Sector Focus Point

A deep dive into the biggest sector in the world

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Equity and Quant Strategy
United States

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See Team Page for List of Analysts

US Tech: macro, micro, quant and stock picks

Ahead of BofA's Tech Conference, we publish our deep-dive on the sector (actually, two sectors plus a chunk of consumer via AMZN). We are market-weight Information Technology and underweight Comm. Services (see sector note) based on positioning and macro trends that drive capital flows. Fundamentals drive long-term returns and here our analysts weigh in on opportunities on pp. 11 plus Exhibit 1 for stock picks. Quantitative tools can help with security selection, portfolio construction and risk budgeting which we explore in the last section of this report.

Technicals: liquidity risk, right-sizing, new leadership

AAPL is now bigger than the Russell 2000. Seven stocks drove YTD S&P 500 gains, all Tech or Tech-adjacent. Today, mega caps have liquidity risk after asset owners' equity exposure barbelled to either passive index funds where tech = 30%-40%, or to illiquid private equity. Active institutional managers, price setters, are now MW Info. Tech, OW Comm. Services. Tech inflows hit records (see Flow Show) but more Tech right-sizing is likely. We appear to be in the early stages of a shift in leadership from new economy disruptors to capital-starved, now disciplined cyclicals with growth and efficiency angles.

Macro: rates, protectionism, consolidation, efficiency/AI

Long duration growth companies that dominate Tech are hurt by rising discount rates and quantitative tightening. Geopolitical and supply chain risks represent new costs for Hardware and Semis, whose margins grew from frictionless globalization. A pull forward in demand during COVID argues for consolidation of tech spend, better for megacaps than microcaps. Wage / cost inflation spawning automation/efficiency/AI spend is positive for select Software and Semis that can survive a higher hurdle rate (see BofA's AI Primer). We prefer capex takers (e.g., Semis) to spenders (Exhibit 36) where Software, Media and Services might need to spend on AI just to avoid obsolescence.

Regulations: cyber, C-suite, people, privacy, security

Regulatory, policy and political issues facing the sector are multifactorial. Tech has enjoyed a free ride relative to commodities, big banks and other cyclicals. But the impact of tighter regulations could increase the sector's cost of capital – Financials' price to book value was cut in half post-GFC. Today, fraying in the sector is evident via issues with varying severity: an increasing gap between highest and lowest paid employees to share class voting rights, from anti-monopolistic legislature to board independence, from global labor and corruption risk to data privacy and cyberattacks. Megacaps could win the relative game, via a moat created by regulatory burdens.

See inside for analysts' top stock picks and industry views, a quant guide to Tech with stock selection tools, proprietary micro and macro reads and other statistical frameworks.

Exhibit 1: Tech large cap stock ideas
BofA analyst stock ideas

Ticker	Company name
MSFT	Microsoft Corporation
NVDA	NVIDIA Corporation
ANET	Arista Networks, Inc.
FTNT	Fortinet, Inc.
PANW	Palo Alto Networks, Inc.
AMZN	Amazon.com, Inc.
DELL	Dell Technologies, Inc. Class C

Source: BofA Global Research

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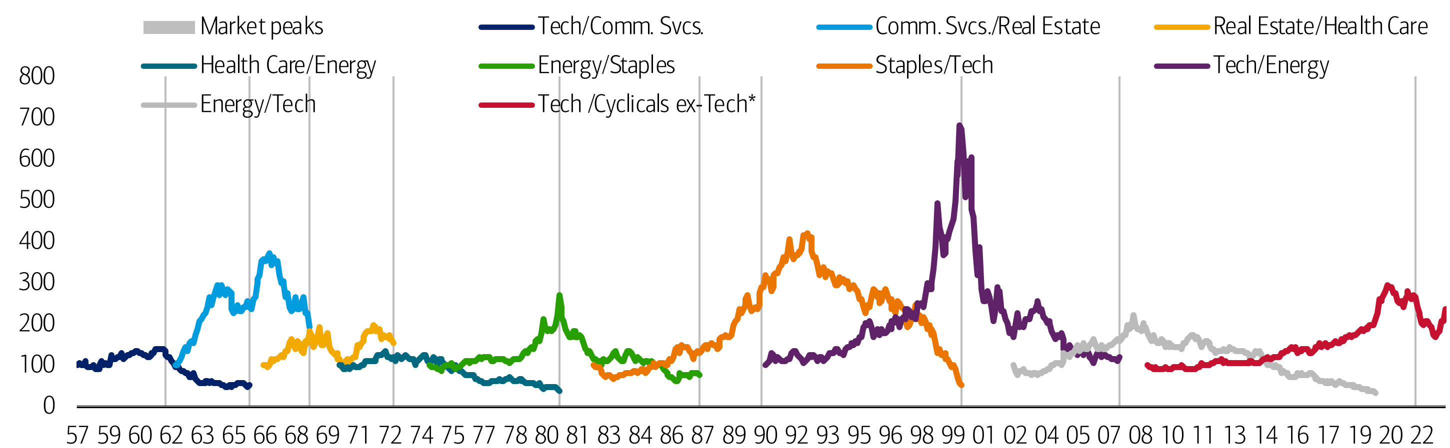
Timestamp: 05 June 2023 07:06AM EDT

Changing leadership

The last few decades saw falling discount rates culminating in ZIRP (zero interest rate policy), liquidity looking for a home, disinflation and disruption, frictionless globalization, increasingly oligopolistic markets and a shift from active to passive investing – mostly tailwinds for long duration growth, multinationals, disruptors, share gainers and momentum investors, where Tech sits at the intersection of these themes. Tech stocks led by 145ppt vs the S&P 500 over the past decade. But if bear markets herald a shift in leadership (and almost every prior bear market has), Tech may not be the exclusive winner over the next cycle (Exhibit 2).

Exhibit 2: Bear markets almost always resulted in a change in leadership
Relative performance of prior bull market leader vs the next bull market leader (beginning of bull market = 100)



Source: BofA US Equity & Quant Strategy, FactSet *Cyclicals ex-Tech include Energy, Financials, Materials, and Industrials

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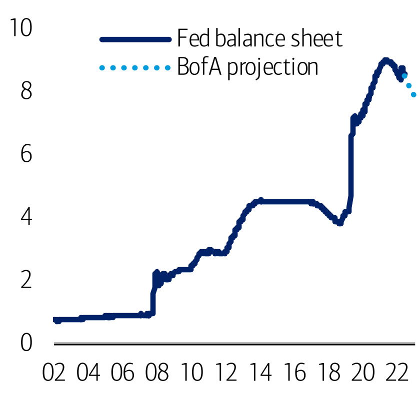
Quantitative easing helped, tightening could hurt

Multi-year growth leadership is a recent phenomenon. Value stocks have outperformed Growth stocks over the long haul - 3.5ppt per year since 1926. 2010's tailwinds are reversing. Liquidity extended to the banks this year partially explains Tech's 2023 comeback. Since the GFC, Russell Growth vs Russell Value returns have been correlated with Fed balance sheet expansion/contraction (ρ= 50%). Unless the Fed continues to expand its balance sheet, Tech leadership is at risk.

Exhibit 3: Fed's balance sheet normalization has begun
Fed balance sheet + BofA projection ($T)



Source: Bloomberg, BofA Global Research

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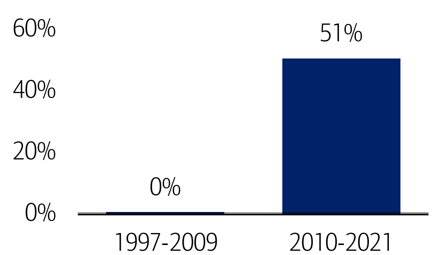
Exhibit 4: Over half of non-earnings driven market cap changes was explained by the Fed balance sheet expansion since GFC
R-sq of Fed balance sheet YoY vs YoY change in S&P 500 market cap that is not driven by earnings (5/97-12/21)



Source: FactSet, BofA US Equity & Quant Strategy
*Non-earnings driven market cap change = [total market cap change] – [historical avg. fwd P/E] x [chg. in fwd EPS]

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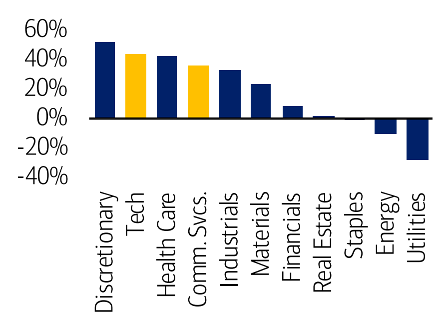
Exhibit 5: QE helped Tech, QT could hurt
Correlations between y/y change in Fed balance sheet and y/y change in trailing PE (2010-present)



Source: BofA US Equity & Quant Strategy, FactSet, Haver Analytics

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Extreme concentration risk driven by Tech

Seven stocks drove the entire gain on the S&P 500 YTD. The top five stocks now account for 24% of the S&P 500, a record high and well above the Tech Bubble peak of 18%. AAPL's market cap also surpassed the Russell 2000. Moreover, valuation dispersion in the S&P 500 is just off its widest level in history, with expensive stocks rerating vs inexpensive stocks (Exhibit 7).

Exhibit 6: Extreme concentration risk in the market
Top 5 companies' weight in the S&P 500 (1990-5/23)

Source: Bloomberg, BofA US Equity & Quant Strategy

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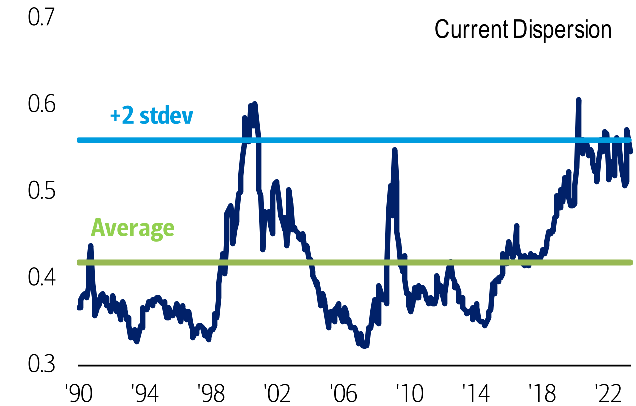
Exhibit 7: Valuation dispersion just off record highs. Mean reversion represents 10% downside risk to S&P 500
Dispersion of forward P/E in the S&P 500 (std. ev. / mean); 1990-5/23



Source: FactSet, BofA US Equity & Quant Strategy

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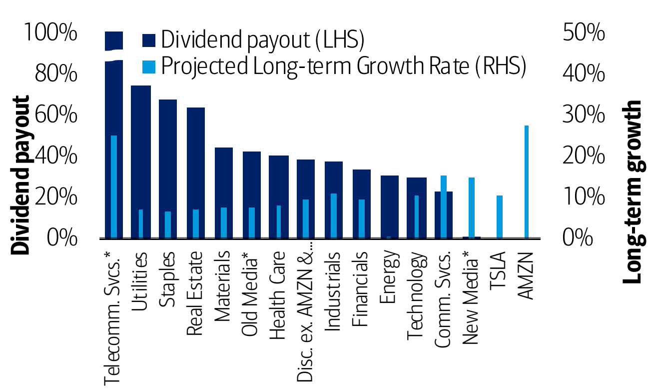
Tech has duration risk, and we believe real rates can move higher

Rate cycles are long - recall we are exiting 40+ years of falling rates, and are just off of all-time lows. A demand vacuum for bonds has been created by the Fed, China, BoJ and other foreign buyers stepping away. Higher growth down the road from today's productivity and efficiency spend could push real rates higher. Bonds are now consensus, with recommended allocations at decade highs (Exhibit 9). Higher real rates would disproportionately hurt long duration Growth and Tech stocks which still trade at lofty premia to Value stocks.

Exhibit 8: Short duration (high payout/low growth) to long duration (high growth/low payout)
S&P 500 dividend payout ratios and projected long-term growth rates as of 5/22/23



Source: FactSet, BofA US Equity & Quant Strategy. *denotes industry groups/industries in Communication Services; "New Media" includes Entertainment and Interactive Media & Services industries; "Old Media" includes Media industry.

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Exhibit 9: Long bonds is consensus: recommend bond allocation is hovering near all-time highs
Average recommended allocation to bonds by Wall Street strategists (2006-5/23)

Source: BofA US Equity & Quant Strategy

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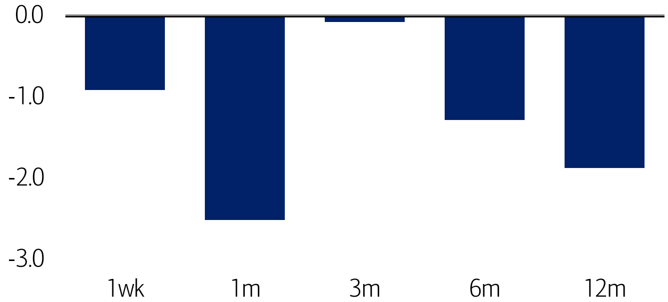
Tech companies can reduce duration by cutting costs, shoring up capital and returning cash to shareholders, and some megacaps are doing that this year.

How will Tech companies return cash? Buybacks more likely than dividends

Exhibit 10: The market penalizes tech companies that initate dividends as ex-growth

Avg. relative perf of TMT/Tech stocks vs S&P 500 after initial dividend announcement (post-GFC)



Source: Bloomberg, FactSet, BofA US Equity & Quant Strategy

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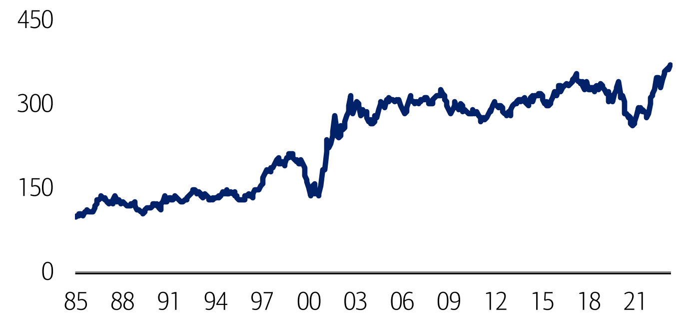
Exhibit 11: Buybacks within Tech are rewarded

Relative performance of share repurchase factor in Tech (top quintile stocks) vs Tech sector



Source: FactSet, BofA US Equity & Quant Strategy

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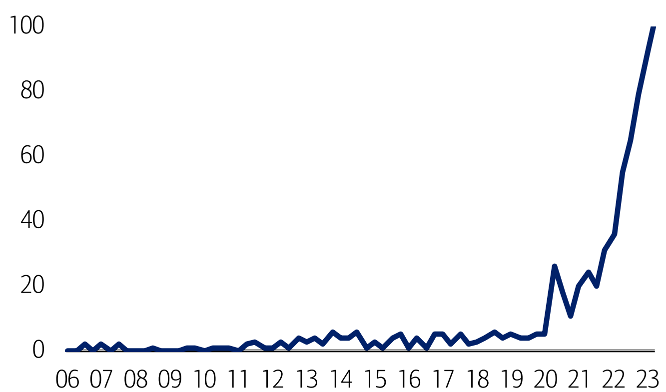
Globalization has peaked – Tech is most impacted

Globalization has peaked, mentions of re-shoring continue to skyrocket (Exhibit 12), and companies have become less dependent on China imports since 2018. Tech is the poster child of globalization as it sports the highest foreign exposure and the highest emerging markets exposure.

Reshoring and foreign direct investment (FDI) job announcements totaled over 360,000 in 2022, a +53% YoY increase from 2021's record (Source: Reshoring Initiative, 2022 Data Report).

