Sector Focus Point

Spring closet re-vamp: what to buy, keep and give away in Tech sector

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Equity and Quant Strategy
United States

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Tech caught in the crosshairs of regime shifts

The last few decades were marked by (1) important liquidity looking for a home, (2) falling discount rates culminating in ZIRP (zero interest rate policy), (3) disinflation from demographics and disruption, (4) globalization, (5) increasingly oligopolistic markets, and (6) a significant asset shift from active to passive, representing tailwinds for long duration growth, multinationals, disruptors/share gainers and momentum names, all of which apply to Tech more than any other sector. Tech was the best sector by a wide margin over the last decade (+145ppt vs. SP500) but peak liquidity, trough rates, inflation, passive fund volatility/crowding, anti-monopolistic rumblings and near-shoring pressure represent risks. Tech has also historically been the worst performer during stagflation (Exhibit 11). Moreover, cyclical tailwinds are reversing – COVID pulled forward demand and created difficult comps (Exhibit 12).

When is it time to buy Tech? When you stop asking

In the aftermath of the Tech Bubble, it took several years for Tech to bottom, but only after many companies went away, those that were left consolidated capacity, shored up capital, and most importantly, after investors had given up on the sector. Today, that is not the case: screen requests are dominated by "washed out Growth and Tech", Tech and TMT are still the most overweight sectors, Growth still trades one std. dev. expensive vs. Value (Exhibit 4). Despite what feels like a violent rotation, Growth still leads by 335ppt since 2008, but over the long haul (back to 1926) Value has outperformed Growth by 3.6ppt per annum (Exhibit 2).

Be selective: 25% of '99 IPOs are today's blue chips

We like some Tech stocks, particularly those that have drifted into the top quintile of the market by Free Cash Flow to Enterprise Value (FCF/EV) – one of the best performing factors of the ~70 we track, a strong performing style during the first year of a Fed hiking cycle – but a laggard during the ZIRP years when cash was essentially worthless. "Value Tech" is not necessarily bad Tech: investors need to differentiate between stocks in growth limbo (negative momentum and revisions) vs. true value, where Tech companies with the highest FCF/EV have generated annualized alpha of 4.5ppt vs. the sector (see screen: Exhibit 29). When it comes to new issuance, be selective. One out of four of 1999's IPOs survived and are blue chip companies today; IPOs that survived rose by ~250%.

One bullish theme is intact: automation

Machines have begun to replace people since the Industrial Revolution, aiding in wage disinflation. But tight labor markets like today's have incentivized corporations to invest in efficiency-enhancing initiatives, leading to increased productivity with about a 2-yr lag (Exhibit 18). Automation may play a key role in being able to shift supply chains back to the US, and we see strong evidence of near-shoring and accelerating automation capex (Exhibit 5).

See inside for analysts' top stock picks and industry views (pg. 19); quant guide to Tech (stock selection tools, proprietary micro and macro reads – pg. 11).

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

Ticker	Company name
AMZN	Amazon.com, Inc.
QCOM	Qualcomm Incorporated
JNPR	Juniper Networks, Inc.
CRWD	CrowdStrike Holdings, Inc. Class A
ZS	Zscaler, Inc.
NOW	ServiceNow, Inc.
NVDA	NVIDIA Corporation
AAPL	Apple Inc.
IBM	International Business Machines

Source: BofA Global Research

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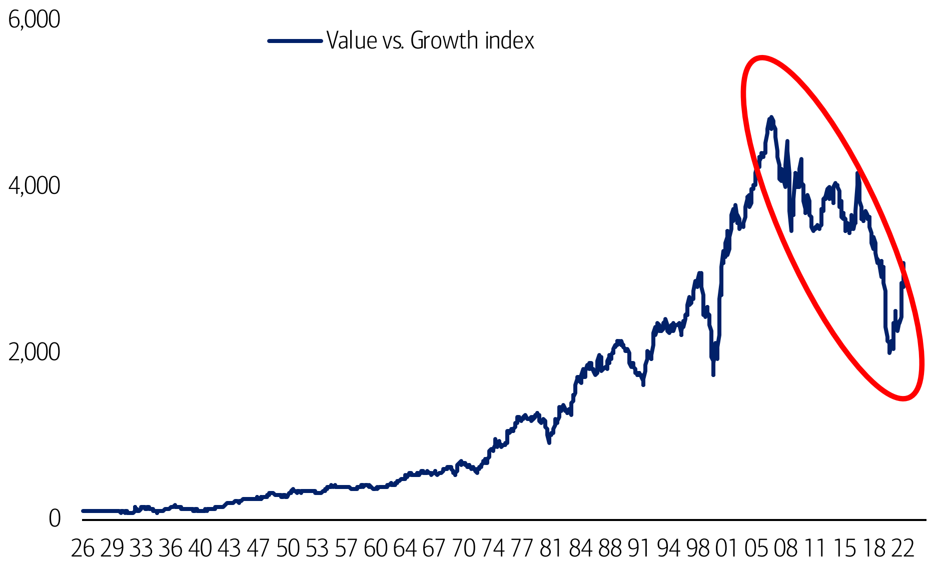
Tech: Last decade's darling

The last few decades were marked by (1) important liquidity looking for a home, (2) falling discount rates culminating in ZIRP (zero interest rate policy), (3) disinflation from demographics and disruption, (4) globalization, (5) increasingly oligopolistic markets, and (6) a significant asset shift from active to passive, representing tailwinds for long duration growth, multinationals, disruptors/share gainers and momentum plays, all of which apply to Tech more than any other sector. Tech was the best sector by a wide margin over the last decade (+145ppt vs. SP500).

But Growth outperformance was just a recent phenomenon. Historically, Value stocks have outperformed Growth stocks by 3.6ppt/yr since 1926 (Exhibit 2). Moreover, following the Tech Bubble in 2000, it took nearly a decade for Tech to begin outperforming. The tailwinds in the 2010s are reversing: higher rates, historic inflation, de-globalization, and tighter policy pose risks to the last decade's winner.

Exhibit 2: Growth outperformance was just a recent phenomenon. Value has historically outperformed Growth over time.
Value/Growth performance (Fama French factors based on Book Value to Price; 1926-5/22)



Source: Tuck School of Business data library, BofA US Equity & Quant Strategy; Note: March performance is based on the Russell 1000 Value and Growth index

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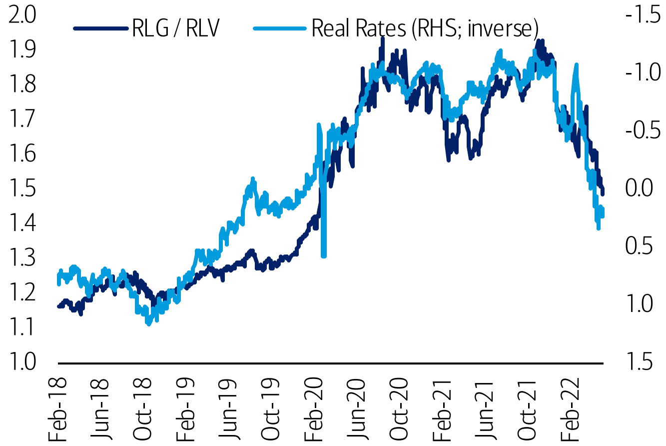
2020s: Rising cost of capital, de-globalization

Rising cost of capital has been extremely painful for Growth stocks

Since 2018, real rates have shown a strong inverse correlation (-95%) vs. the relative performance of Russell 1000 Growth over Value, indicating lower rates fueled Growth stocks over Value. The reversal has been painful, with Growth lagging Value by 16ppt YTD. But despite the de-rating, Growth stocks still trade at one standard deviation above the historical average vs. Value.

