFA
Equity & Quant Strategist
BofAS
jill.carey@bofa.com

Michael Widmer
Commodity Strategist
MLI (UK)
michael.widmer@bofa.com

Equity Research

Craig Siegenthaler, CFA
Research Analyst
BofAS
craig.siegenthaler@bofa.com

Ebrahim H. Poonawala
Research Analyst
BofAS
ebrahim.poonawala@bofa.com

Elizabeth L Suzuki
Research Analyst
BofAS
elizabeth.suzuki@bofa.com

Athanasios Vamvakidis
FX Strategist
MLI (UK)
athanasios.vamvakidis@bofa.com

Pratik K. Gupta
CLO/MBS Strategist
BofAS
pratik.gupta@bofa.com

Kenjin Hotta >>
Research Analyst
BofAS Japan
kenjin.hotta@bofa.com

Steve Byrne, CFA
Research Analyst
BofAS
steve.byrne@bofa.com

Ronald J. Epstein
Research Analyst
BofAS
r.epstein@bofa.com

Mariana Perez Mora >>
Research Analyst
Merrill Lynch (Argentina)
mariana.perezmora@bofa.com