Exhibit 12: Mentions of re-shoring skyrocketed

Companies mentions of re-/near-/on-shoring (2006-5/22/2023)



Source: AlphaSense, BofA Global Research

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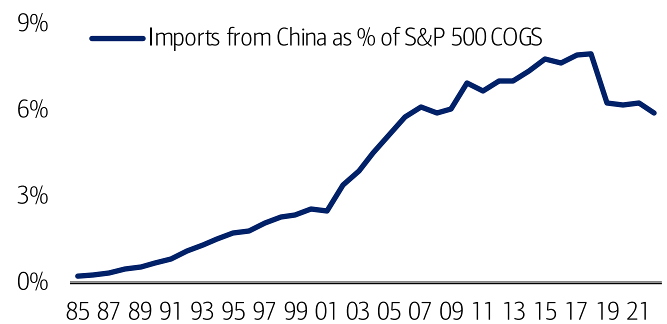
Exhibit 13: Companies are becoming less dependent on China imports (% of S&P 500 COGS ex-D&A has fallen to 6% from 8%)

Imports from China (final + intermediate) as % of S&P 500 COGS ex. D&A (1986-2022)



Source: Census data, FactSet, BofA US Equity & Quant Strategy

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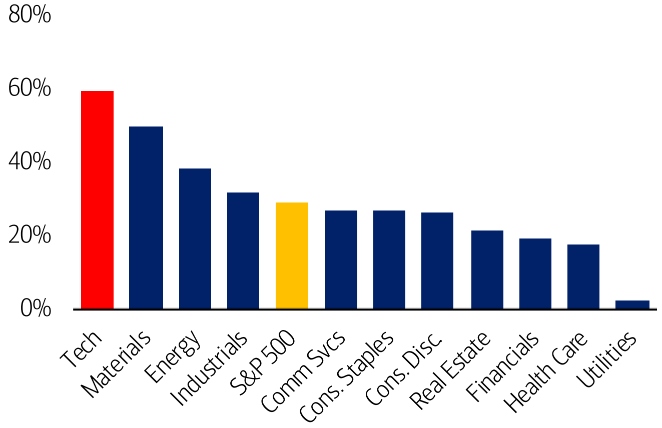
Exhibit 14: Tech is the poster child of globalization
S&P 500 foreign exposure by sector



Source: BofA US Equity & Quant Strategy, 2021FY company filings, Georev, FactSet, BofA analyst estimates

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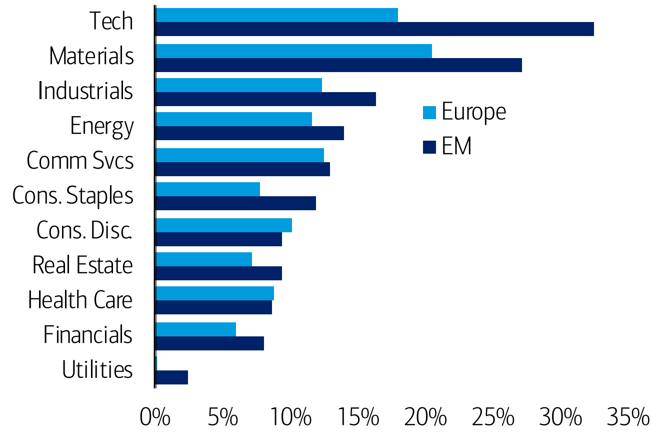
Exhibit 15: Tech has the largest EM exposure
S&P 500 Europe vs EM foreign exposure by sector



Source: BofA US Equity & Quant Strategy, 2021FY company filings, Georev, FactSet, BofA analyst estimates

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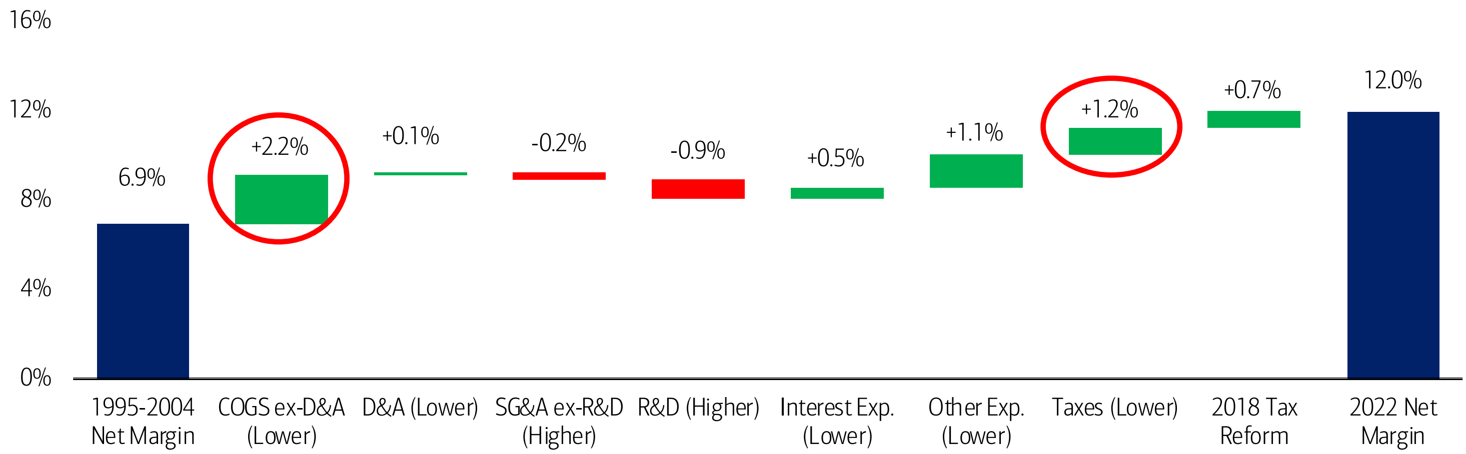
Exhibit 16: Globalization explains most of margin expansion since 1995
2022 net margin (ex-Financials) expansion waterfall vs 1995-2004 levels (factors related to globalization circled in red)



Source: BofA US Equity & Quant Strategy, FactSet

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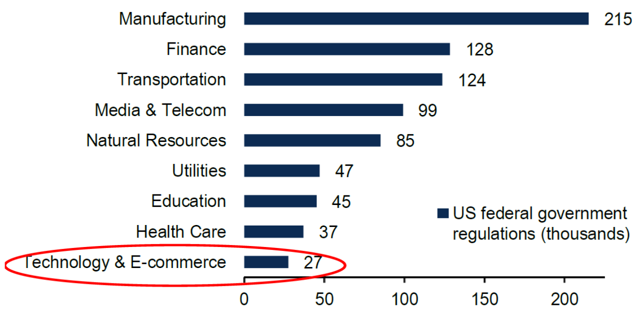
A complicated policy backdrop for Tech

In addition to global supply chain risks, regulatory, policy and political issues facing the sector are multifactorial. Tech has enjoyed a free ride relative to commodities, big banks and other cyclicals. But the impact of tighter regulations could increase the sector's cost of capital – Financials' price to book value was cut in half post-GFC.

Exhibit 17: Regulation light sector at risk of tighter regs
US federal government regulations by sector, thousands



Source: BofA Global Investment Strategy, McLaughlin & Sherouse (2017)

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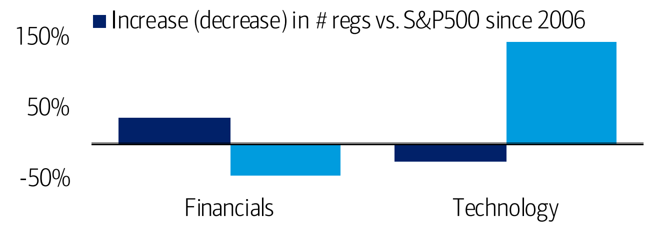
Exhibit 18: US Financials vs US Tech: regulations led to lower multiples (and vice versa)
# of regulations vs change in Price to Book Value, 2006 vs 2017



Source: BofA US Equity & Quant Strategy, quantGov

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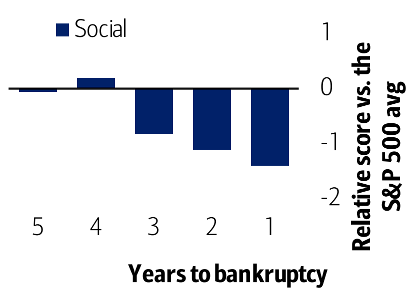
Issues with varying severity have revealed themselves recently, like an increasing gap between highest and lowest paid employees, share class voting rights, anti-monopolistic legislature, a lack of board independence, global supply chain risks, data privacy and cyberattacks. US Tech primacy is paramount from a national security perspective. The government is behooved to avoid crippling the sector with undue compliance mandates. The size and access to data of the top three cloud providers (AMZN, GOOGL, MSFT) account for two-thirds of the global market and it benefits the US to retain and grow that share. Tech lobbying spend reached new highs in 2022 (not surprising, given its market cap increase) but highlights increasing private and public sector interplay. **Megacaps could win on a relative basis given their deeper pockets and the barriers to entry from regulatory burdens.**

Red flag: social factors like trust are deteriorating similar to banks ahead of GFC.

Exhibit 19: Social factors deteriorating preceded bankruptcies
Trailing 5-yr MSCI ESG pillar scores of S&P 500 companies that subsequently went bankrupt (2005-2017)



Source: Sustainalytics, BofA US Equity & Quant Strategy

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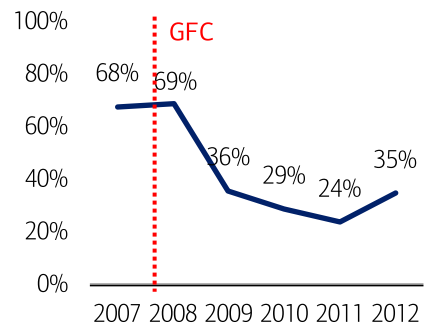
Exhibit 20: Consumer trust in banks plummeted post-GFC
Trust in banks in the US, 2007-2012



Source: Edelman Trust Barometer. Please indicate how much you trust banks to do what is right (9-point scale where 1 means you "do not trust them at all" and 9 means you "trust them a great deal"). Informed publics ages 35-64 in the US

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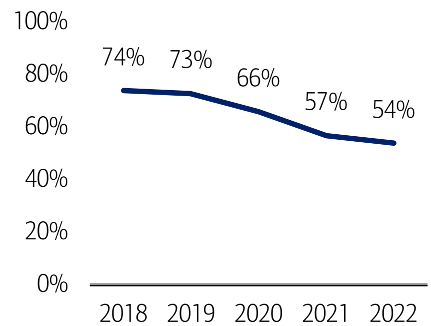
Exhibit 21: Eroding trust in Tech now
Trust in Tech in the US, 2018-2022



Source: Edelman Trust Barometer. Please indicate how much you trust businesses in Technology to do what is right (9-point scale where 1 means you "do not trust them at all" and 9 means you "trust them a great deal"). General population, US

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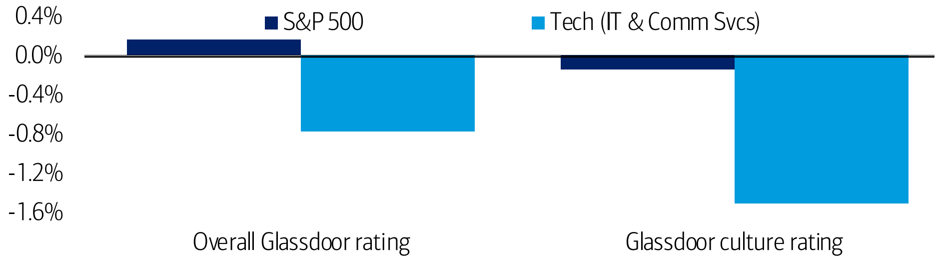
Employee retention at risk from employee perception issues: In a sector where innovation drives returns, talent retention is more important than in other industries with more fungible skillsets.

Exhibit 22: Tech deteriorating on workplace satisfaction and culture
Average change in Glassdoor rating (Overall and Culture) for S&P 500 and for S&P 500 Tech companies in 2022



Source: Glassdoor, Thinknum, BofA US Equity & Quant Strategy. Tech includes companies in Information Technology and Communication Services.

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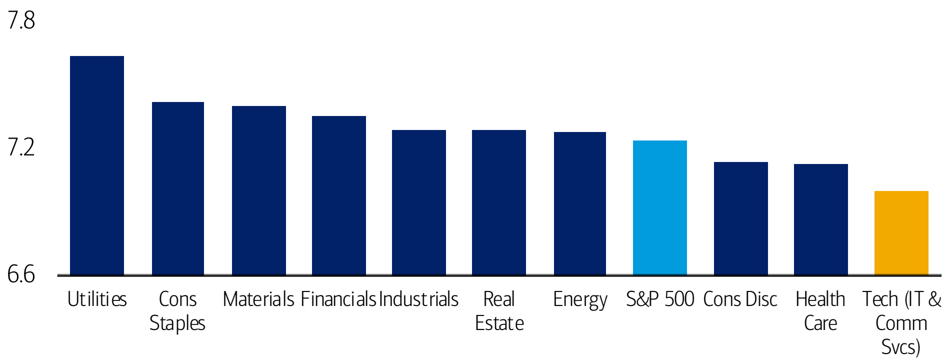
Governance risks

Exhibit 23: Tech underperforms on "G"
Average Bloomberg Governance Score; for S&P 500 companies and for S&P 500 companies within IT and Comm Svcs, as of 2/2023



Source: Bloomberg, BofA US Equity & Quant Strategy

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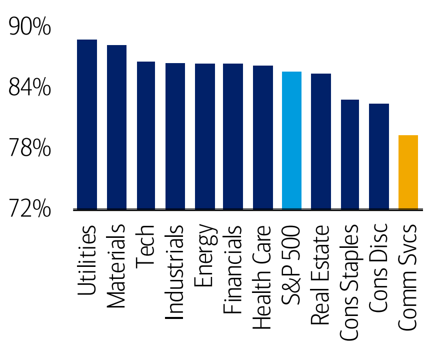
Exhibit 24: Comm Svcs has far fewer independent directors
Percent of independent directors on board, sector average for S&P 500 companies as of 2/2023



Source: Bloomberg, BofA US Equity & Quant Strategy

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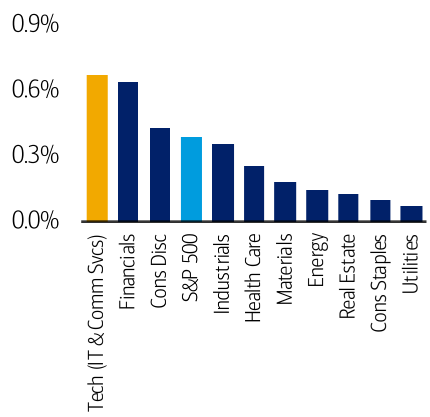
Exhibit 25: Tech CEOs control more shares
Percent of shares owned by CEO, sector average for S&P 500 companies as of 2/2023



Source: Bloomberg, BofA US Equity & Quant Strategy

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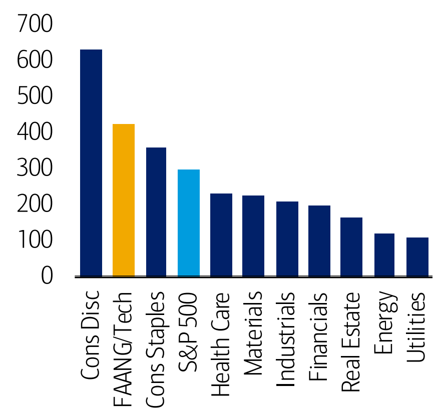
Exhibit 26: Tech second to Cons Disc in CEO-employee wage gap
Sector average of CEO salary to median employee salary ratio for S&P 500, as of 1/2023



Source: Bloomberg, BofA US Equity & Quant Strategy

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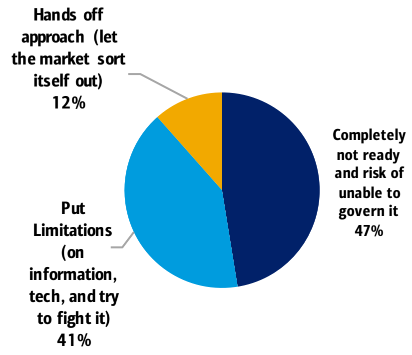
Exhibit 27: How will governments adapt to the new world of technology?
47% of respondents feel governments are not completely ready and are at the risk of being unable to govern



Source: BofA Global Research; n = 78
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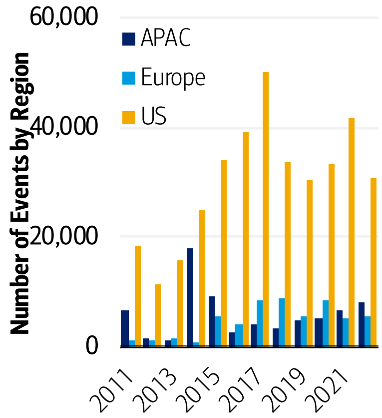
Exhibit 28: US had the most cybersecurity events in 2022
Events by Region