Exhibit 3: Falling real rates fueled Growth outperformance. A reversal has been painful (-95% correlation since 2018).
Russell 1000 Growth vs. Value relative performance and 10-yr year rates (2018-5/23/22)



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

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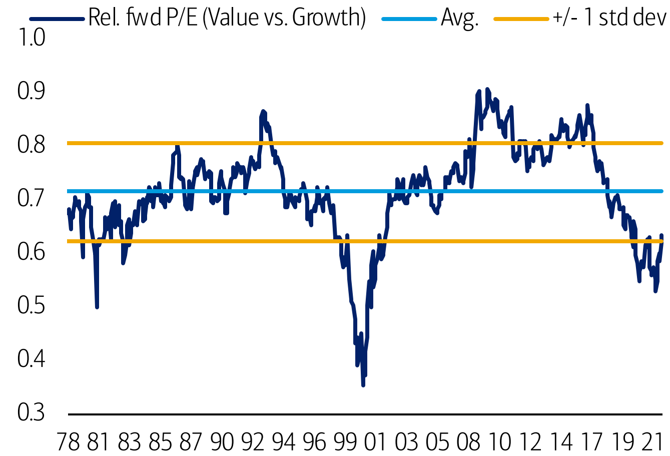
Exhibit 4: Value still trades close to a 1-std dev. discount vs. Growth
Relative fwd P/E of Russell 1000 Value vs. Growth (1978-5/22)



Source: FactSet, BofA US Equity & US Quant Strategy

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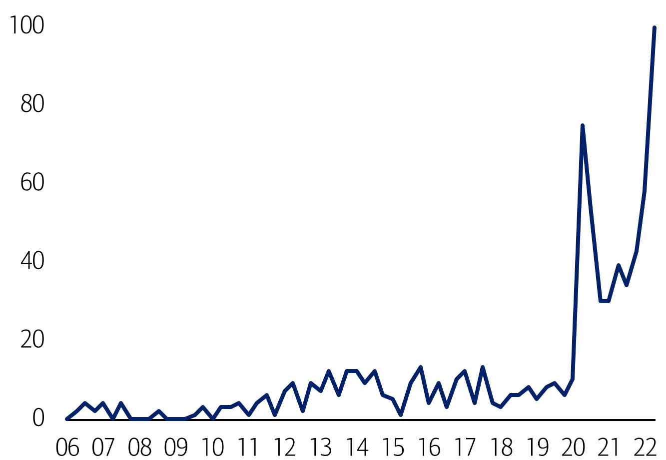
Globalization has peaked – Tech is most impacted

Globalization has peaked and companies' mentions of re-shoring skyrocketed in 1Q (Exhibit 5). Companies have also become less dependent on China imports since 2018. Tech can be considered the poster child of globalization, and it sports the highest foreign exposure and the highest emerging markets exposure.

> The Reshoring Initiative projects reshoring and foreign direct investment (FDI) job announcements to be over 220,000 in 2021, +38% YoY, the biggest annual number in history.

Exhibit 5: Mentions of re-shoring skyrocketed
Companies mentions of re-/near-/on-shoring (2006-1Q22)



Source: AlphaSense, BofA Global Research

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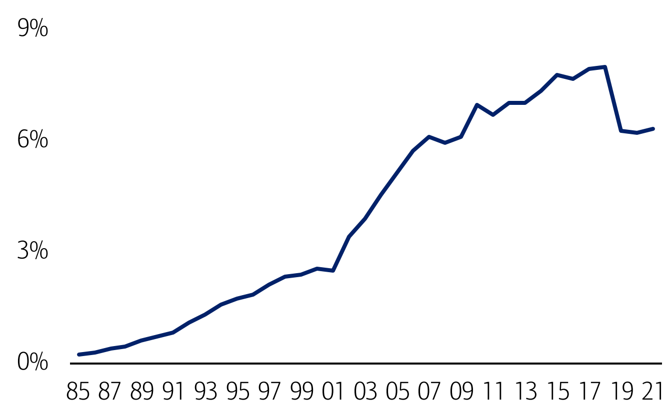
Exhibit 6: Companies are becoming less dependent on China imports (% of S&P 500 COGS ex-D&A has fallen to 6% from 8%)
Imports from China (final+intermediate) as % of S&P 500 COGS ex. D&A (1986-2021)



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

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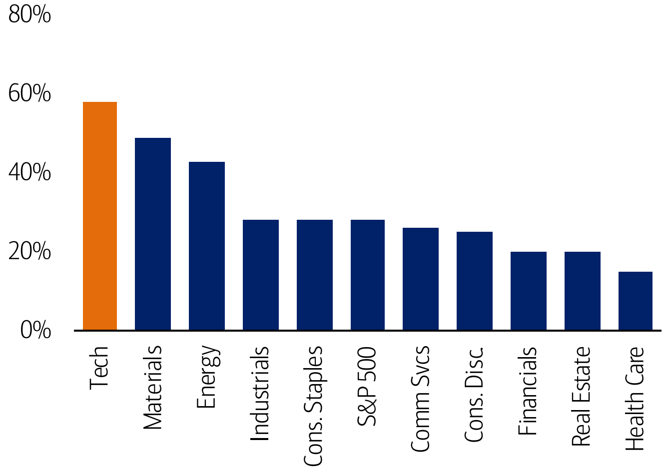
Exhibit 7: Tech is the poster child of globalization
S&P 500 foreign exposure by sector



Source: BofA US Equity & Quant Strategy, 2019FY company filings, Georev, FactSet, BofA analyst estimates

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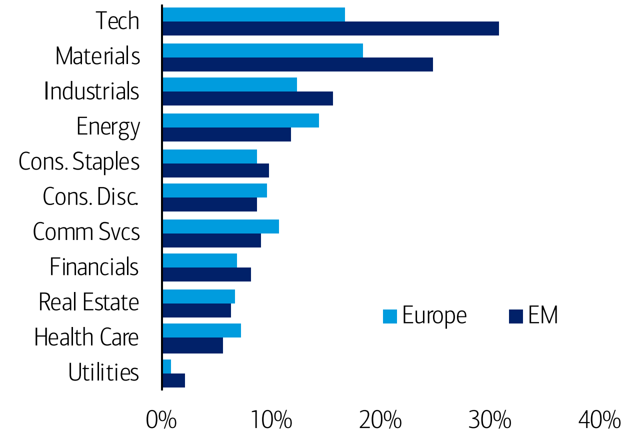
Exhibit 8: Tech has the largest EM exposure
S&P 500 Europe vs EM foreign exposure by sector