BofA APAC ESG Strategy, Ravenpack, FactSet, MSCI, Bloomberg
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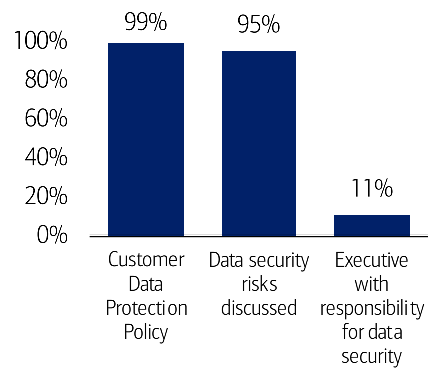
Exhibit 29: Cybersecurity policy is de rigeur, but accountability is low
Percent of companies in the S&P 500, as of 1/2023



Source: Bloomberg, BofA US Equity & Quant Strategy
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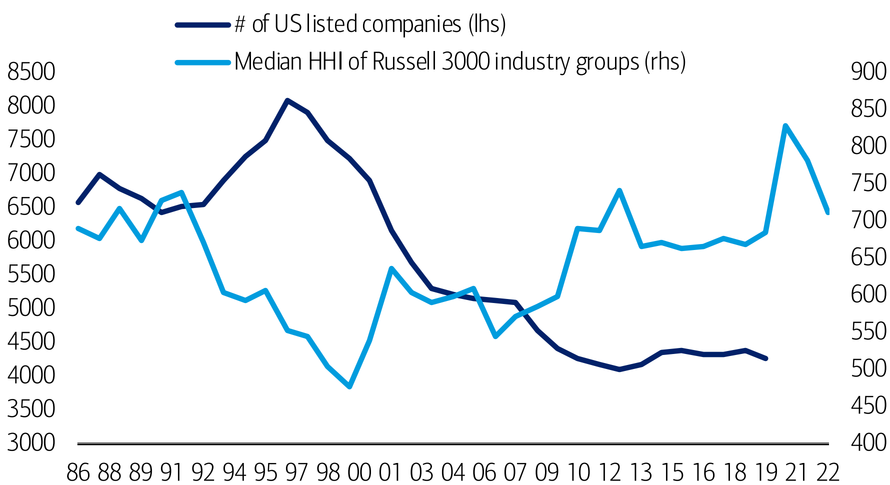
Exhibit 30: Despite the recent drop, US oligopoly power (market concentration) has risen, posing regulatory risks for Tech giants
# of US listed companies vs median HHI (1986-present)



*HHI=Herfindahl-Hirschman Index of market concentration; 0 = fully competitive industry and 10,000 = monopoly, based on the sum of the squares of the market share of each firm in the industry
Source: World Bank, FactSet, BofA US Equity & US Quant Strategy
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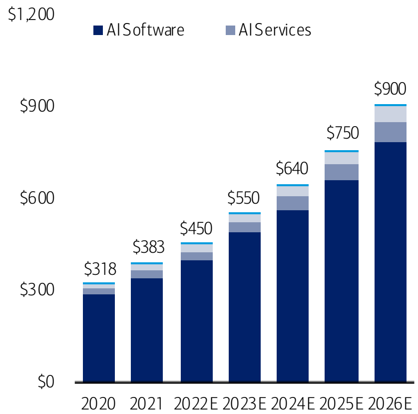
The next big thing: AI

Everyone is talking about AI these days, with mentions of AI soaring during 1Q earnings calls. AI can be a huge opportunity, not just for companies that provide AI services, but for the users as well. Our Thematic Strategist highlights AI could add 0.8-1.4ppt to global productivity growth in the long run – see Thematic AI Primer. According to industry analysts at IDC, the global AI opportunity (software + services + hardware) is projected to reach $900B by 2026, mostly via Software.

Exhibit 31: AI Software spend to reach ~900bn by 2026E, mostly via software
Global AI market size (US$ bn)



Source: BofA Global Research, IDC
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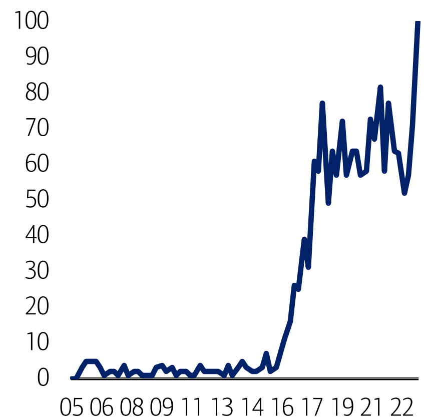
Exhibit 32: Mentions of AI soared
Mentions of "AI" during earnings calls (max = 100; 1Q05-1Q23)



Source: AlphaSense, BofA US Equity & Quant Strategy
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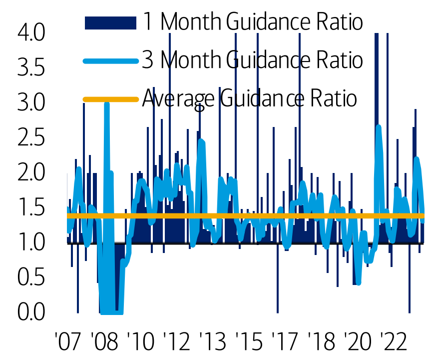
Exhibit 33: Our capex guidance ratio remains above 1x, pointing to continued strength in capex
S&P 500 Capex Guidance Ratio (# Above vs Below Consensus) - 05/23



Source: FactSet, BofA US Equity & Quant Strategy
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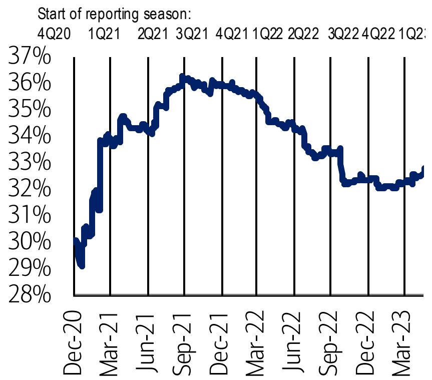
After 15 months of lagging S&P 500, Nasdaq 100 earnings pulled ahead from cost cutting initiatives and AI. Tech's earlier earnings downturn could result in an earlier recovery. Wage inflation has been a catalyst for companies to invest in productivity-enhancing initiatives like automation.

Buy capex takers, not spenders: AI is a growth theme but not all Tech stocks win. Companies that spend on capex have chronically underperformed (Exhibit 36). Software companies could end up spending on AI just to remain competitive. We prefer Semis as a group, benefitting from the AI capex cycle. Software is more idiosyncratic than Semis and Hardware (Exhibit 43) – see AI Primer for our team's proprietary AI ranking system.

Exhibit 34: NDX earnings pulled ahead after cost cutting and AI benefits
NDX 2023E earnings as % of SPX 2023E earnings (12/31/20-5/30/23)



Source: FactSet, BofA US Equity & Quant Strategy
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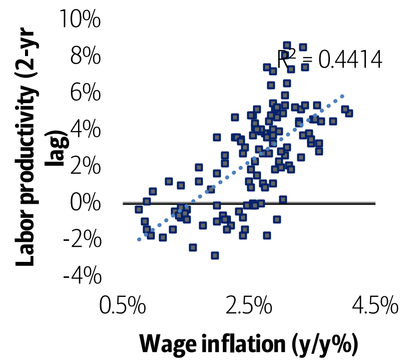
Exhibit 35: Wage inflation and labor productivity spend is positive for IT
US Manufacturing wage inflation and labor productivity (y/y % changes)



Source: Bureau of Labor Statistics, BofA Global Research
Note: Quarterly data of US manufacturing labor productivity versus average hourly earnings of production & nonsupervisory employees
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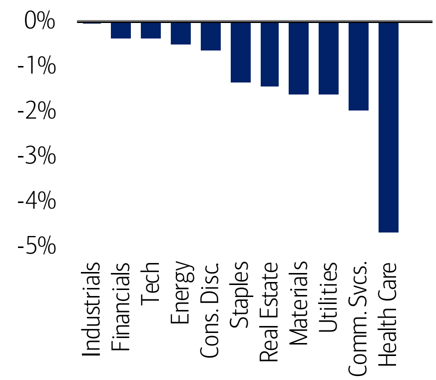
Exhibit 36: Buy capex takers, not spenders (laggards in every sector)
Annualized relative performance of capex spenders in each sector (top decile in capex to sales) vs its equal-weighted sector (1986-4/23)



Source: FactSet, BofA US Equity & Quant Strategy
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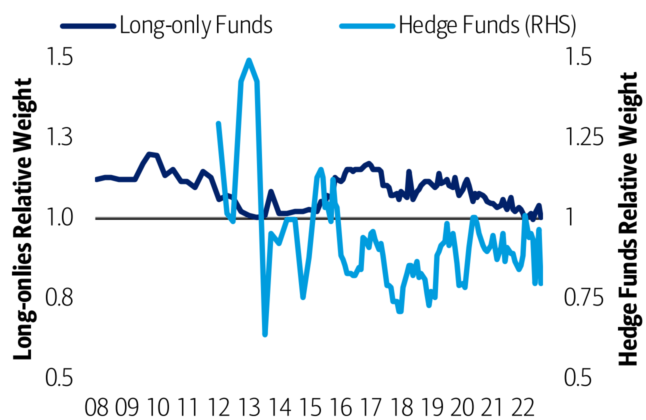
Positioning risk subsided in Tech, rising in Comm. Svcs.

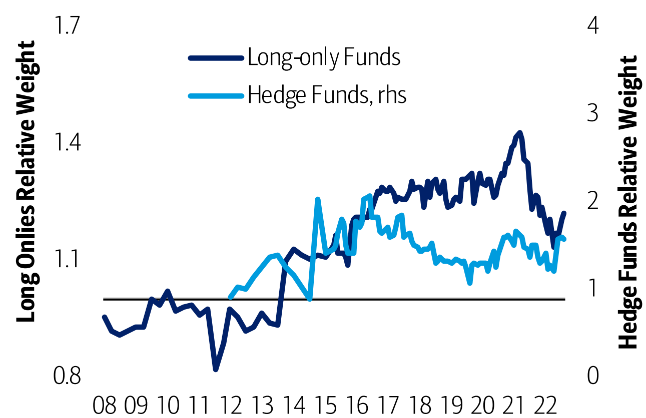
Following big underperformance last year, long onlies have reduced their exposure to Tech to a market-weight, a low since the financial crisis. On the other hand, active funds increased exposure to Communication Services after its YTD +32%.

Exhibit 37: Tech's crowding risk has subsided
Long-only and hedge funds' net relative weight in Tech (as of 4/2023)



Source: FactSet, BofA US Equity & Quant Strategy
BofA GLOBAL RESEARCH

Exhibit 38: Crowds moved back into Comm. Svcs. after YTD momentum
Long-only and hedge funds' net relative weight in Comm. Svcs. (as of 4/2023)



Source: FactSet, BofA US Equity & Quant Strategy
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Micro: analyst views

Enterprise Software

Brad Sills, Koji Ikeda, Michael Funk

Industry backdrop heading into 2H

Who are the AI winners and losers in enterprise software?

We believe this is the key question heading into the second half of 2023. While we believe it's premature to declare long-term AI and generative AI beneficiaries and laggards, we believe applying an AI lens to software stock evaluation is prudent. In our AI Primer published 5/30/23, we introduce a proprietary AI ranking system (based on 13 yes/no questions) to help identify AI leaders and others where the potential is less understood. The most notable factors we think may contribute to AI success include: 1) access to high volumes of quality data; 2) marketing leading installed-bases for ongoing data acquisition; and 3) highly specialized solutions embedded within enterprises. Stocks that screened well in our proprietary framework include: MSFT, ORCL, CRM, HUBS, DDOG, WDAY, NOW, CCCS, VEEV, and SHOP. With the proposed $20bn acquisition of Figma by Adobe, we also recently published a Digital content design industry deep dive and implications for leader Adobe, which discusses the potential implications of generative AI to the creative professional.

DevOps is gaining mindshare…AI likely to drive increasing DevOps workloads

We recently published a DevOps primer, CI/CD may be one of the keys to winning in DevOps, as we believe DevOps vendors stand to benefit as organizations continue to digitally transform. Moreover, we believe one thing with AI is certain, it will accelerate the pace of new application development, which will make delivering those applications to end-users quickly and securely is as important as ever. We believe the DevOps TAM is big at $51bn, leaving plenty of runway for the best-of-breed vendors to grow fast and scale. We also introduce a proprietary framework to evaluate DevOps vendors, where Microsoft and GitLab screened best positioned within our coverage universe.

CDPs, the next buzzword in front office software?

In April, we published a primer on customer data platforms (CDPs), Setting the stage for CDP battles to come, as we believe CDPs have the potential to be a key part of next-generation customer engagement strategies. In the report, we discuss the technology, key features of disruptive CDP vendors, the CDP market opportunity, competitive environment, key players within our coverage universe, among many other topics. We believe front-office software will be topical in the 2H because many front office software vendors have experienced demand headwinds as organizations have tightened budgets as growth and pipeline generation slowed. However, this will likely lead to outsized share gains for the front-office software vendors that offer differentiated platforms with strong value propositions and fast ROI. We believe CDPs will play a role in driving this.

Top large cap idea: Microsoft (MSFT)

We believe that Microsoft is well positioned to generate sustained mid/high teens revenue growth over a multi-year period, led by continued adoption of Azure cloud infrastructure platform, cloud-based Office 365 productivity suite and a shift to more profitable Games and Game Pass revenue in Xbox (from traditional video game/hardware model). While a revenue mix shift toward lower margin Azure segment is likely to offset some scale benefits near term, operating expense scale is likely to drive stable 60-70 bps of margin expansion per year in the coming years, driving solid high teens/low 20s FCF growth in the long term and exiting the macro. Microsoft scored highest in our AI ranking. We believe Microsoft is ahead of the curve, with AI enabled offerings already available, such as Teams Premium with ChatGPT features and Azure AI offerings. We believe many more LLMs and AI features will be launched across all key Microsoft franchises. We look for revenue contribution from the AI offering to drive incremental growth in the coming FY25.

Semiconductors

Vivek Arya, Blake Friedman, Duksan Jang, Lauren Guy

Consumer/industrial/optical seeing pockets of sluggishness, AI/auto strong

In semis, inventory overhang in PCs (AMD, INTC), smartphones (QCOM, CRUS), IoT, networking (ANET), optical (MTSI) has been exacerbated with a sluggish rebound in China. Autos remains a bright spot (ON), but bookings momentum is waning in industrial semis (TXN, MCHP). We main favorable to secular drivers in data center (AI), autos (silicon carbide and EVs), and manufacturing (semicap, EDA) driving outsized growth.

Top 3 themes: 1) AI, 2) EV, 3) Complexity/Reshoring

As near/medium-term global growth remains sluggish, we focus on companies exposed to longer-term technology inflections including: 1) **AI:** the gold-rush of infra investment by large hyperscale vendors in generative AI/large-language models. NVDA top pick, though we also see AVGO/MRVL upside once we get through a potential near-term volatility in traditional networking demand (see related note with est. cuts); 2) **EV**: we see ON as top beneficiary and a leader in Silicon Carbide (SiC). We also continue to like ADI on best-in-class FCF generation and returns; and 3) **Chip complexity/reshoring**: we like AMAT as a top pick for its broad exposure to rising global cycle in mature-node investments and for its attractive valuation (15x CY24 PE vs peers at 17x). Also highlight electronic design automation (EDA) tool vendor CDNS - well exposed to rising cost/complexity of chip-making and use of AI in design optimization.

AI offers upside for several top compute vendors

Focus today remains on powering generative AI where GPU/accelerators are becoming essential to large language models (LLMs). The AI accelerator/system TAM could approach $75-$80bn by CY27, and we see the ecosystem dominated by NVDA – with its end-to-end platform (Hopper/Ampere accelerators, Grace CPU, Mellanox/networking, AI/software libraries) developed over several decades unrivaled by peers. Within the past few months, NVDA has showcased at multiple events (see GTC highlights, Computex takeaways) that their portfolio reaches well beyond accelerators for initial training activity. We also highlight AI networking/custom silicon benefits that can drive upside for MRVL/AVGO (10%-15% of sales AI today with much stronger runway). We acknowledge AMD's CPU server gain opportunities (30%+ share potential in CY23), and promising/emerging accelerator products (MI300), though data center GPU ramp remains in early stages (we estimate <$1bn in sales even by CY25).

NVDA (top pick): NVDA uniquely positioned with a full-stack of AI silicon, software, scale, supply and developer ecosystem to transform the nearly $1 Trillion traditional data centers market. NVDA holds essential GPU assets (accelerators) needed to accelerate servers to develop critical large language models (LLMs). We estimate only ~15% of cloud servers are accelerated (i.e. GPU attach), highlighting strong runway. Under select scenarios (45% accelerator attach rate, 75% market share), NVDA could generate >$20 in EPS in 5-years (from $7-$8 in CY23E). NVDA also holds other key data center assets (networking equipment, software) that further bolster company AI position.

Networking & Security

Tal Liani, Jonathan Eisenson, Madeline Brooks, Tomer Zilberman

Industry backdrop heading into 2H23

Backlog and order levels could normalize by year-end

Recent quarter results from networking vendors pointed to softening underlying fundamental trends and risk of normalized backlog and order levels. High backlog balances are driving revenue, margins, and earnings growth this year; however, we could see a reversion of trends in 2024. The focal point of Cisco's quarter was product order growth, down -23% despite an easier comp of +8%, vs a similar -22% decline in 2Q23 on a tougher +33% comp in 2Q22, reflecting a declining demand environment. Juniper's ending backlog decreased more than $350mn sequentially to roughly $1.7bn, accelerating from last quarter's ~$250mn drawdown, despite prior commentary from management that drawdown would ease from a $250-$300mn rate. Arista noted that Cloud Titan spending is expected to slow down, returning to historical ordering patterns, meaning less early ordering and reduced visibility, and we expect slower revenue growth once backlog is worked through, starting 2H23. On the flip side, the decline in orders might merely be reversion to the mean after a strong 2022, and orders could snap back once the backlog reaches normalized levels.

Thesis for cybersecurity and networking remains intact

Despite the near-term pressure, we believe the long-term thesis for both cybersecurity and networking remains intact. Although sales cycles have elongated on increased deal scrutiny, cybersecurity still remains an essential part of the network, as digital transformation accelerates and enterprises migrate to the Cloud. We believe our Buy-rated cybersecurity stocks are well-positioned to benefit from the growing efforts to protect the networks at both the enterprise and consumer levels, fueling the adoption of new security paradigms. For networking, we believe current trends will continue in the near term as Hyperscalers address traffic growth and AI investments, Service Providers invest in 5G and network capacity, and Cable Operators drive fiber deeper into the network and invest in capacity upgrades via new protocols. On one hand, we expect 2023 to prove more challenging and expect both providers and enterprises to reduce their network investments from peak spending levels last year. On the other hand, we believe these market dynamics are already reflected in expectations and forecast better supply chain and high backlog balances to drive better revenue, margins, and earnings growth.

Top large cap stock ideas: ANET, FTNT, PANW

Our top picks heading into the BofA tech conference and 2H23 are ANET, FTNT, and PANW. We favor stocks that continue to execute ahead of Street expectations despite macroeconomic headwinds.

- **Arista (ANET, $54.6bn):** Arista gave some cautious commentary around Cloud Titan spending and discussed slowdown in spending levels. Further, their modest FY23 revenue guidance raise to 26% growth, from 25% previously, implies a sharp deceleration in the back half of the year, with total revenue growth expected to substantially decline from 54% in 1Q and expected 31% in 2Q to only 14% in 2H23. Some parts of the modest guide are driven by management conservatism, as visibility into Cloud Titan demand decreased from 9 months in the prior quarter to six months in the current quarter, but it's also reflective of lower order levels. Arista doesn't disclose backlog or order levels, but we believe they are equally exposed to backlog/order normalization similar to the other networking vendors.

  However, we take a longer view of the stock and maintain our Buy rating and $170 PO as Arista is still rapidly gaining market share, especially in 400G switching, and caters to the most important parts of data center infrastructure, which remains a key investment area for enterprises and hyperscalers. 400G grew from 1% of data center switching revenue in 2020 to 14% in 2022, and Gartner estimates that over 90% of the demand for 400G comes from hyperscalers. At the same time, Arista grew from 19% of 400G market share in 2020 to 39% in 2022, proving it is catering to the growing demand for higher-bandwidth networking gear. We believe that after this near-term transitory period of order normalization, Arista will continue to see solid demand with AI workloads being a potential contributor. AI workloads should have a higher revenue contribution in 2023, yet it is still at its infancy. Management believes 2023 should be a critical year for seeing Arista 7800 platform trials come into production to support AI workloads, with growth acceleration impacting 2024 and 2025.

- **Fortinet (FTNT, $53.9bn)** We recently upgraded Fortinet from Neutral to Buy given the company's strong fundamentals and continued execution. While backlog drawdown remains a reality for the company, continued solid demand and business momentum outweigh these concerns in our view. Catalysts for the stock include continued strong demand, a healthy financial profile, and unique market positioning and industry tailwinds that cater to Fortinet's value proposition. 1Q revenues grew 30%, orders grew double digits YoY supported by new logo additions, and 30% service revenue growth was driven by SaaS and Fortiguard growth of 35%. 1Q margins were healthy, with gross margin expanding 190bps YoY to 76.3%, and operating margin of 26.5% was the highest seasonal level in the company's history. Fortinet is well positioned to benefit from the convergence of networking and security, as the company's portfolio allows CISOs to manage both functions from a unified platform. Because of this integration, companies are able to save on both OpEx and CapEx costs as a single analyst can run both functions from the same appliance, which is especially valuable for companies in uncertain economic markets where IT spend is more heavily scrutinized. Additionally, the company has a unique hardware-led approach that provides substantial provide advantage versus competitors and enables it to bundle mor services into its platforms. In our view, Fortinet is well positioned to achieve long term 2025 financial targets of $10bn in billings, 20%+ operating margin, and 30% FCF margin.

- **Palo Alto Networks (PANW, $65.0bn):** Despite a challenging macroeconomic environment, Palo Alto Networks continues to post impressive results with no signs of slowdown. The company continues to show good traction with 3Q23 NGS (Next-Generation Security) ARR up 60.2% YoY vs Street's 56% and billings growth was solid at 25.6% YoY growth vs Street's 23.9%, attesting to the success of the company's execution. Key drivers are centered around increased customer appetite for software-based solutions and cloud-delivered form factors. Management flagged that the environment continues to become more challenging, noting that cautious spending and deal scrutiny continues to be more widespread among customers. We believe this is partially reflected in beat factor performance with 3Q23's billings beat factor at ~1%, lower than last year's 12%. However, the company continues to outpace market growth, with product revenue up 10.4% YoY vs Street's 6.7%, with software now accounting for 30% of product revenue. Management expects FY23 OM to be ~23.1% vs 21.7% prior, representing a new baseline to build on with a focus on profitability and better cost controls, such as resource utilization, to accommodate growth.

Internet

Justin Post, Michael McGovern

Top Internet large cap stock pick: AMZN

Amazon is our top large cap stock pick within the Internet sector, for: 1) improving macro position as fuel and other inflation has less impact on consumers & input costs; 2) ongoing share gains in retail; 3) Potential for retail Margin upside from here, driven by fulfilment rationalization and growth in profit centers like advertising; 4) AWS optimization cycle coming to an end, leading to better revenue & margin performance; 5) Upside for stock based on historical valuations.

A top stock for moderating inflation and interest rates

With decelerating inflation rates throughout 2023, consumers should feel less pressure on discretionary goods spend, which has been crowded out by grocery and leisure spend. In an improving environment, consumers will be more likely to spend on higher margin, 3P items on Amazon, vs lower margin grocery & CPG items. In addition to improving demand, Amazon' margins should benefit from lower raw material and transportation costs, with commodities like fuel prices driving a significant share of Amazon's cost base. Finally, lower interest rates could help the valuation multiples of longer duration earnings stocks due to lower discount rates.

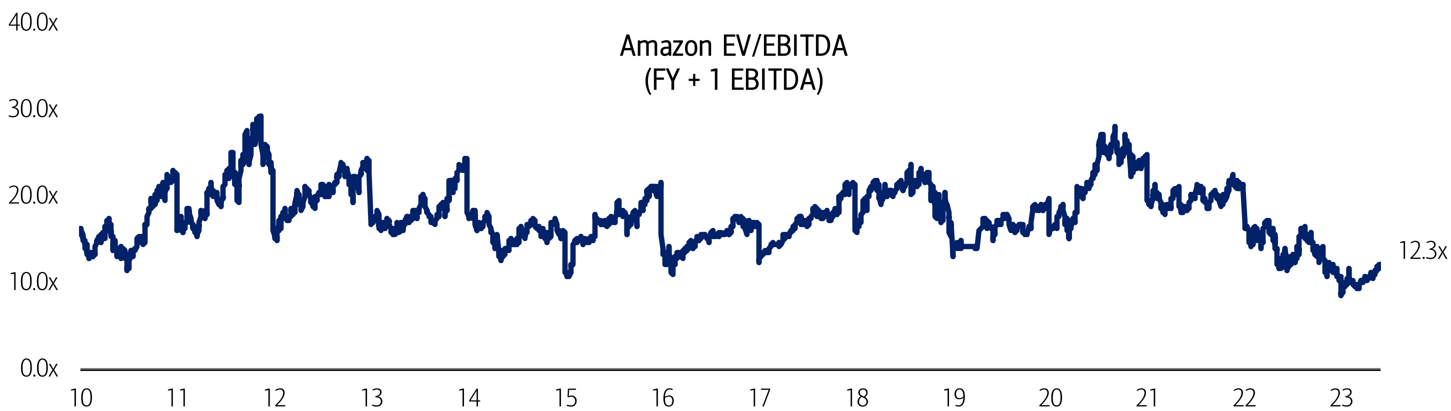
Share gains in retail, which is still early in penetration at 20% Online in US
Amazon continues to be a share-gainer in the retail & eCommerce space, despite Online penetration gains slowing post-COVID. For 1Q'23, we estimate Amazon's US eCommerce market share grew approx. 150bps Y/Y to 35.8%, slightly improving from 120bps y/y share gain in 4Q. As the post-pandemic reopening cycle fades, we think overall Online retail growth can reaccelerate, and Amazon is well positioned for sector improvement.

Retail Margin Upside from here
Amazon is exiting a double investment cycle in Fulfilment + Transportation, and our analysis of past investment cycles shows potential for significant margin improvement from here. In 1Q'23, management had a bullish tone on Retail margins, and we think Amazon is in a period of Retail margin beats with more efficiencies to emerge in 2023. We note that in 2022 Amazon began to transition to a regional distribution model in the US, likely to improve efficiency and shipping speeds over time. As a result, Prime Deliveries are on track to reach their fastest speeds ever in 2023, while shipping cost per unit was down 4% y/y in 1Q. We see upside to Street estimates that suggest 100-150pbs of y/y retail margin improvement in 2024.

AWS optimization cycle ending
As corporates outlooks for sales growth deteriorated in 2022, companies looked for expense savings, which pressured cloud spend in 2022. By 3Q'23 we think the sector will be past the peak of the cost optimization cycle, and AWS revenue growth will begin to accelerate. Upside drivers from here are fuel price declines and potential savings from AWS layoffs announced in 1Q that should lower 2Q costs, and a potential AI driven demand cycle for cloud services that could start to benefit 2H'23 cloud spend.

Upside based on historical multiples
Amazon's valuation on a revenue multiple basis is toward the lower half of its historical range, at about 2.1x 2024E revenue (vs 10-year historical average also at 2.1x), though we argue that the revenue multiple should be increasing over time on mix shift to 3P services and AWS. On an EBITDA valuation basis, Amazon's multiple in the lower half of historical averages, currently at 12x 2024E EBITDA vs the 10-year historical average FY + 1 EBITDA of 17.8x. Within the last five years, Amazon's EBITDA multiple peaked at about 30x (in late 2020), and has hit a trough towards 9x in recent months (see chart below).

Exhibit 39: Amazon EV/EBITDA
Amazon's EBITDA multiple at 12x is toward the low end of its historical valuation range



Source: BofA Global Research, Bloomberg

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IT Hardware

Wamsi Mohan, Ruplu Bhattacharya

Industry backdrop heading into 2H23

Consumer cycle recovers before Enterprise cycle

Estimate revisions have been significantly more negative for consumer exposed companies as the benefits accrued during covid driven demand boost in 2020/2021 reversed sharply in 2022/2023. We expect the trajectory of demand recovery to first manifest itself in Consumer (PC, TV, Smartphones) and later in Enterprise where the full demand impacts have not completely manifested in estimates given supply constraint driven elevated backlogs in 2023 (Servers, Networking).

Signs of a bottom in Consumer, especially PCs

Our recent checks from Asia point to some stability in PCs where certain components are starting to see significant inventory depletion and in some select instances rush orders that has not happened for several quarters. Although we expect PC units to still decline y/y in 2023, there will be q/q growth with an absolute bottom in 1H2023. Further, our analysis suggests that PC units in 2024 will be in the range of 273-289mn units in 2024 depending on assumptions around replacement of consumer notebooks (especially ones that were purchased during 2021/2021) and the strength likely persists into 2025.

Top large cap idea: DELL

Dell remains one of the largest hardware IT providers that can fulfill an organizations IT needs from PC to servers to storage. We view valuation as attractive driven by cyclical issues. Dell is also making changes to become more shareholder friendly and is emphasizing capital returns to a much larger extent. With PCs bottoming and Enterprise estimates largely de-risked, we view shares as attractive.

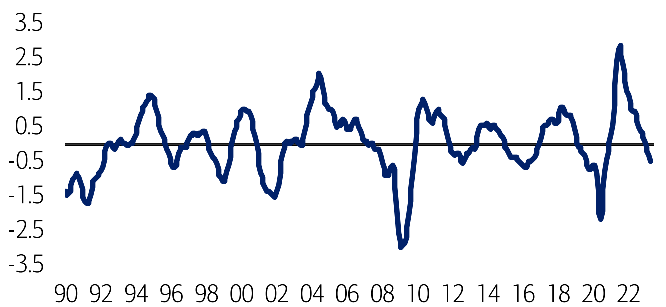
A quantitative take on Tech

Our US regime indicator is a four-phase framework based on the amalgamation of various uncorrelated macro inputs (credit spreads, inflation, estimate revisions and the slope of the yield curve, etc.). When aggregated, the indicator defines four distinct phases that are usually accompanied by well-behaved factor, style and size performance.

The indicator has been in the Downturn phase since January 2023, during which High Quality, Low Risk, and Large Size have outperformed. This indicator is better used for factors than sectors, given changing dynamics of sectors over time. But Information Technology and Communication Services have historically outperformed during Downturns.

Whipsaw risks are high today: Of the eight inputs into the Regime indicator, five improved from last month. Just a 6% increase across the inputs would result in a flip to an Upturn. This shift is painful given extreme reversals in leadership of risk (low to high), size (large to small), style (quality value to deep value) and quality (high quality to distress). Energy, Financials and Discretionary would likely rally and Tech and Comm Services would likely lag. See whipsaw alert note.