Source: BofA US Equity & Quant Strategy, 2019FY company filings, Georev, FactSet, BofA analyst estimates

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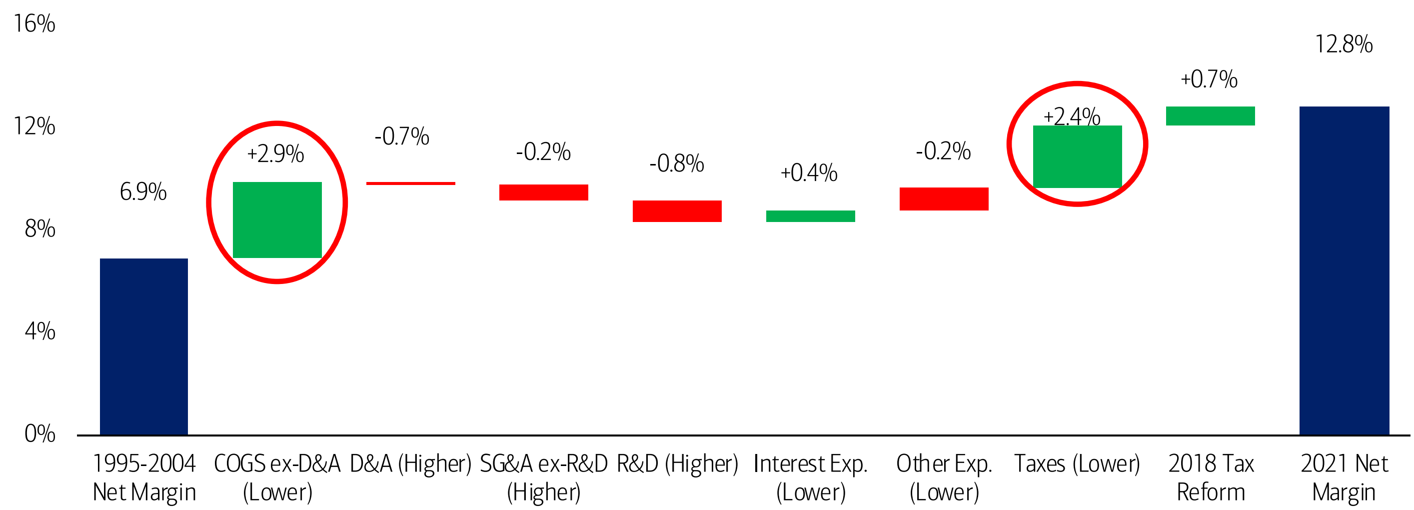
Exhibit 9: Globalization has been a main contributor of margin growth over the past two decades
2021 net margin (ex-Financials) expansion waterfall vs. 1995-2004 levels (factors related to globalization circled in red)



Source: BofA US Equity & US Quant Strategy, FactSet

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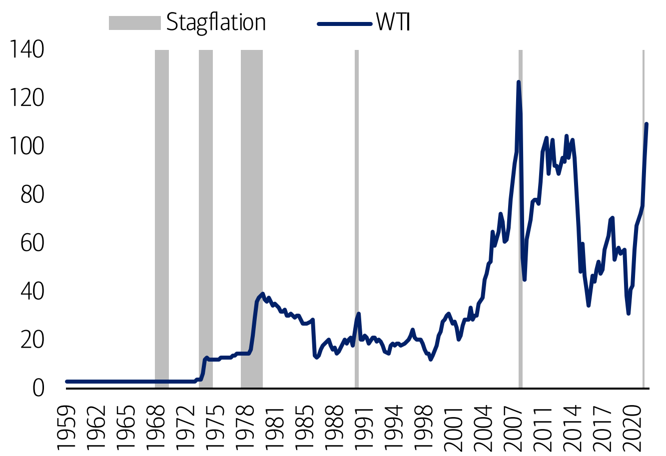
Consistent laggard during stagflation

Historically, stagflation has been accompanied by oil shocks. The risk of stagflation is rising, as our commodity strategists warn that a sharp contraction in Russian oil exports could trigger a full-blown 1980s-style oil crisis (see Global Energy Weekly, 27 May 2022), pushing Brent well past $150/bbl (vs. current ~$120/bbl).

Historically, Tech has been one of the worst performers during stagflation, consistently underperforming both during the 1970s (-54ppt vs. S&P 500) and 1980s (-273ppt).

Exhibit 10: Historically, stagflation has been accompanied by oil shocks
Quarterly avg WTI and stagflation periods (below trend growth, high & rising inflation 1959-1Q22)



Source: BofA US Equity & Quant Strategy, Bloomberg, Global Financial Data which cites: Data from 1860 through 1897 are from The Derrick's Hand-Book of Petroleum, Oil City, PA: Derrick Publishing Co., 1898, Vol. 1. Daily data for oil prices was published in the same book in Vol. 1 (1897), 3 (1915), and 4(1919). Prices are for quotations in Oil City, PA. through 1919. Prices from 1920 to June 1941 are the price per barrel for oil in Pennsylvania based upon data from the National Bureau of Economic Research. From 1941 through 1968, the cost of a barrel of oil (equal to 42 US gallons) as collected by Platt's is used. From 1969 through December 1982, data from the Bureau of Labor Statistics is used, with the exception of the period from October 1973 through December 1982 when the US price of oil was fixed. During this period the landed costs of imports from the US Department of Energy is used. From January 1983 to present the price for West Texas Intermediate Crude Oil is used at 40 degree API, f.o.b. Cushing, Oklahoma.

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Exhibit 11: Tech has consistently been a big laggard in stagflationary environments
S&P 500 sectors' relative performance during stagflation (1972-1Q22)

	Below-trend GDP growth, with...		
	High & rising inflation	**Rising inflation**	**High inflation**
Energy	19.8%	9.4%	7.2%
Utilities	7.8%	8.2%	3.5%
Staples	8.8%	3.3%	6.5%
Real Estate	7.5%	1.1%	4.5%
Health Care	4.0%	1.7%	2.3%
Financials	2.1%	3.0%	1.4%
Materials	3.9%	0.2%	(1.1%)
Comm. Svc.s	(1.3%)	(2.2%)	4.5%
Industrials	(4.8%)	(1.4%)	(2.3%)
Cons. Disc.	(9.8%)	(6.6%)	(1.4%)
Tech	(17.9%)	(4.5%)	(8.0%)

Source: BofA US Equity & Quant Strategy, FactSet

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It is not just rates; fundamentals are also lagging

While rising rates are seen as the major culprit of the Tech sell-off, earnings are also lagging as well. The ratio of Nasdaq 100 consensus 2022 earnings vs. S&P 500 earnings fell to sub-2020 levels, indicating a reversal of COVID demand pull forward.