Exhibit 40: US Regime Indicator is presently in Downturn
(January 1990-April 2023)



Source: BofA US Equity & Quant Strategy, Refinitiv, ICE Data Indices, LLC, Institute for Supply Management, Bureau of Labor Statistics, Federal Reserve **Note:** Phase 1 – Early Cycle; Phase 2 – Mid Cycle; Phase 3 – Late Cycle; Phase 4 – Recession Disclaimer: The indicator identified as the US Regime Indicator above is intended to be an indicative metric only and may not be used for reference purposes or as a measure of performance for any financial instrument or contract, or otherwise be relied upon by third parties for any other purpose, without the written consent of BofA Global Research. This indicator was not created to act as a benchmark

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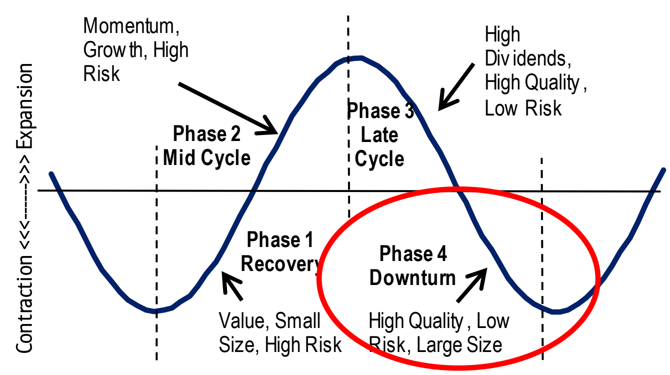
Exhibit 41: Quality, Low Risk and Large Size strategies have historically outperformed in Downturn
U.S. Regime Model– a heuristic



Source: BofA US Equity & Quant Strategy

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Exhibit 42: Tech exhibits 57% hit rate of outperformance during Downturn
Sector performance in the four US regime indicator phases (relative to equal-weighted S&P 500)

		Comm Svcs	Staples	Discretionary	Energy	Financials	Health Care	Industrials	Info. Tech.	Materials	Real Estate	Utilities
Phase 1	Avg:	-6.8%	-4.7%	3.3%	5.3%	14.6%	-7.0%	5.1%	-0.2%	10.1%	9.1%	-12.8%
Early Cycle	Median:	-3.7%	-10.0%	5.7%	-2.3%	13.5%	-6.5%	3.2%	2.2%	8.2%	3.5%	-12.5%
	Hit Rate:	37.5%	37.5%	62.5%	50.0%	100.0%	25.0%	75.0%	50.0%	75.0%	50.0%	0.0%
Phase 2	Avg:	-2.3%	-9.3%	0.0%	3.8%	-0.3%	-2.9%	2.5%	12.0%	-3.1%	-6.2%	-15.9%
Mid Cycle	Median:	-3.2%	-10.3%	-2.7%	-2.0%	0.7%	-1.1%	-0.6%	6.6%	-1.4%	-12.6%	-17.4%
	Hit Rate:	33.3%	22.2%	44.4%	44.4%	55.6%	44.4%	44.4%	66.7%	44.4%	33.3%	0.0%
Phase 3	Avg:	-4.8%	9.8%	-2.3%	0.9%	0.9%	16.4%	3.6%	-1.6%	-4.9%	-3.0%	12.9%
Late Cycle	Median:	-2.4%	5.5%	-2.3%	-6.8%	-1.8%	10.4%	1.1%	1.5%	-8.6%	-2.6%	5.6%
	Hit Rate:	33.3%	66.7%	33.3%	44.4%	44.4%	77.8%	77.8%	55.6%	33.3%	44.4%	66.7%
Phase 4	Avg:	4.1%	3.8%	6.7%	-11.3%	-6.3%	5.1%	-4.4%	6.2%	-4.4%	-2.6%	-9.5%
Downturn	Median:	3.7%	-0.6%	6.3%	-15.2%	-3.0%	2.6%	-4.8%	5.3%	-7.8%	-9.2%	-12.5%
(Current)	Hit Rate:	57.1%	42.9%	71.4%	28.6%	42.9%	71.4%	28.6%	57.1%	28.6%	28.6%	14.3%

Source: BofA US Equity & Quant Strategy, Refinitiv, ICE Data Indices, LLC, Institute for Supply Management, Bureau of Labor Statistics, Federal Reserve
Note: Performance is calculated as price return relative to equal-weighted S&P 500, for all styles except High Dividend Yield, where total return for the style and the index are used. Hit rate = % of months in phase where style outperformed equal-weighted S&P 500.

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Picking stocks vs allocating to sectors

Tech groups by two measures: (1) **Long-short alpha**, or "perfect foresight alpha", the spread between the best and worst performing stocks within a group over a discrete time period. High average long-short alpha offers investors stronger alpha opportunities. (2) **Pair wise correlation**, the average correlation of daily returns of every pair of stocks within a sector over a discrete time period. Low average correlation indicates more differentiated companies, and can indicate more idiosyncratic or company-specific factors rather than just macro.

Exhibit 43: Within TMT, Tech Hardware and Software offer best opportunities for stock pickers
Historical intra-stock correlation vs performance spread (2Q86-1Q23)

Source: FactSet, BofA US Equity & Quant Strategy

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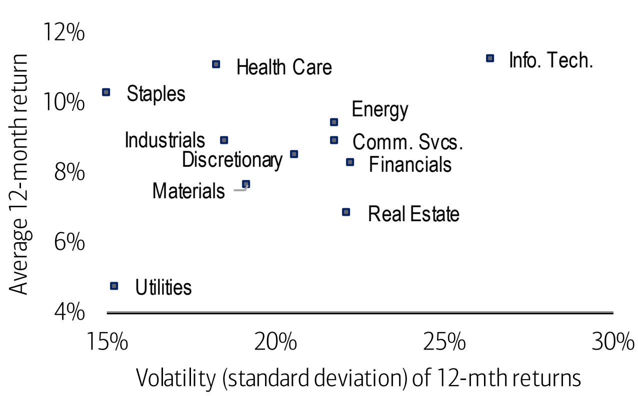
Exhibit 44: Tech = high risk, high rewards
Average 12-mo returns and volatility of returns (1982-present)



Source: Compustat, BofA US Equity & Quant Strategy

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Highest return at the highest risk

Since 1970, Tech has offered the highest returns but at the highest level of risk relative to other sectors in the S&P 500. But the scant excess return Tech offers vs Consumer Staples is at the expense of significantly higher – almost double – the volatility.

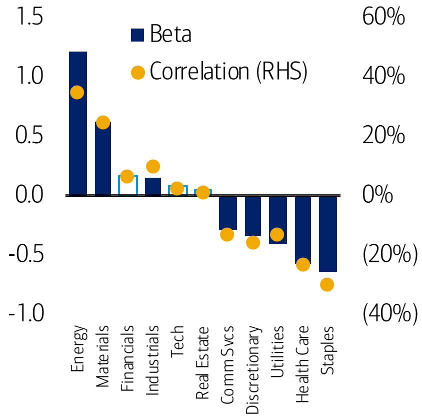
The macro guide to Tech

Most macro variables have shown scant relationships to Technology's relative performance vs the S&P 500. The exception is a strong correlation to China (Exhibit 47).

Caveat: equity duration or the time to recover one's initial investment has lengthened considerably for Technology companies thus rates and inflation may have more impact today than historically.

Exhibit 45: Inflation: bad for Communication Services

S&P 500 sectors' relative performance sensitivity to our BofA Inflation Composite (1974-present)



Source: BofA US Equity & Quant Strategy, FactSet, Bloomberg

Note: Empty bars indicate not statistically significant

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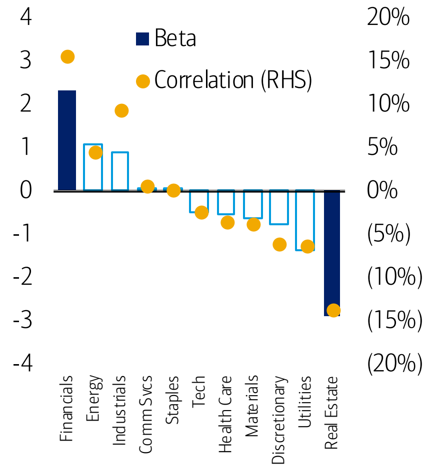
Exhibit 46: No rate risk until recently

S&P 500 sectors' relative performance sensitivity to real rates (1997-present)



Source: BofA US Equity & Quant Strategy, FactSet, Bloomberg

Note: Empty bars indicate not statistically significant

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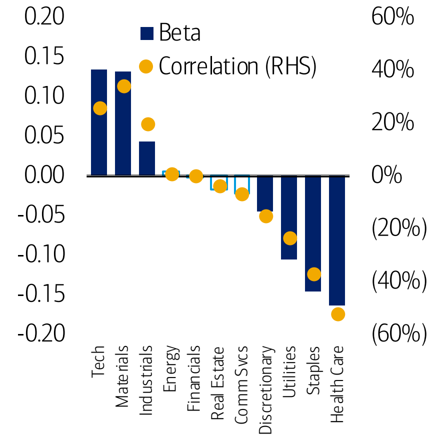
Exhibit 47: Tech is the most sensitive sector to China

S&P 500 sectors' relative performance sensitivity to MSCI China (1996-present)



Source: BofA US Equity & Quant Strategy, FactSet, Bloomberg

Note: Empty bars indicate not statistically significant

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Appendix

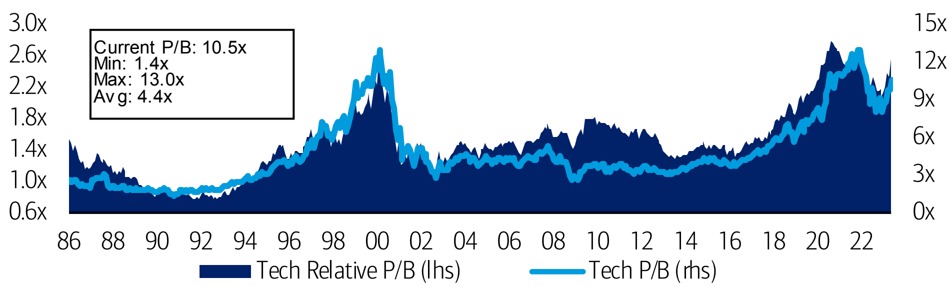
Exhibit 48: Relative Valuation (vs S&P500) for information Technology industries (based on data from 1986-5/23)
Information Technology relative price to book, price to operating cash flow, price to earnings by industry

	Price to Book (Relative)			Price to Operating Cash Flow (Relative)			Forward P/E (Relative)		
Information Technology *(# of co's)*	**Current**	**Average**	**Implied upside**	**Current**	**Average**	**Implied upside**	**Current**	**Average**	**Implied upside**
Communications Equipment (5)	1.43	1.24	-14%	1.01	1.37	36%	0.81	1.16	43%
Electronic Equipment Instruments & Components (8)	0.98	0.97	-1%	1.15	1.30	13%	1.01	1.13	12%
IT Services (8)	1.55	1.38	-11%	0.95	0.87	-9%	1.02	0.93	-10%
Semiconductors & Semiconductor Equipment (21)	1.62	1.24	-23%	1.71	1.11	-35%	1.57	1.08	-31%
Software (18)	2.81	2.13	-24%	1.81	1.61	-11%	1.59	1.30	-18%
Technology Hardware Storage & Peripherals (6)	7.90	1.29	-84%	1.56	1.19	-23%	1.47	1.03	-30%

Source: Compustat, First Call, BofA US Equity & US Quant Strategy

BofA GLOBAL RESEARCH

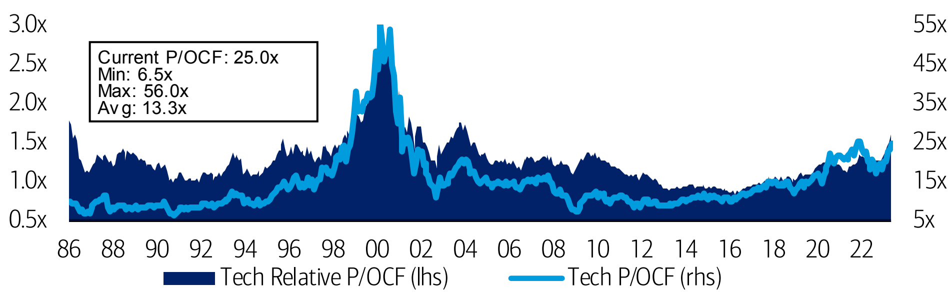
Exhibit 49: Tech P/B at 10.5x vs 4.4x historical average, 1986-05/23
Information Technology price-to-book and relative price-to-book vs S&P 500



Source: Compustat, BofA US Equity & US Quant Strategy

BofA GLOBAL RESEARCH

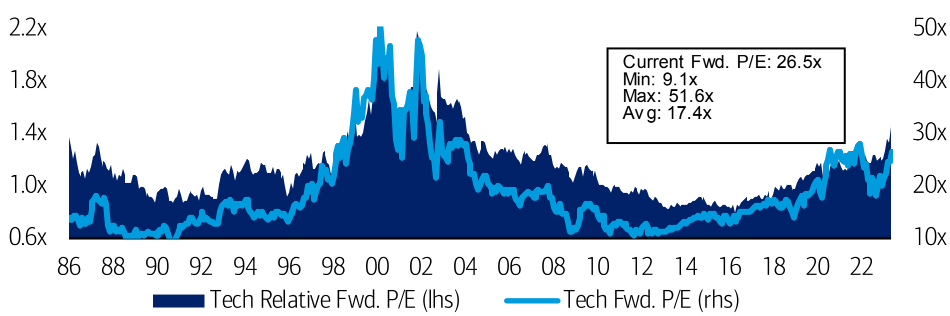
Exhibit 50: Tech P/OCF at 25.0x vs 13.3x historical average, 1986-05/23
Information Technology price-to-op. cash flow and relative price-to-op. cash flow vs S&P 500



Source: Compustat, BofA US Equity & US Quant Strategy

BofA GLOBAL RESEARCH

Exhibit 51: Tech fwd P/E at 26.5x vs 17.4x historical average, 1986-05/23
Information Technology price-to-fwd earnings and relative price-to-fwd earnings vs S&P 500



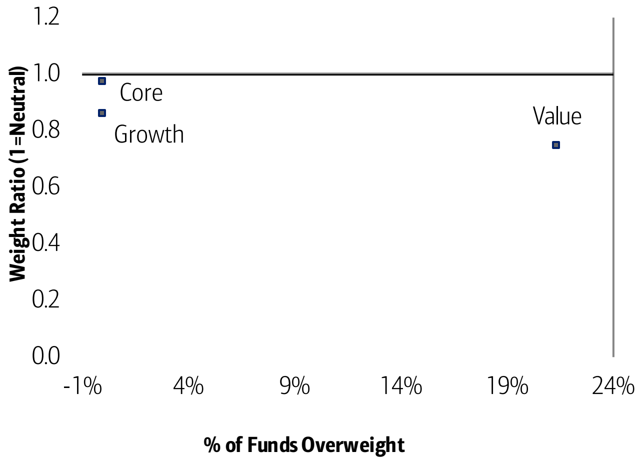
Source: Compustat, BofA US Equity & US Quant Strategy

BofA GLOBAL RESEARCH

Long-only fund positioning

Information Technology

Exhibit 52: Value and Growth Managers are both underweight Info Tech Sector
Fund Managers' positioning in Technology sector, Apr. 2023



Source: BofA US Equity & US Quant Strategy
Benchmarks used: Russell 1000 Growth for Growth funds; Russell 1000 Value for Value funds; S&P 500 for All and Core funds.

BofA GLOBAL RESEARCH

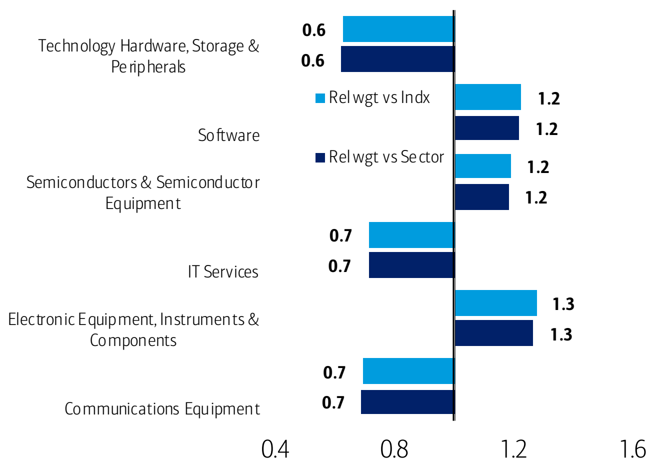
Exhibit 53: Amphenol (APH) is the most overweight
Most overweight stocks in Information Technology Apr. 2023

Ticker	Company Name	Industry	Rel Wt	% Funds Holding Stock
APH	Amphenol Corp-A	Elect. Equip., Inst. & Comp.	2.41	17%
TEL	Te Connectivity	Elect. Equip., Inst. & Comp.	2.23	14%
KLAC	Kla Corp	Semis & Semis Equipment	1.97	22%
AVGO	Broadcom Inc	Semis & Semis Equipment	1.89	26%
NOW	Servicenow Inc	Software	1.88	36%
EPAM	Epam Systems Inc	IT Services	1.77	6%
INTU	Intuit Inc	Software	1.76	41%
MU	Micron Tech	Semis & Semis Equipment	1.65	13%
NTAP	Netapp Inc	Tech. HW, Storage & Periph.	1.63	6%
MSI	Motorola Solutio	Communications Equipment	1.62	15%

Source: BofA US Equity & US Quant Strategy, FactSet Ownership
This screen is not a recommended list either individually or as a group of stocks. Investors should consider the fundamentals of the companies and their own individual circumstances/objectives before making any investment decision.