Exhibit 12: NDX earnings as % of SPX earnings are now below the Dec 2020 level
NDX 2022E earnings as % of SPX 2022E earnings (12/31/20-5/23/22)

Source: FactSet, BofA US Equity & Quant Strategy

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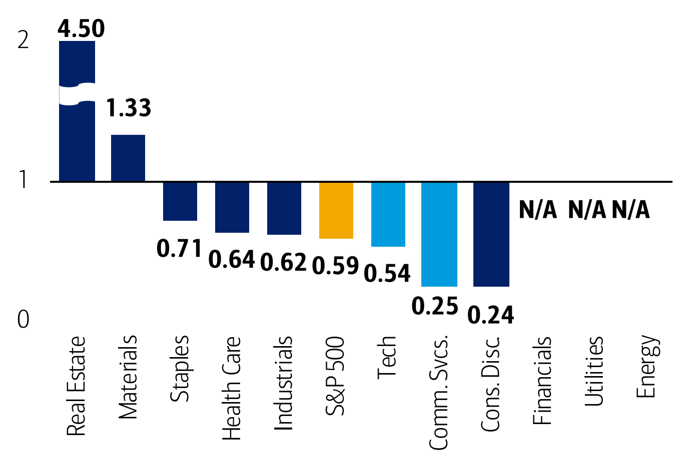
Exhibit 13: TMT has among the weakest guidance of all sectors
S&P 500 3-mo. guidance ratio (# of above- vs. below-consensus guidance; as of 5/22)



Source: Bloomberg, BofA US Equity & Quant Strategy
*Financials, Utilities and Energy had no EPS guidance over the past three months

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When is it time to buy Tech?

Buy Tech wholesale when everyone forgets about it

Following the Tech Bubble, it took about 10 years for the Tech sector to recover and regain its lead. During that period, many companies went away; those that remained consolidated capacity, repaired balance sheets and began to return capital. And importantly, during that period, investors forgot about Tech - Tech underperformed the S&P 500 by 60ppt between 2000 and 2007. Then, Tech led for the next decade. In the meantime, we would be selective and take advantage of volatility. One out of four of 1999's IPOs are blue chips today and IPOs that survived increased by ~250% market cap.

Despite the 16ppt underperformance in Russell 1000 Growth vs. Value YTD, investors are still overweight TMT, and the relative discount in Value stocks is still almost one standard deviation below the historical average. But we see some opportunities within the sector – we favor Tech stocks with healthy FCF/EV, a good late cycle factor and the best value factor within Tech (Exhibit 29).

Exhibit 14: Tech still a near-record weight in the S&P 500
Tech weight in S&P 500, 1990-5/22

Source: Haver Analytics/S&P, BofA US Equity & US Quant Strategy

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Despite selloff, Tech still 27% of S&P 500

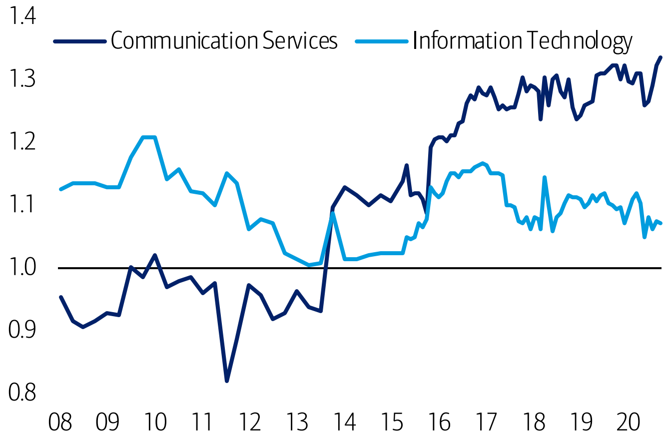
Even with Tech's correction since December, its weight in the S&P remains at 27%, down roughly 2ppt from recent highs.

Add on Communication Services, and IT + TMT makes up over 35% of the benchmark.

Growth is still crowded

Growth stocks are still crowded, especially compared to the last decade's laggards like Energy. Moreover, one of our most frequent client requests has been which beaten-down Growth stocks to buy, indicating there is still lots of interest and continued crowding risk in Growth stocks.

Exhibit 15: Active funds are still overweight Tech and Comm. Svcs...
Large cap active managers' relative weight in Tech & Comm. Svcs. vs. S&P 500 (2008-5/22)



Source: BofA US Equity & Quant Strategy, FactSet Ownership

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Exhibit 16: ...especially compared to the last decade's laggards like Energy
Energy sector vs Communication Services sector relative weight in mutual fund holdings (9/08-4/22)

Source: BofA US Equity & Quant Strategy, FactSet

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Tech today vs. the Tech Bubble

Exhibit 17: Today vs 2000 better = valuations, profitability, shareholder returns; worse = growth
S&P 500 tech financial metrics today (5/31/2022) vs. in 2000; red = worse than 2000

	Technology			Communication Services		
Metric	Today	Mar. 2000	Change	Today	Mar. 2000	Change
Valuations						
Fwd P/E	20.99	52.56	+	16.01	34.06	+
Trailing P/E	23.17	70.00	+	16.68	43.79	+
PE Trail ex Cash	22.1	75.8	+	15.5	44.4	+
FCF Yield	3.9%	1.0%	+	5.5%	0.8%	+
EV/FCF	25.82	93.42	+	21.22	124.95	+
EV/EBITDA	18.1	37.2	+	10.4	12.2	+
P/BV	9.10	14.24	+	3.39	5.87	+
P/Sales	6.0	12.0	+	2.9	8.4	+
EV/Sales	6.0	7.8	+	3.4	2.5	-
P/OCF	20.37	55.68	+	10.77	17.87	+
EV/OCF	20.5	52.9	+	12.8	19.3	+
PEG	1.4	2.1	+	0.9	1.8	+
Quality/Profitability						
Quality ranking (% of B+ or Better Rated Stocks)	50.0%	35.5%	+	34.8%	47.1%	-
% of stocks with negative earnings	0.0%	3.2%	+	4.3%	14.7%	+
ROC	16.9%	17.0%	-	8.7%	6.9%	+
ROA	16.7%	12.7%	+	8.2%	5.4%	+
ROE	46.6%	27.6%	+	21.3%	14.0%	+
Gross Margin	50.8%	39.6%	+	44.2%	32.2%	+
EBITDA Margin	33.8%	22.1%	+	33.7%	33.9%	-
EBIT Margin	29.7%	14.8%	+	22.0%	20.1%	+
Net Margin	25.9%	17.3%	+	17.4%	19.2%	-
Growth						
Div. Growth	8.5%	13.4%	-	-3.0%	9.8%	-
Trailing Net Income Growth	27.3%	35.3%	-	23.9%	19.1%	+
Trailing Sales Growth	16.6%	14.4%	+	15.1%	26.4%	-
Trailing FCF Growth	7.3%	28.9%	-	8.3%	15.8%	-
LT (5yr) EPS growth	15.1%	25.2%	-	17.2%	18.8%	-
Shareholder returns						
Dividend Yield	0.9%	0.1%	+	0.91%	0.81%	+
BuyBack Yield	0.6%	-3.3%	+	2.4%	-8.6%	+
Dividend Payout	23.7%	6.7%	+	17.0%	29.8%	-
Total (Div+Buyback) Payout	38.7%	-240.8%	+	60.3%	-297.0%	+
Total shareholder return (Buyback + Div Yield)	1.5%	-3.3%	+	3.4%	-7.5%	+
Balance sheet						

Exhibit 17: Today vs 2000 better = valuations, profitability, shareholder returns; worse = growth
S&P 500 tech financial metrics today (5/31/2022) vs. in 2000; red = worse than 2000

	Technology			Communication Services		
Cash/Market Cap	6.1%	2.5%	+	8.8%	2.0%	+
Net Debt/Market Cap	1.7%	-0.2%	-	18.7%	14.8%	+
Total Debt/Market Cap	7.8%	1.6%	+	27.5%	6.0%	+
Net Debt/EBITDA	0.3	-0.1	-	1.8	1.7	+

Source: BofA US Equity & Quant Strategy, FactSet

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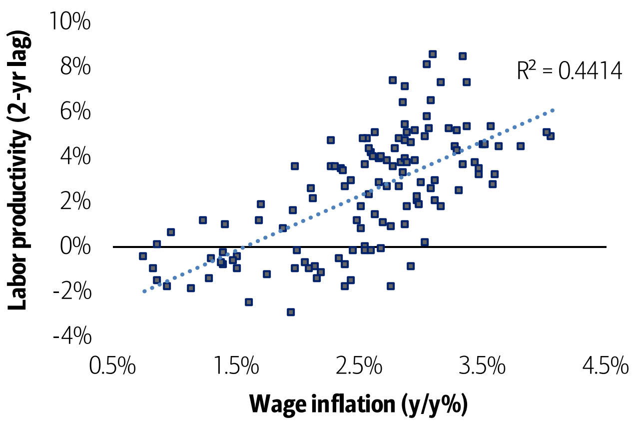
Where Tech can benefit: Automation

Wage inflation has historically served as a catalyst for companies to invest in productivity-enhancing initiatives. This could include industrial automation, substitution of intermediary goods, or increased skill-based training. Capex also started accelerating, jumping 20% YoY in 1Q, and our capex guidance ratio remains above the historical average, pointing to continued strength in capex ahead. Automation is also a key enabler of re-shoring supply chains, especially given the tight labor market in the U.S.

Exhibit 18: Wage inflation has historically driven labor productivity growth on a lagged basis
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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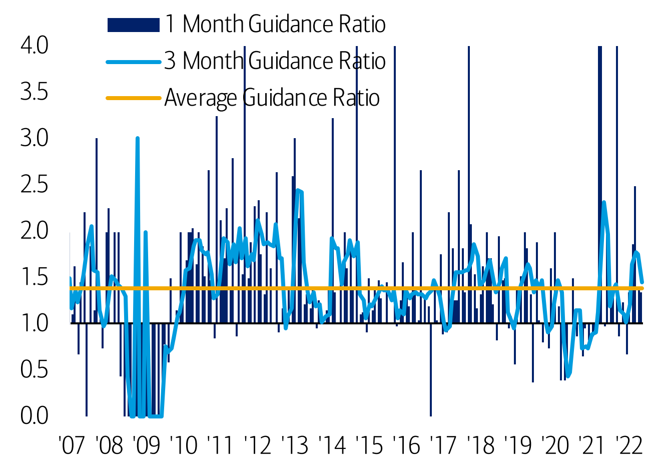
Exhibit 19: Our capex guidance ratio remains above average, pointing to continued strength in capex
S&P 500 Capex Guidance Ratio (# Above vs. Below Consensus) - 05/20/22



Source: FactSet, BofA US Equity & Quant Strategy

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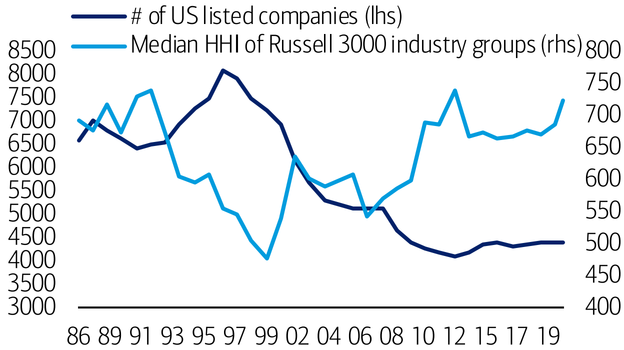
Increased regulatory risks

Market concentration risk has been rising in the U.S. since the financial crisis, marked by a declining number of public companies and a rising Herfindahl–Hirschman Index (HHI; metric of market concentration). Growing anti-monopolistic rumblings from Washington poses risks to Big Tech – looking at Financials as an example, increased regulations following the financial crisis have led to lower multiples.

Exhibit 20: 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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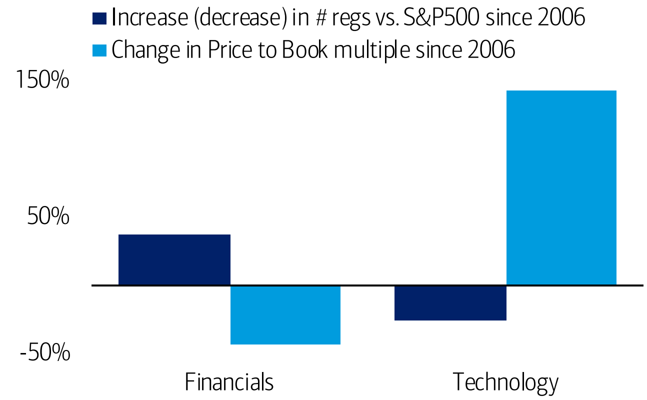
Exhibit 21: US Financials vs. US Tech: regulations led to lower multiples (and vice versa)
# of regulations vs. change in Price to Book Value, 2006 vs. 2017



Source: BofA US Equity & Quant Strategy, quantGov

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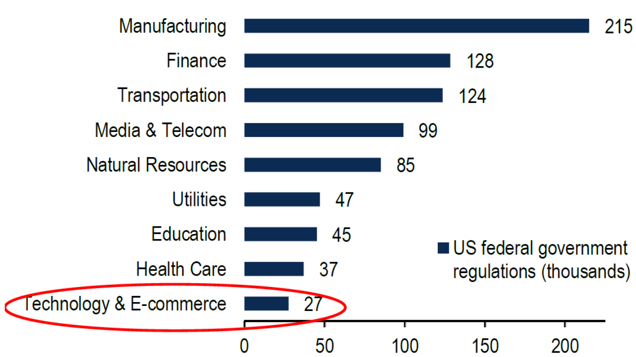
Exhibit 22: Regulation light sector at risk of tighter regs
US federal government regulations by sector, thousands



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

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Technology & e-commerce companies have been among the most lightly regulated: just 27K regulations for tech; by comparison, manufacturing is regulated by 215K rules and the financial sector is regulated by 128K.