BofA GLOBAL RESEARCH

Exhibit 54: Fund managers are most overweight Software and most underweight Tech hardware Storage & Peripherals
Industry Exposure (All Styles), Apr. 2023



Source: BofA US Equity & US Quant Strategy

BofA GLOBAL RESEARCH

Exhibit 55: IBM (IBM) is the most underweight
Most underweight stocks in Information Technology Apr. 2023

Ticker	Company Name	Industry	Rel Wt	% Funds Holding Stock
IBM	IBM	IT Services	0.09	12%
GEN	Gen Digital Inc	Software	0.09	4%
QRVO	Qorvo Inc	Semis & Semis Equipment	0.11	3%
SEDG	Solaredge Techno	Semis & Semis Equipment	0.12	6%
WDC	Western Digital	Tech. HW, Storage & Periph.	0.14	3%
AKAM	Akamai Technolog	IT Services	0.18	3%
KEYS	Keysight Tec	Elect. Equip., Inst. & Comp.	0.21	8%
PTC	Ptc Inc	Software	0.22	5%
SWKS	Skyworks Solutio	Semis & Semis Equipment	0.22	7%
ENPH	Enphase Energy	Semis & Semis Equipment	0.29	15%

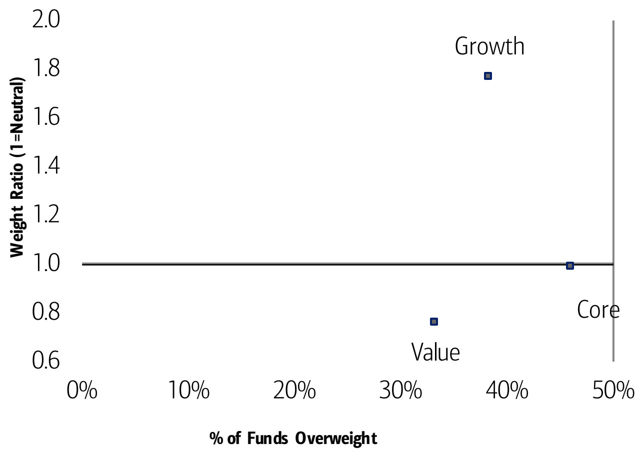
Source: BofA US Equity & US Quant Strategy, FactSet Ownership.
This screen is not a recommended list either individually or as a group of stocks. Investors should consider the fundamentals of the companies and their own individual circumstances/objectives before making any investment decision.

BofA GLOBAL RESEARCH

Communication Services

Exhibit 56: Growth managers are 80% overweight Communication Services sector

Fund Managers' positioning in Communication Services sector, Apr. 2023



Source: BofA US Equity & US Quant Strategy, FactSet Ownership. This screen is not a recommended list either individually or as a group of stocks. Investors should consider the fundamentals of the companies and their own individual circumstances/objectives before making any investment decision.

BofA GLOBAL RESEARCH

Exhibit 57: Netflix (NFLX) is the most overweight

Most overweight stocks in Communication Services Apr. 2023

Ticker	Company Name	Industry	Rel Wt	% Funds Holding Stock
NFLX	Netflix Inc	Entertainment	2.32	33%
CHTR	Charter Commun-A	Media	2.11	16%
DISH	Dish Network-A	Media	2.00	3%
MTCH	Match Group Inc	Interactive Media & Services	1.98	12%
FOXA	Fox Corp - A	Media	1.92	6%
CMCSA	Comcast Corp-A	Media	1.81	29%
META	Meta Platforms-A	Interactive Media & Services	1.66	53%
TTWO	Take-Two Interac	Entertainment	1.59	8%
GOOG	Alphabet Inc-C	Interactive Media & Services	1.29	52%
TMUS	T-Mobile Us Inc	Wireless Telecom	1.23	26%

Source: BofA US Equity & US Quant Strategy, FactSet Ownership. This screen is not a recommended list either individually or as a group of stocks. Investors should consider the fundamentals of the companies and their own individual circumstances/objectives before making any investment decision.

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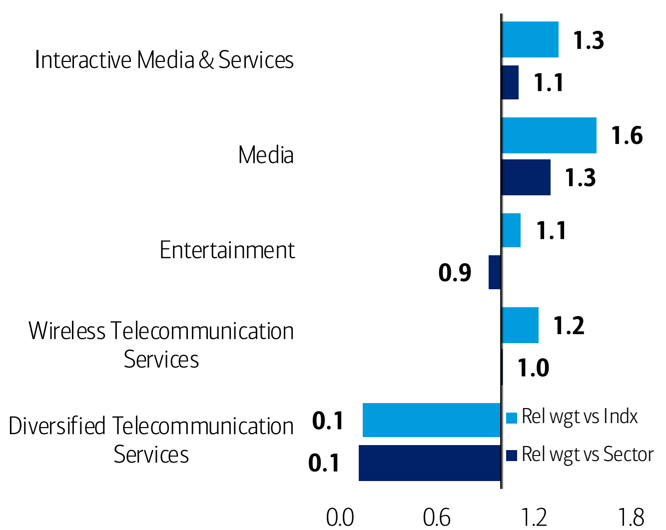
Exhibit 58: Fund managers are most overweight Media

Industry Exposure (All Styles), Apr. 2023



Source: BofA US Equity & US Quant Strategy, FactSet Ownership

BofA GLOBAL RESEARCH

Exhibit 59: News Corp. (NWS) is the most underweight

Most underweight stocks in Communication Services Apr. 2023

Ticker	Company Name	Industry	Rel Wt	% Funds Holding Stock
NWS	News Corp-Cl B	Media	0.03	2%
T	At&T Inc	Diversified Telecom	0.04	12%
OMC	Omnicom Group	Media	0.15	6%
VZ	Verizon Communic	Diversified Telecom	0.21	16%
WBD	Warner Bros Disc	Entertainment	0.23	6%
DIS	Walt Disney Co/T	Entertainment	0.42	38%
ATVI	Activision Blizz	Entertainment	0.48	14%
IPG	Interpublic Grp	Media	0.51	8%
NWSA	News Corp-Cl A	Media	0.69	3%
LYV	Live Nation Ente	Entertainment	0.73	9%

Source: BofA US Equity & US Quant Strategy, FactSet Ownership.
This screen is not a recommended list either individually or as a group of stocks. Investors should consider the fundamentals of the companies and their own individual circumstances/objectives before making any investment decision.

BofA GLOBAL RESEARCH

Factors to watch

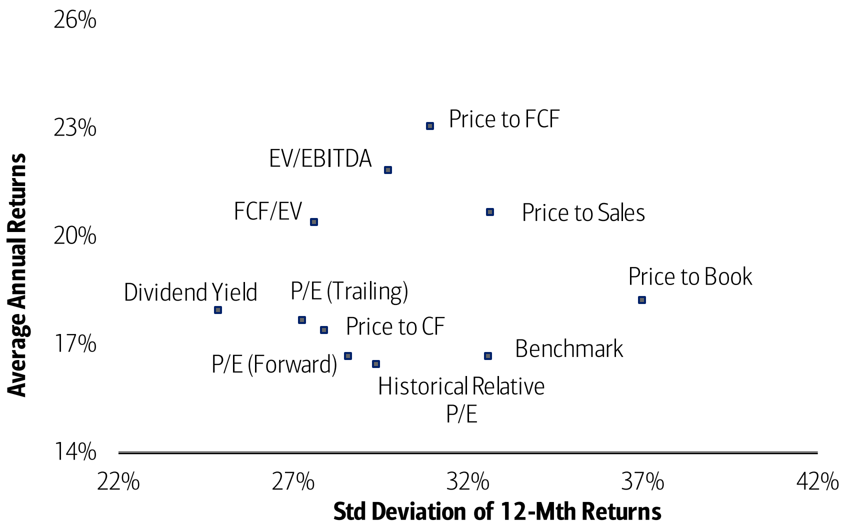
Exhibit 60: Most predictive long-short factors for TMT
Analysis spans 1985 to May 2023, based on historical Russell 1000 constituents)

	Valuation Measures	Momentum Measures	Growth Measure	Quality Measure
Information Technology	EV/EBITDA, FCF/EV	Trading Volume	Estimate Revision	ROA
Media & Entertainment	Price to Sales, FCF/EV	12-Mth Return and 1-Mth Reversal, Trading Volume	PEG Ratio	ROC, 5-yr Debt Adj. ROE

Source: BofA US Equity & US Quant Strategy
Note: Based on factors with best return vs hit rate combo in charts below. This performance is back-tested and does not represent the actual performance of any account or fund. Back-tested performance depicts the theoretical (not actual) performance of a particular strategy over the time period indicated. No representation is being made that any actual portfolio is likely to have achieved returns similar to those shown herein

BofA GLOBAL RESEARCH

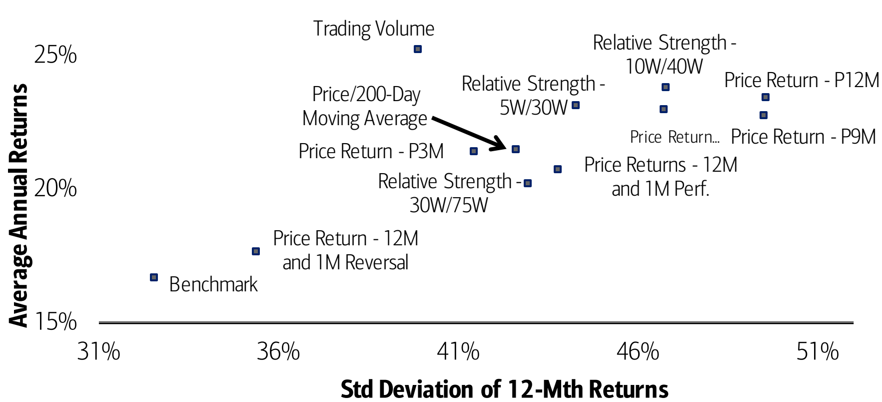
Exhibit 61: Valuation Strategies for Information Technology: Top Quintile Returns (1985 to 2023)
Price to Free Cash Flow outperformed the index most



Source: BofA US Equity & Quant Strategy

BofA GLOBAL RESEARCH

Exhibit 62: Momentum Strategies for Information Technology: Top Quintile Returns (1985 to 2023)
Trading Volume outperformed the index most

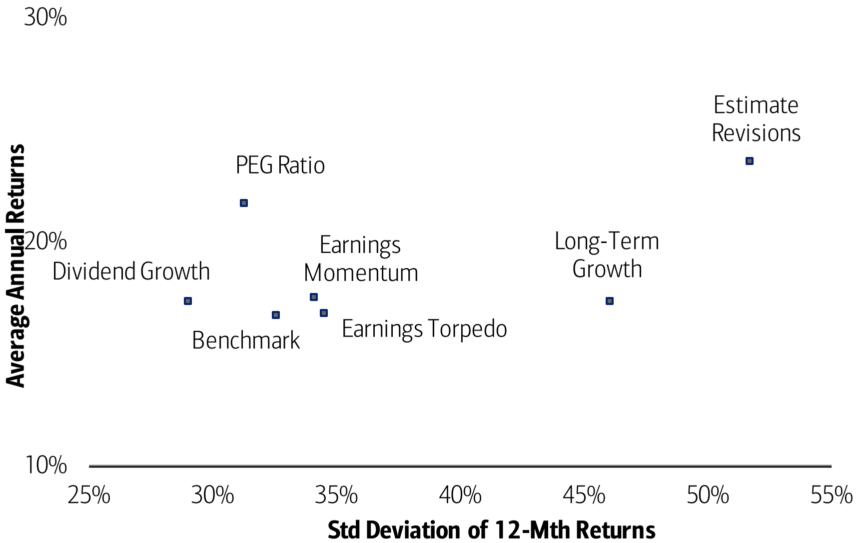


Source: BofA US Equity & Quant Strategy

BofA GLOBAL RESEARCH

Exhibit 63: Growth Strategies for Information Technology: Top Quintile Returns (1985 to 2023)

EPS Revisions outperformed the index most

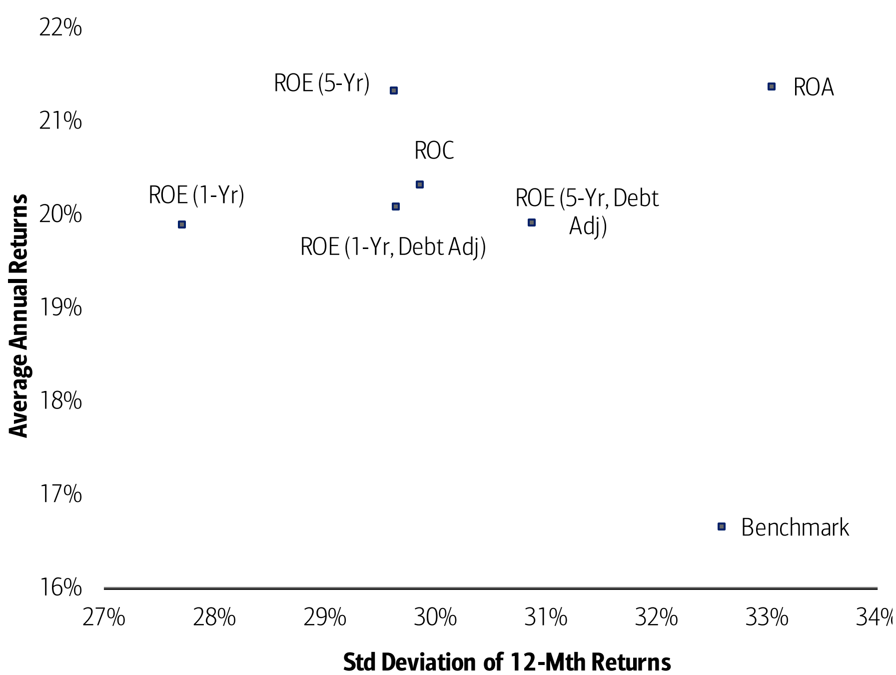


Source: BofA US Equity & Quant Strategy

BofA GLOBAL RESEARCH

Exhibit 64: Quality Strategies for Information Technology: Top Quintile Returns (1985 to 2023)

ROA outperformed the index most

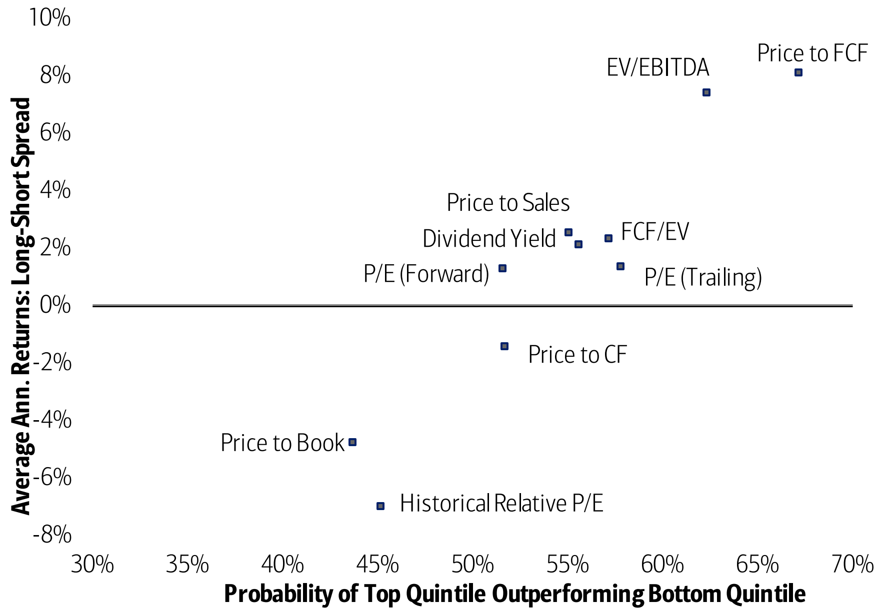


Source: BofA US Equity & Quant Strategy

BofA GLOBAL RESEARCH

Long-Short: Quintile 1 / Quintile 5 Spread

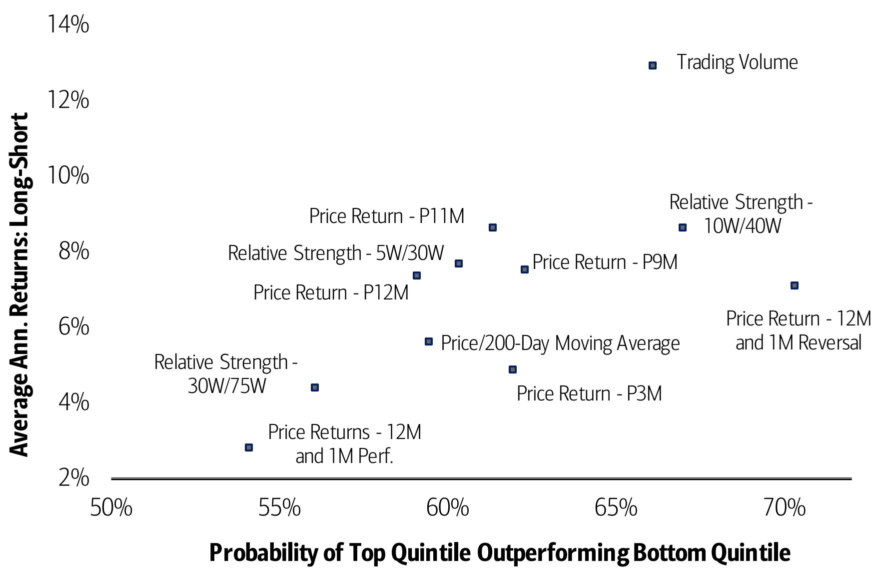
Exhibit 65: Valuation Strategies for Information Technology: Avg Long-Short Spreads vs Consistency of Spreads (1985 to 2023)
EV/EBITDA and Price / FCF fared best



Source: BofA US Equity & Quant Strategy

BofA GLOBAL RESEARCH

Exhibit 66: Momentum Strategies for Information Technology: Avg Long-Short Spreads vs Consistency of Spreads (1985 to 2023)
High Trading Volume fared best

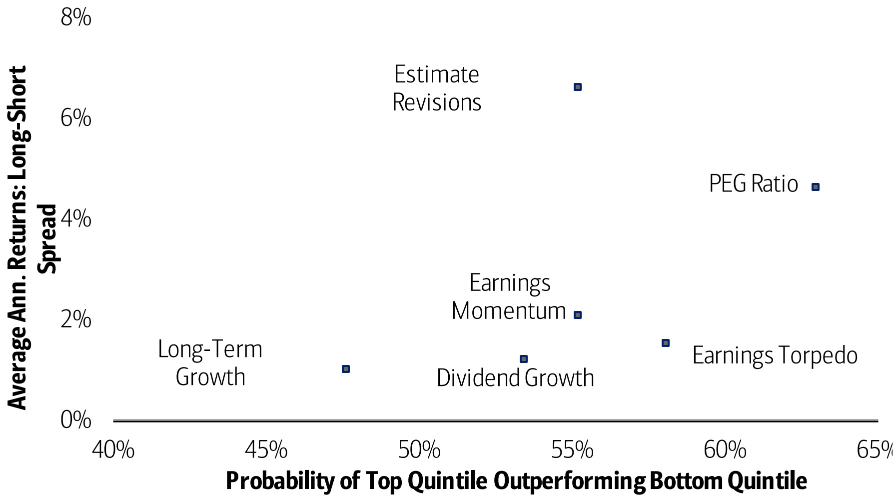


Source: BofA US Equity & Quant Strategy

BofA GLOBAL RESEARCH

Exhibit 67: Growth Strategies for Information Technology: Avg Long-Short Spreads vs Consistency of Spreads (1985 to 2023)

EPS Estimate Revisions fared best

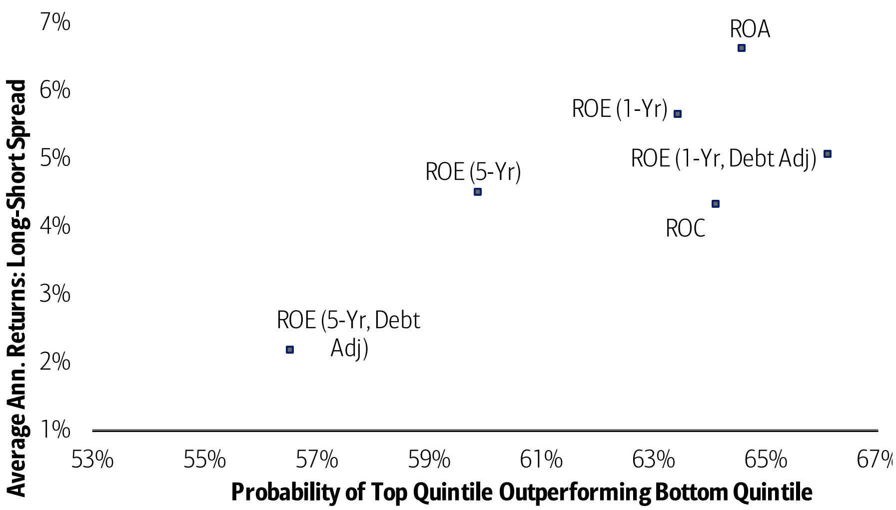


Source: BofA US Equity & Quant Strategy

BofA GLOBAL RESEARCH

Exhibit 68: Quality Strategies for Information Technology: Avg Long-Short Spreads vs Consistency of Spreads (1985 to 2023)

ROA fared best



Source: BofA US Equity & Quant Strategy

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Tech factor performance

Note: The analysis of Russell 1000 Tech factor returns in Exhibit 60-Exhibit 68 is back-tested and does not represent the actual performance of any account or fund. Back-tested performance depicts the hypothetical back-tested performance of a particular strategy over the time period indicated. In future periods, market and economic conditions will differ and the same strategy will not necessarily produce the same results. No representation is being made that any actual portfolio is likely to have achieved returns similar to those shown herein. In fact, there are frequently sharp differences between back-tested returns and the actual results realized in the actual management of a portfolio. Back-tested performance results are created by applying an investment strategy or methodology to historical data and attempts to give an indication as to how a strategy might have performed during a certain period in the past if the product had been in existence during such time. Back-tested results have inherent limitations including the fact that they are calculated with the full benefit of hindsight, which allows the security selection methodology to be adjusted to maximize the returns. Further, the results shown do not reflect actual trading or the impact that material economic and market factors might have had on a portfolio manager's decision-making under actual circumstances. Back-tested returns do not reflect advisory fees, trading costs, or other fees or expenses. See our monthly Quantitative Profiles report for complete definitions of factors we track.

Exhibit 69: Mentioned stocks and QRQ ratings
Stocks mentioned in the report

Ticker	Company name	Last price	BofA Rating	QRQ	Analyst
MSFT	Microsoft Corporation	$337	BUY	B-1-7	Sills,Brad
ORCL	Oracle Corporation	$107	NEUTRAL	B-2-7	Sills,Brad
CRM	Salesforce, Inc.	$212	BUY	B-1-9	Sills,Brad
HUBS	HubSpot, Inc.	$525	BUY	C-1-9	Sills,Brad
DDOG	Datadog Inc Class A	$99	BUY	C-1-9	Ikeda,Koji
WDAY	Workday, Inc. Class A	$214	BUY	B-1-9	Sills,Brad
NOW	ServiceNow, Inc.	$549	BUY	B-1-9	Sills,Brad
CCCS	CCC Intelligent Solutions Holdings Inc	$11	BUY	B-1-9	Funk,Michael
VEEV	Veeva Systems Inc Class A	$196	NEUTRAL	B-2-9	Sills,Brad
SHOP	Shopify, Inc. Class A	$58	NEUTRAL	C-2-9	Sills,Brad
AMD	Advanced Micro Devices, Inc.	$118	NEUTRAL	C-2-9	Arya,Vivek
INTC	Intel Corporation	$31	UNDERPERFORM	B-3-8	Arya,Vivek
QCOM	QUALCOMM Incorporated	$116	BUY	B-1-7	Liani,Tal
CRUS	Cirrus Logic, Inc.	$80	UNDERPERFORM	B-3-9	Arya,Vivek
ANET	Arista Networks, Inc.	$164	BUY	B-1-9	Liani,Tal
MTSI	MACOM Technology Solutions Holdings, Inc.	$61	BUY	C-1-9	Arya,Vivek
ON	ON Semiconductor Corporation	$87	BUY	C-1-9	Arya,Vivek
TXN	Texas Instruments Incorporated	$175	NEUTRAL	B-2-7	Arya,Vivek
MCHP	Microchip Technology Incorporated	$77	BUY	B-1-7	Arya,Vivek
AVGO	Broadcom Inc.	$816	BUY	B-1-7	Arya,Vivek
MRVL	Marvell Technology, Inc.	$60	BUY	B-1-7	Arya,Vivek
NVDA	NVIDIA Corporation	$393	BUY	C-1-7	Arya,Vivek
ADI	Analog Devices, Inc.	$180	BUY	B-1-7	Arya,Vivek
AMAT	Applied Materials, Inc.	$135	BUY	B-1-7	Arya,Vivek
CDNS	Cadence Design Systems, Inc.	$231	BUY	B-1-9	Arya,Vivek
CSCO	Cisco Systems, Inc.	$50	BUY	B-1-7	Liani,Tal
FTNT	Fortinet, Inc.	$68	BUY	B-1-9	Liani,Tal
PANW	Palo Alto Networks, Inc.	$218	BUY	B-1-9	Liani,Tal
AMZN	Amazon.com, Inc.	$125	BUY	B-1-9	Post,Justin
DELL	Dell Technologies, Inc. Class C	$47	BUY	C-1-7	Mohan,Wamsi

Source: BofA Global Research

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Price objective basis & risk

Amazon.com (AMZN)

Our PO of $139 is based on our SOTP analysis that values the 1P retail business at 0.8x 2024E Revenue (including subscription/Prime membership fees), 3P retail business at 3.0x 2024E Revenue, AWS at 5.0x 2024 Sales, and the advertising business at 3.5x 2024 Sales. For 2024E, our 5.0x AWS multiple is a discount to our SaaS comps at 6.9x, our 0.8x GMV multiple is a discount to our retail comps at 1.1x, and our 3.5x advertising multiple is in line with our digital advertising comps at 3.5x. We think some conglomerate discount is warranted with elevated regulatory/antitrust risk, but long-term we believe that in-line to discount multiples are warranted given growth rates in-excess of peers.

Our PO of $139 for Amazon implies 2.2x 2024E P/Sales, a multiple near the middle of Amazon's historical range of 1.0-3.5x.

Downside risks to our price objective are increasing competition from offline and local retailers, rich P/E multiple, AWS investments and/or price cuts and regulatory pressure on the 3P marketplace. The stock has been subject to heavy volatility in the past, based on margin trends, and this volatility could increase due to economic uncertainty.

Arista Networks (ANET)
Our $170 PO is based on a 2024E P/E multiple of roughly 27x. This is a discount to high-growth software peers of 40x and a slight premium versus networking peers of 20x. We compare the stock to the two groups given its growth attributes and networking hardware solutions, as well as its exposure to secular growth trends across the cloud, OTT video, and big data.

Downside risks are: 1) margin pressure from the ramp in sales to Cloud Titans, 2) lumpiness around large customer spending, 3) valuation risks, especially if issues arise around newer growth opportunities.

Upside risks are: 1) better-than-expected execution that could translate into higher-than-anticipated growth rates, especially within Cloud Titan 2) solid market share gains in new areas, such as campus switching and 400G

Dell Technologies Inc. (DELL)
Our PO of $55 is based on approximately 10x our C23 EPS estimate of $5.60. Our target multiple compares to median 5x of historical range 3x-8x for Dell since it returned to the public markets in 2019. Dell went private in 2013 and prior to that the company had a very different structure. As such, we do not believe earlier historical trading multiples are meaningful. In our opinion, a multiple higher than the historical range is warranted given improved storage portfolio, lower financial leverage and it balances opportunities to invest in core areas of growth, with ongoing weak macro and component shortages.

Downside risks: faster-than-expected slowdown in the global economy, which could prove to be a headwind to revenue growth, faster-than-expected strengthening of the U.S. dollar, trade war with China, and higher-than-expected tariffs, Dell not being able to source needed processors from Intel, new sales teams not being able to ramp as expected, and unexpected share loss to competitors.

Upside risks: faster-than-expected revenue growth and market share gain, faster mix shift to storage and premium PC and server configurations, which can drive upside to margins, faster-than-expected ramp of new sales teams, and component shortages normalizing more quickly than expected, which can drive upside to cash flow.

Fortinet (FTNT)
Our $75 PO is based on roughly 27x 2024E EV/FCF. The valuation is a premium to the hardware peer group average multiple of 16-20x but in line with software peers. We believe the premium to the hardware peer group is appropriate at this stage given the recent share gains, shift to more recurring software, and expansion into adjacent security markets. New market tailwinds, such as software defined wide area networking (SD-WAN) should drive further market share gains.

Upside risks to our price objective are growth of non-FortiGate products, which could support high growth and acceleration from current levels and could result in more SaaS-like multiples and drive up the valuation.

Downside risks to our price objective are 1) product convergence leading to a shrinking market with larger competitors, 2) exposure to public spending and EMEA, 3) reputation risk if major threats missed and 4) early ordering that occurred during CY21/CY22 creates tough comps heading in CY23

Microsoft Corporation (MSFT)

Our PO of $340 is based on an EV/FCF multiple of 32x our C24 free cash flow estimate. The growth-adjusted multiple is in line with the large cap GARP group.

Downside risks to our price objective: 1) Microsoft could see some near term gross margin pressure as the Azure business grows as a percentage of overall revenue. While Microsoft's on premise offerings offer a high margin profile, growth in these lines of business is decelerating. 2) Enterprise application spending has proven to be highly cyclical, given the more discretionary nature of applications projects. During an economic slowdown, when firms are faced with shrinking IT budgets, projects involving application upgrades, migrations or new installations are often deferred. This could present a higher degree of risk for a bookings deceleration for Microsoft and other application vendors, in the event of an economic slowdown.

NVIDIA Corporation (NVDA)

Our $500 PO is based on 50x CY24E PE ex cash, within NVDA's historical 26x-69x forward year PE range, justified given stronger growth opportunities ahead as gaming cycle troughs and data center demand potentially faces strong, long-term demand dynamics.

Risks to our price objective are: 1) weakness in consumer driven gaming market, 2) Competition with Intel, AMD, Broadcom, Marvell, internal cloud projects and other private companies in accelerated computing markets, 3) Potential restrictions from US Government on shipments of advanced AI technologies to overseas customers, 4) Lumpy and unpredictable sales in new enterprise, data center, and autos markets, 5) Potential for decelerating capital returns, 6) potential for autos slowdown until advanced driver assist systems becomes more meaningful, and 7) elevated opex growth.

Palo Alto Networks (PANW)

Our price objective of $230 is based on roughly 8x CY24E EV/Sales, which is at the high-end range of appliance companies, which trade at roughly 6-8x 2024E EV/Sales. However, the migration to Software and Cloud warrants a higher valuation, with successful SaaS vendors trading at 11-25x forward revenues. In our view, as the Cloud & SaaS business continues to see robust growth and as the legacy Firewall business is successfully converted into software, the stock's multiple should expand over time.

Downside risks to our PO are increased competition and execution-related challenges as the company transitions to the cloud and SASE models.

Analyst Certification

We, Brad Sills, Justin Post, Koji Ikeda, CFA, Michael J. Funk, Tal Liani, Vivek Arya and Wamsi Mohan, hereby certify that the views each of us has expressed in this research report accurately reflect each of our respective personal views about the subject securities and issuers. We also certify that no part of our respective compensation was, is, or will be, directly or indirectly, related to the specific recommendations or view expressed in this research report.

Special Disclosures

BofA Securities is currently acting as a financial advisor toBroadcom Inc in connection with its proposed acquisition of VMware Inc, which was announced on May 26, 2022.The proposed transaction is subject to approval by shareholders of VMware Inc.This research report is not intended to provide voting advice, serve as an endorsement of the proposed transaction, or result in the procurement, withholding or revocation of a proxy.