New economy also lags old economy on total carbon emissions

The "greenium" in place for new economy companies may be misplaced and poised to reverse – supply chain emissions data disclosure has improved and tells a different story than direct emissions. Based on ICE ESG data, the total emissions of new economy vs. old economy companies is surprisingly skewed in favor of old economy. Internet Retail carries 3x the emissions of Brick & Mortar; Software & Services eclipse Banks, Insurance and Commercial Services; and New Media Scope 3 emissions intensity is 5x of the Old Media.

Exhibit 23: "New economy" sectors often have higher total emissions than "old economy" counterparts

Median Scope 1, 2, 3 greenhouse gas emissions (metric tons) per million dollars of revenue by category

Source: ICE Data Services, BofA US Equity & Quant Strategy

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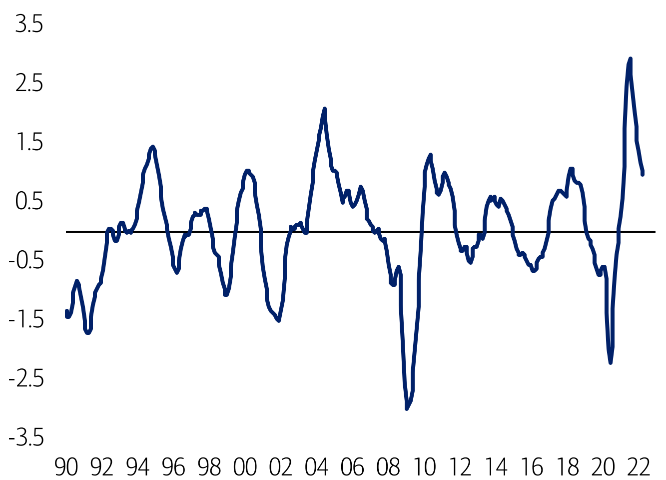
A Quant take on Technology stocks

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 Late Cycle phase since September 2021, during which companies with High Quality, Low Risk, and High Dividends have historically outperformed. Tech has outperformed 75% of the time during Late Cycle.

Exhibit 24: US Regime Indicator is firmly in Late Cycle
(January 1990-April 2022)



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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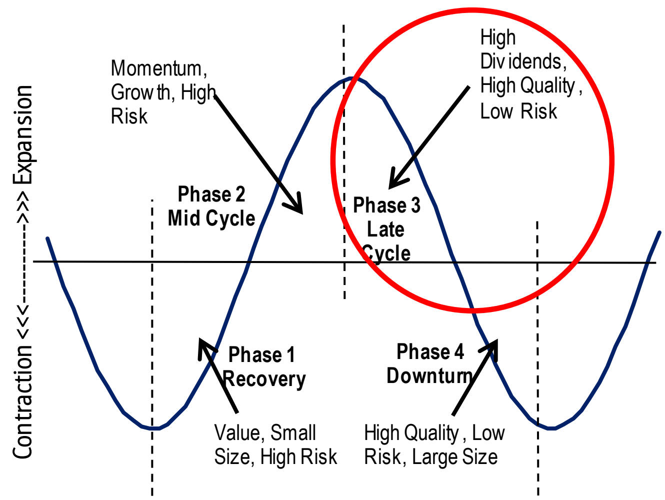
Exhibit 25: Quality, Low Risk and High Dividend strategies have historically outperformed in late Cycle
U.S. Regime Model– a heuristic



Source: BofA US Equity & Quant Strategy

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Exhibit 26: Tech exhibits 75% hit rate of outperformance during Late-Cycle
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:	-13.4%	-4.8%	3.1%	5.3%	15.0%	-6.2%	5.4%	0.4%	10.8%	1.7%	-13.0%
Early Cycle	Median:	-10.9%	-9.3%	4.8%	-2.3%	12.9%	-6.0%	4.8%	2.3%	9.1%	-7.8%	-12.3%
	Hit Rate:	12.5%	25.0%	75.0%	50.0%	100.0%	25.0%	87.5%	62.5%	75.0%	37.5%	0.0%
Phase 2	Avg:	-10.9%	-10.4%	2.2%	3.7%	0.2%	-3.7%	3.3%	10.8%	-3.1%	-4.4%	-15.0%
Mid Cycle	Median:	-11.8%	-10.4%	-0.6%	-2.2%	-0.2%	-1.5%	-0.5%	7.0%	-1.9%	-12.1%	-15.0%
	Hit Rate:	11.1%	22.2%	44.4%	44.4%	44.4%	44.4%	44.4%	66.7%	44.4%	33.3%	0.0%
Phase 3	Avg:	-0.9%	13.5%	0.1%	-6.6%	0.4%	17.0%	3.8%	-0.4%	-6.1%	4.5%	12.9%
Late Cycle	Median:	-1.0%	2.4%	2.8%	-10.4%	-2.0%	10.1%	1.6%	3.5%	-9.6%	4.7%	5.4%
	Hit Rate:	37.5%	62.5%	62.5%	37.5%	37.5%	75.0%	75.0%	75.0%	25.0%	75.0%	62.5%
Phase 4	Avg:	4.2%	3.3%	6.9%	-10.6%	-7.3%	4.6%	-4.6%	7.9%	-3.1%	-8.7%	-8.2%
Downturn	Median:	6.0%	2.3%	7.4%	-13.2%	-5.0%	2.6%	-5.0%	6.7%	-4.8%	-8.4%	-12.3%
	Hit Rate:	71.4%	57.1%	71.4%	28.6%	42.9%	71.4%	28.6%	71.4%	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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In our short-term Momentum & Value quantitative sector rotation framework, both Information Technology and Communication Services have dropped to the second to last. Historically, both sectors (particularly Communication Services) lagged after ranking in the bottom two in our framework.

Exhibit 27: Tech ranks among the lowest in our tactical sector framework, other long duration sectors (as of 5/31/22)
Sector ranks based on relative price momentum, EPS revision and valuation

Sector	Combined Rank	Price Momentum Rank	EPS Revision Rank	Valuation Rank
Energy	33	11	11	11
Materials	28	9	10	9
Industrials	20	5	9	6
Health Care	18	8	2	8
Financials	18	4	7	7
Real Estate	17	6	8	3
Utilities	16	10	5	1
Consumer Staples	15	7	4	4
Information Technology	14	3	6	5
Communication Services	14	1	3	10
Consumer Discretionary	5	2	1	2

Source: BofA US Equity & US Quant Strategy

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Exhibit 28: TMT historically lagged after ranking in the bottom two in our tactical sector framework
Avg. relative performance vs. S&P 500 and outperformance hit rate for Tech after ranking at the bottom in our tactical sector framework (12/99-5/22)

	1-mo	3-mo	6-mo	12-mo
Tech				
Avg.	(0.2%)	0.3%	0.6%	0.8%
Hit rate	48.6%	54.3%	48.6%	45.7%
Comm. Svcs.				
Avg.	(1.2%)	(2.9%)	(4.8%)	(5.7%)
Hit rate	42.6%	26.9%	23.5%	22.4%

Source: BofA US Equity & US Quant Strategy, FactSet

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Most frequent screen requests

Beaten-down Tech stocks with strong FCF

We like some Tech stocks, particularly those that have drifted into the top quintile of the market by Free Cash to Enterprise Value – one of the best performing factors of the ~70 we track, a strong performing style during the first year of a Fed hiking cycle - but a recent laggard during the ZIRP years when cash was essentially worthless. "Value Tech" is not necessarily bad Tech: investors need to differentiate between stocks in growth purgatory (negative momentum and revisions) vs. true value, where Tech companies with the highest Free Cash Flow to EV have generated annualized alpha of 4.4ppt vs. the sector.