US - Enterprise Software Coverage Cluster

Investment rating	Company	BofA Ticker	Bloomberg symbol	Analyst
BUY				
	8x8	EGHT	EGHT US	Michael J. Funk
	Alarm.com	ALRM	ALRM US	Michael J. Funk
	Alteryx, Inc	AYX	AYX US	Koji Ikeda, CFA
	Amplitude, Inc.	AMPL	AMPL US	Koji Ikeda, CFA
	BILL	BILL	BILL US	Brad Sills
	CCC Intelligent Solutions	CCCS	CCCS US	Michael J. Funk
	Datadog Inc	DDOG	DDOG US	Koji Ikeda, CFA
	Dropbox	DBX	DBX US	Michael J. Funk
	Dynatrace	DT	DT US	Koji Ikeda, CFA
	Elastic NV	ESTC	ESTC US	Koji Ikeda, CFA
	Expensify	EXFY	EXFY US	Koji Ikeda, CFA
	GitLab Inc.	GTLB	GTLB US	Koji Ikeda, CFA
	Global-e Online Ltd.	GLBE	GLBE US	Koji Ikeda, CFA
	HashiCorp	HCP	HCP US	Brad Sills
	HubSpot	HUBS	HUBS US	Brad Sills
	Informatica Inc.	INFA	INFA US	Koji Ikeda, CFA
	Intapp Inc.	INTA	INTA US	Koji Ikeda, CFA
	Intuit	INTU	INTU US	Brad Sills
	JFrog Ltd	FROG	FROG US	Koji Ikeda, CFA
	MeridianLink, Inc.	MLNK	MLNK US	Koji Ikeda, CFA
	Microsoft Corporation	MSFT	MSFT US	Brad Sills
	nCino, Inc.	NCNO	NCNO US	Adam Bergere
	NICE Ltd.	NICE	NICE US	Michael J. Funk
	NICE Ltd.	NCSYF	NICE IT	Michael J. Funk
	PowerSchool Holdings, Inc.	PWSC	PWSC US	Koji Ikeda, CFA
	RingCentral	RNG	RNG US	Michael J. Funk
	Salesforce.com	CRM	CRM US	Brad Sills
	ServiceNow	NOW	NOW US	Brad Sills
	Splunk	SPLK	SPLK US	Brad Sills
	UiPath	PATH	PATH US	Brad Sills
	Weave	WEAV	WEAV US	Michael J. Funk
	Workday Inc.	WDAY	WDAY US	Brad Sills
	Zeta Global	ZETA	ZETA US	Koji Ikeda, CFA
NEUTRAL				
	Adobe	ADBE	ADBE US	Brad Sills
	Autodesk	ADSK	ADSK US	Michael J. Funk
	Bentley Systems	BSY	BSY US	Michael J. Funk
	BigCommerce Holdings, Inc.	BIGC	BIGC US	Koji Ikeda, CFA
	Confluent	CFLT	CFLT US	Brad Sills
	Copperleaf Technologies, Inc.	YCPLF	CPLF CN	Koji Ikeda, CFA
	Coveo	YCVO	CVO CN	Koji Ikeda, CFA
	DocuSign	DOCU	DOCU US	Brad Sills
	Freshworks, Inc.	FRSH	FRSH US	Adam Bergere
	Jamf	JAMF	JAMF US	Koji Ikeda, CFA
	Lightspeed Commerce Inc.	LSPD	LSPD US	Koji Ikeda, CFA
	Lightspeed Commerce Inc.	YLSPD	LSPD CN	Koji Ikeda, CFA
	LiveVox Holdings	LVOX	LVOX US	Michael J. Funk
	Oracle Corporation	ORCL	ORCL US	Brad Sills
	Shopify, Inc.	SHOP	SHOP US	Brad Sills
	Unity	U	U US	Michael J. Funk
	Veeva Systems, Inc.	VEEV	VEEV US	Brad Sills
	Zoom Video Communications	ZM	ZM US	Michael J. Funk
	ZoomInfo	ZI	ZI US	Koji Ikeda, CFA
UNDERPERFORM				
	AvidXchange, Inc.	AVDX	AVDX US	Brad Sills
	Blackbaud, Inc.	BLKB	BLKB US	Koji Ikeda, CFA
	BlackLine, Inc.	BL	BL US	Koji Ikeda, CFA
	C3.ai	AI	AI US	Brad Sills
	CS Disco, Inc.	LAW	LAW US	Koji Ikeda, CFA
	Enfusion, Inc.	ENFN	ENFN US	Koji Ikeda, CFA
	Everbridge	EVBG	EVBG US	Koji Ikeda, CFA
	Five9	FIVN	FIVN US	Michael J. Funk
	Guidewire Software, Inc.	GWRE	GWRE US	Michael J. Funk

US - Enterprise Software Coverage Cluster

Investment rating	Company	BofA Ticker	Bloomberg symbol	Analyst
	Kaltura, Inc.	KLTR	KLTR US	Michael J. Funk
	Twilio	TWLO	TWLO US	Michael J. Funk
	Veritone, Inc.	VERI	VERI US	Koji Ikeda, CFA
	Vertex, Inc.	VERX	VERX US	Brad Sills
RSTR				
	VMware	VMW	VMW US	Brad Sills

US - Internet Coverage Cluster

Investment rating	Company	BofA Ticker	Bloomberg symbol	Analyst
BUY				
	ACV Auctions	ACVA	ACVA US	Nat Schindler
	Alphabet	GOOGL	GOOGL US	Justin Post
	Alphabet	GOOG	GOOG US	Justin Post
	Amazon.com	AMZN	AMZN US	Justin Post
	AppLovin	APP	APP US	Omar Dessouky, CFA
	Arhaus, Inc	ARHS	ARHS US	Curtis Nagle, CFA
	Bumble, Inc.	BMBL	BMBL US	Nat Schindler
	Chewy Inc	CHWY	CHWY US	Nat Schindler
	Digital Turbine, Inc	APPS	APPS US	Omar Dessouky, CFA
	DoorDash	DASH	DASH US	Michael McGovern
	Duolingo	DUOL	DUOL US	Nat Schindler
	Expedia	EXPE	EXPE US	Justin Post
	Fiverr	FVRR	FVRR US	Nat Schindler
	Intact Financial	YIFC	IFC CN	Grace Carter, CFA
	LendingTree	TREE	TREE US	Nat Schindler
	Match Group	MTCH	MTCH US	Nat Schindler
	Meta Platforms Inc	META	META US	Justin Post
	NerdWallet Inc	NRDS	NRDS US	Nat Schindler
	Peloton	PTON	PTON US	Justin Post
	RH	RH	RH US	Curtis Nagle, CFA
	Roblox Corp. Class A	RBLX	RBLX US	Omar Dessouky, CFA
	Shutterstock	SSTK	SSTK US	Nat Schindler
	Squarespace Inc	SQSP	SQSP US	Nat Schindler
	Take-Two Interactive	TTWO	TTWO US	Omar Dessouky, CFA
	Tempur Sealy International Inc.	TPX	TPX US	Curtis Nagle, CFA
	TripAdvisor	TRIP	TRIP US	Nat Schindler
	Uber	UBER	UBER US	Justin Post
	Udemy Inc	UDMY	UDMY US	Nat Schindler
	Wayfair	W	W US	Curtis Nagle, CFA
	Wix.com	WIX	WIX US	Nat Schindler
	Xometry	XMTR	XMTR US	Nat Schindler
	Zillow	ZG	ZG US	Curtis Nagle, CFA
	Zillow	Z	Z US	Curtis Nagle, CFA
NEUTRAL				
	1stDibs.com	DIBS	DIBS US	Curtis Nagle, CFA
	Airbnb	ABNB	ABNB US	Justin Post
	Beachbody	BODY	BODY US	Joanna Zhao
	Booking Holdings Inc	BKNG	BKNG US	Justin Post
	Carvana Co	CVNA	CVNA US	Nat Schindler
	eBay	EBAY	EBAY US	Curtis Nagle, CFA
	Electronic Arts	EA	EA US	Omar Dessouky, CFA
	Etsy, Inc.	ETSY	ETSY US	Curtis Nagle, CFA
	LegalZoom	LZ	LZ US	Nat Schindler
	Overstock.com Inc	OSTK	OSTK US	Curtis Nagle, CFA
	Pinterest	PINS	PINS US	Justin Post
	Snap	SNAP	SNAP US	Justin Post
	Upwork Inc	UPWK	UPWK US	Nat Schindler
	Viant	DSP	DSP US	Nat Schindler
UNDERPERFORM				
	AdTheorent	ADTH	ADTH US	Nat Schindler

US - Internet Coverage Cluster

Investment rating	Company	BofA Ticker	Bloomberg symbol	Analyst
	Cardlytics	CDLX	CDLX US	Nat Schindler
	Lyft, Inc.	LYFT	LYFT US	Michael McGovern
	Opendoor Technologies	OPEN	OPEN US	Curtis Nagle, CFA
	PLAYSTUDIOS, Inc. Class A	MYPS	MYPS US	Omar Dessouky, CFA
	Playtika	PLTK	PLTK US	Omar Dessouky, CFA
	Purple Innovation	PRPL	PRPL US	Curtis Nagle, CFA
	Redfin Corp	RDFN	RDFN US	Curtis Nagle, CFA
	System1	SST	SST US	Nat Schindler
	The RealReal	REAL	REAL US	Michael McGovern
	Trivago NV	TRVG	TRVG US	Nat Schindler
	Upstart	UPST	UPST US	Nat Schindler
	Wish	WISH	WISH US	Michael McGovern

US - Telecom and Data Networking Equipment Coverage Cluster

Investment rating	Company	BofA Ticker	Bloomberg symbol	Analyst
BUY				
	Amdocs	DOX	DOX US	Tal Liani
	Arista Networks	ANET	ANET US	Tal Liani
	Check Point Software Technologies	CHKP	CHKP US	Tal Liani
	Ciena	CIEN	CIEN US	Tal Liani
	Cisco Systems	CSCO	CSCO US	Tal Liani
	CommScope	COMM	COMM US	Tal Liani
	CrowdStrike Holdings Inc.	CRWD	CRWD US	Tal Liani
	CyberArk	CYBR	CYBR US	Tal Liani
	Fastly	FSLY	FSLY US	Tal Liani
	Fortinet	FTNT	FTNT US	Tal Liani
	InterDigital, Inc.	IDCC	IDCC US	Tal Liani
	Palo Alto Networks	PANW	PANW US	Tal Liani
	Qualcomm	QCOM	QCOM US	Tal Liani
	Zscaler	ZS	ZS US	Tal Liani
NEUTRAL				
	Cellebrite	CLBT	CLBT US	Tal Liani
	F5 Inc	FFIV	FFIV US	Tal Liani
	SentinelOne, Inc.	S	S US	Tal Liani
UNDERPERFORM				
	AudioCodes	AUDC	AUDC US	Tal Liani
	Juniper Networks	JNPR	JNPR US	Tal Liani
	Okta Inc	OKTA	OKTA US	Madeline Brooks
	SecureWorks	SCWX	SCWX US	Tal Liani

US - IT Hardware and Technology Supply Chain Coverage Cluster

Investment rating	Company	BofA Ticker	Bloomberg symbol	Analyst
BUY				
	Amphenol	APH	APH US	Wamsi Mohan
	Concentrix Corporation	CNXC	CNXC US	Ruplu Bhattacharya
	Corning Inc.	GLW	GLW US	Wamsi Mohan
	Dell Technologies Inc.	DELL	DELL US	Wamsi Mohan
	DigitalOcean	DOCN	DOCN US	Wamsi Mohan
	Flex Ltd.	FLEX	FLEX US	Ruplu Bhattacharya
	International Business Machines Corp.	IBM	IBM US	Wamsi Mohan
	Jabil Inc.	JBL	JBL US	Ruplu Bhattacharya
	Roku, Inc.	ROKU	ROKU US	Ruplu Bhattacharya
	Seagate Technology	STX	STX US	Wamsi Mohan
	Sensata Technologies Holdings Plc	ST	ST US	Wamsi Mohan
	TD Synnex Corp	SNX	SNX US	Ruplu Bhattacharya
	TE Connectivity Ltd.	TEL	TEL US	Wamsi Mohan
	Teradata Corporation	TDC	TDC US	Wamsi Mohan

US - IT Hardware and Technology Supply Chain Coverage Cluster

Investment rating	Company	BofA Ticker	Bloomberg symbol	Analyst
	Vizio	VZIO	VZIO US	Wamsi Mohan
	Western Digital Corporation	WDC	WDC US	Wamsi Mohan
NEUTRAL				
	Apple Inc.	AAPL	AAPL US	Wamsi Mohan
	Arrow Electronics Inc.	ARW	ARW US	Ruplu Bhattacharya
	Avnet Inc.	AVT	AVT US	Ruplu Bhattacharya
	CDW Corp	CDW	CDW US	Ruplu Bhattacharya
	Hewlett-Packard Enterprise	HPE	HPE US	Wamsi Mohan
	Nutanix Inc	NTNX	NTNX US	Wamsi Mohan
	Pure Storage	PSTG	PSTG US	Wamsi Mohan
UNDERPERFORM				
	HP Inc.	HPQ	HPQ US	Wamsi Mohan
	NetApp Inc.	NTAP	NTAP US	Wamsi Mohan
	Vishay Intertechnology, Inc.	VSH	VSH US	Ruplu Bhattacharya
RVW				
	Latch Inc.	LTCH	LTCH US	Wamsi Mohan

US - Semiconductors and Semiconductor Capital Equipment Coverage Cluster

Investment rating	Company	BofA Ticker	Bloomberg symbol	Analyst
BUY				
	Analog Devices Inc.	ADI	ADI US	Vivek Arya
	Applied Materials, Inc.	AMAT	AMAT US	Vivek Arya
	Broadcom Inc	AVGO	AVGO US	Vivek Arya
	Cadence	CDNS	CDNS US	Vivek Arya
	Coherent Corp	COHR	COHR US	Vivek Arya
	GlobalFoundries	GFS	GFS US	Vivek Arya
	KLA Corporation	KLAC	KLAC US	Vivek Arya
	Lam Research Corp.	LRCX	LRCX US	Vivek Arya
	M/A-Com	MTSI	MTSI US	Vivek Arya
	Marvell Technology Group Ltd.	MRVL	MRVL US	Vivek Arya
	Microchip	MCHP	MCHP US	Vivek Arya
	Nova	NVMI	NVMI US	Vivek Arya
	NVIDIA Corporation	NVDA	NVDA US	Vivek Arya
	NXP Semiconductors NV	NXPI	NXPI US	Vivek Arya
	onsemi	ON	ON US	Vivek Arya
	Synopsys	SNPS	SNPS US	Vivek Arya
	Valens Semiconductor	VLN	VLN US	Vivek Arya
NEUTRAL				
	Advanced Micro Devices, Inc	AMD	AMD US	Vivek Arya
	Camtek	CAMT	CAMT US	Vivek Arya
	Lumentum Holdings	LITE	LITE US	Vivek Arya
	Micron Technology, Inc	MU	MU US	Vivek Arya
	Navitas Semiconductor	NVTS	NVTS US	Blake Friedman
	Teradyne	TER	TER US	Vivek Arya
	Texas Instruments Inc.	TXN	TXN US	Vivek Arya
UNDERPERFORM				
	Ambarella	AMBA	AMBA US	Vivek Arya
	Cirrus Logic	CRUS	CRUS US	Vivek Arya
	Credo Technology	CRDO	CRDO US	Vivek Arya
	Intel	INTC	INTC US	Vivek Arya
	Qorvo Inc.	QRVO	QRVO US	Vivek Arya
	Skyworks Solutions, Inc.	SWKS	SWKS US	Vivek Arya
	Wolfspeed Inc	WOLF	WOLF US	Vivek Arya

Disclosures

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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: Telecommunications Group (as of 31 Mar 2023)

Coverage Universe	Count	Percent	Inv. Banking Relationships R1	Count	Percent
Buy	55	53.92%	Buy	39	70.91%
Hold	23	22.55%	Hold	13	56.52%
Sell	24	23.53%	Sell	16	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.

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

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

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