We screen for Tech and Communication Services stocks (excluding Telecom and Media) that are down more than 25% from highs and have FCF/EV above 3%. We exclude Underperform-rated stocks by our fundamental analysts.

Exhibit 29: Beaten-down Tech stocks with strong FCF
S&P 500 Tech/Communication Services stocks that are down more than 25% from highs and have strong FCF/EV

Ticker	Company name	Sector	Industry	Price	vs. 52-wk high	YTD	BofA Rating	FCF/EV
QRVO	Qorvo, Inc.	Information Technology	Semiconductors & Semiconductor Equipment	109.59	(45.6%)	(29.9%)	Neutral	9.2%
STX	Seagate Technology Holdings PLC	Information Technology	Technology Hardware Storage & Peripherals	83.68	(28.9%)	(25.9%)	Buy	8.0%
MU	Micron Technology, Inc.	Information Technology	Semiconductors & Semiconductor Equipment	73.55	(25.3%)	(21.0%)	Buy	7.4%
CSCO	Cisco Systems, Inc.	Information Technology	Communications Equipment	45.23	(29.6%)	(28.6%)	Buy	6.8%
QCOM	Qualcomm Incorporated	Information Technology	Semiconductors & Semiconductor Equipment	140.02	(27.7%)	(23.4%)	Buy	6.7%
NTAP	NetApp, Inc.	Information Technology	Technology Hardware Storage & Peripherals	72.51	(25.1%)	(21.2%)	Neutral	6.7%
LRCX	Lam Research Corporation	Information Technology	Semiconductors & Semiconductor Equipment	505.79	(30.9%)	(29.7%)	Buy	6.6%
SWKS	Skyworks Solutions, Inc.	Information Technology	Semiconductors & Semiconductor Equipment	107.27	(45.7%)	(30.9%)	Neutral	6.5%
AMAT	Applied Materials, Inc.	Information Technology	Semiconductors & Semiconductor Equipment	114.46	(31.5%)	(27.3%)	Buy	6.4%
TER	Teradyne, Inc.	Information Technology	Semiconductors & Semiconductor Equipment	106.64	(36.9%)	(34.8%)	Buy	6.1%
TTWO	Take-Two Interactive Software, Inc.	Communication Services	Entertainment	124.63	(36.4%)	(29.9%)	Buy	5.4%
FIS	Fidelity National Information Services, Inc.	Information Technology	It Services	103.22	(32.2%)	(5.4%)	Buy	5.0%
FB	Meta Platforms Inc. Class A	Communication Services	Interactive Media & Services	188.64	(50.9%)	(43.9%)	Buy	5.0%
ZBRA	Zebra Technologies Corporation Class A	Information Technology	Electronic Equipment Instruments & Components	334.55	(45.6%)	(43.8%)		4.7%
GPN	Global Payments Inc.	Information Technology	It Services	127.51	(35.5%)	(5.7%)	Buy	4.3%
FFIV	F5, Inc.	Information Technology	Communications Equipment	161.89	(35.0%)	(33.8%)	Buy	4.2%
KEYS	Keysight Technologies Inc	Information Technology	Electronic Equipment Instruments & Components	143.55	(31.3%)	(30.5%)	Neutral	4.0%

Exhibit 29: Beaten-down Tech stocks with strong FCF
S&P 500 Tech/Communication Services stocks that are down more than 25% from highs and have strong FCF/EV

Ticker	Company name	Sector	Industry	Price	vs. 52-wk high	YTD	BofA Rating	FCF/EV
VRSN	VeriSign, Inc.	Information Technology	It Services	174.37	(32.2%)	(31.3%)		3.8%
PYPL	PayPal Holdings, Inc.	Information Technology	It Services	82.48	(73.4%)	(56.3%)	Neutral	3.8%
IT	Gartner, Inc.	Information Technology	It Services	260.86	(29.3%)	(22.0%)	Buy	3.6%
TRMB	Trimble Inc.	Information Technology	Electronic Equipment Instruments & Components	67.24	(30.3%)	(22.9%)		3.5%
ACN	Accenture Plc Class A	Information Technology	It Services	298.65	(28.4%)	(28.0%)	Buy	3.5%
EPAM	EPAM Systems, Inc.	Information Technology	It Services	326.28	(55.0%)	(51.2%)	Buy	3.3%
AMD	Advanced Micro Devices, Inc.	Information Technology	Semiconductors & Semiconductor Equipment	101.22	(38.5%)	(29.7%)	Buy	3.3%

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

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 decisions

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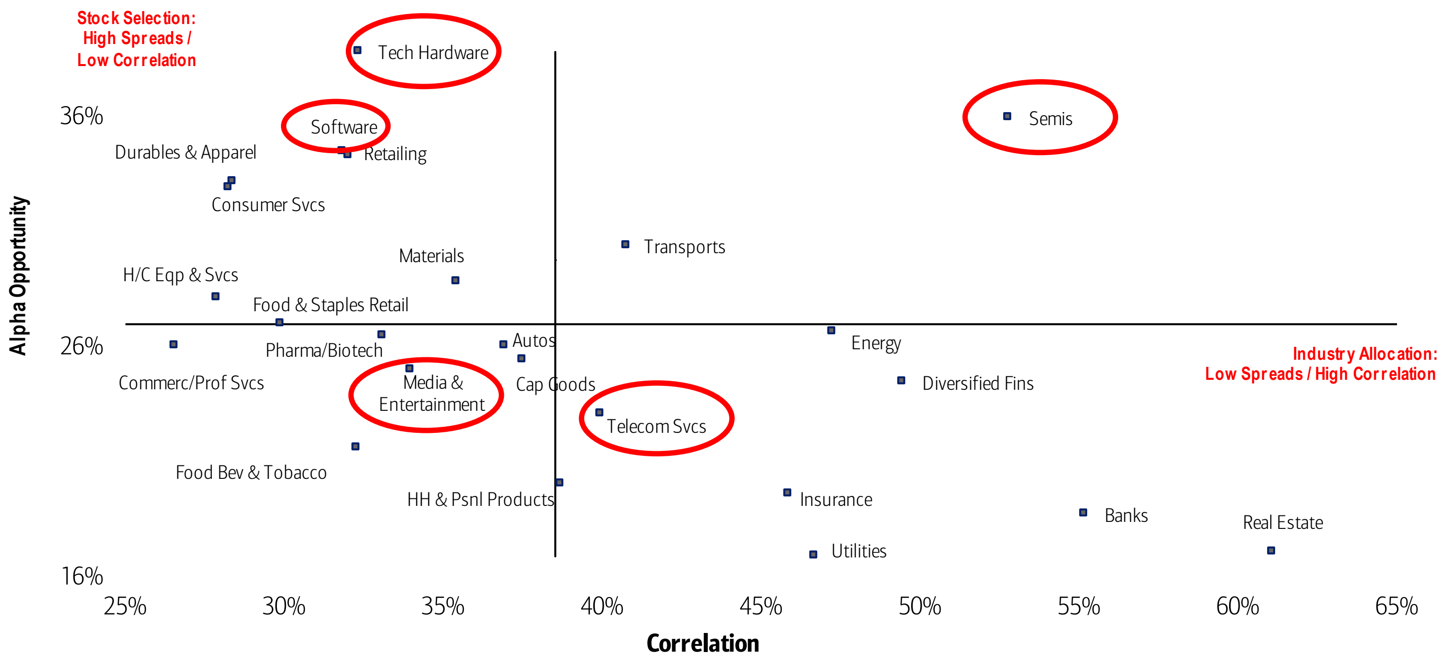
Stock picking versus sector allocation

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 30: Within TMT, Tech Hardware and Software offer best opportunities for stock pickers
Historical intra-stock correlation vs. performance spread (2Q86-1Q22)



Source: FactSet, BofA US Equity & Quant Strategy

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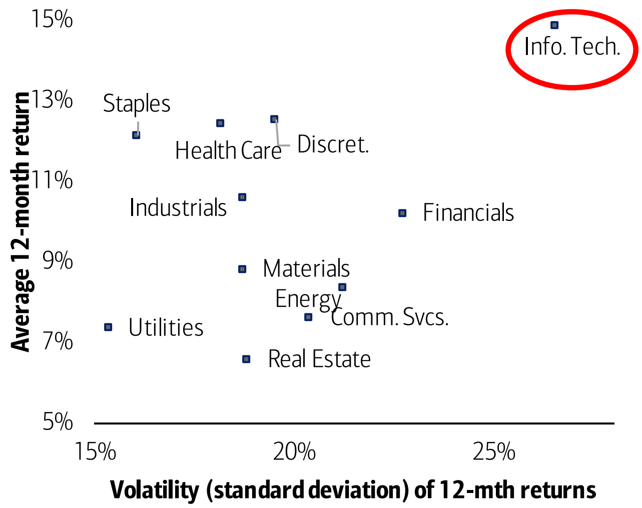
Exhibit 31: Tech = high risk, high rewards
Average 12-mo returns and volatility of returns (1982-present)



Source: Compustat, BofA US Equity & Quant Strategy

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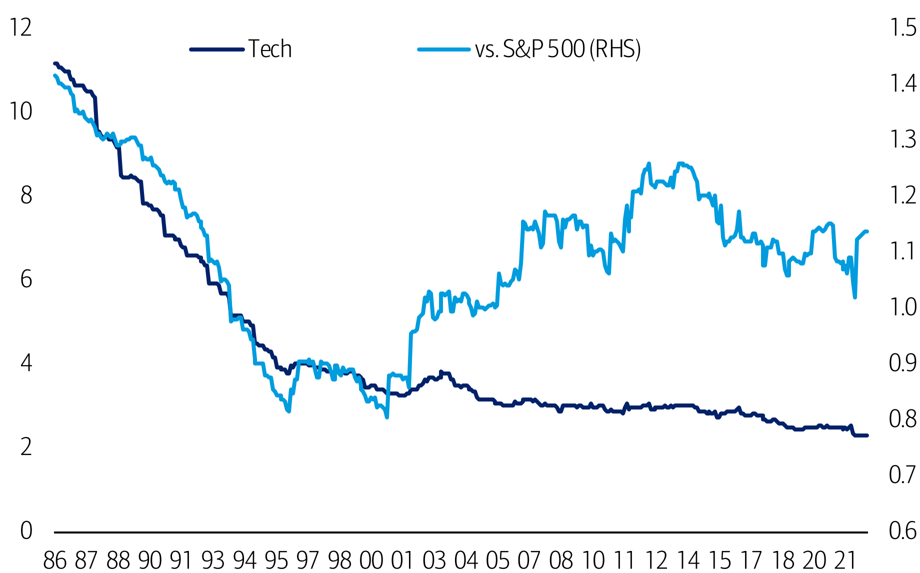
Highest return at the highest risk

Since 1982, 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.

Labor intensity in Tech

Over the past 35 years, the S&P 500 has grown more labor-light from productivity gains and automation benefits: the number of employees per $1mn in sales decreased from almost 8 in 1986 to 2 today. Tech also grew labor-light, with the ratio falling even more precipitously, from 11.2 in 1986 to 2.3 today. But since the 2000 Tech Bubble, Tech companies' labor intensity has fallen less than that of the overall S&P 500, and since 2003, Tech has actually grown more labor intensive than the S&P 500.

Exhibit 32: Tech's decline in labor intensity stalled in 2000, is now more labor intensive than the S&P 500
Number of employees per $1M in sales for Tech and Tech vs. S&P 500 (1986-present)



Source: BofA US Equity & Quant Strategy, FactSet

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Historically, labor-light S&P 500 companies have outperformed labor-intensive counterparts by 2.6ppt on an annualized basis since 1986. Labor-light companies' outperformance was particularly notable in Tech, where labor-light companies outperformed labor-intensive companies by 9.3ppt per annum, the widest spread in any sectors.

Exhibit 33: Labor-light S&P 500 co's offered 2.6ppt alpha per annum

Sector neutral performance of S&P 500 companies with the lowest employee to sale ratio vs companies with the highest employee to sales ratio (based on top quintile most labor-light vs top quintile most labor-intensive, Jan. 1986 – Apr. 2022)

Source: FactSet, BofA Global Research

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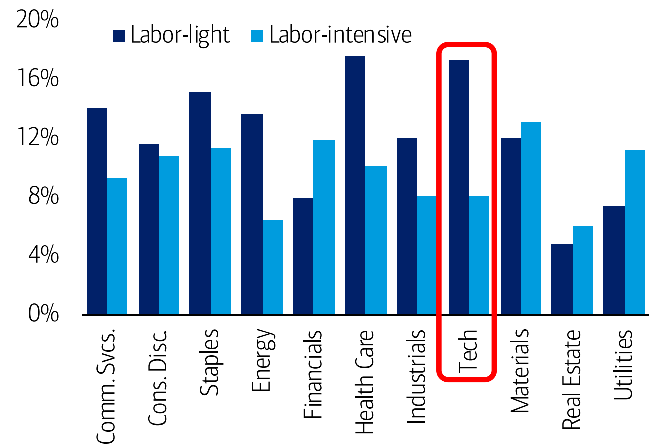
Exhibit 34: Labor-light companies were rewarded the most in Tech

Annualized performance of labor-light and labor-intensive (top quintile most labor-light vs top quintile most labor-intensive) companies within sectors (Jan. 1986 – Apr. 2022)



Source: BofA Global Research

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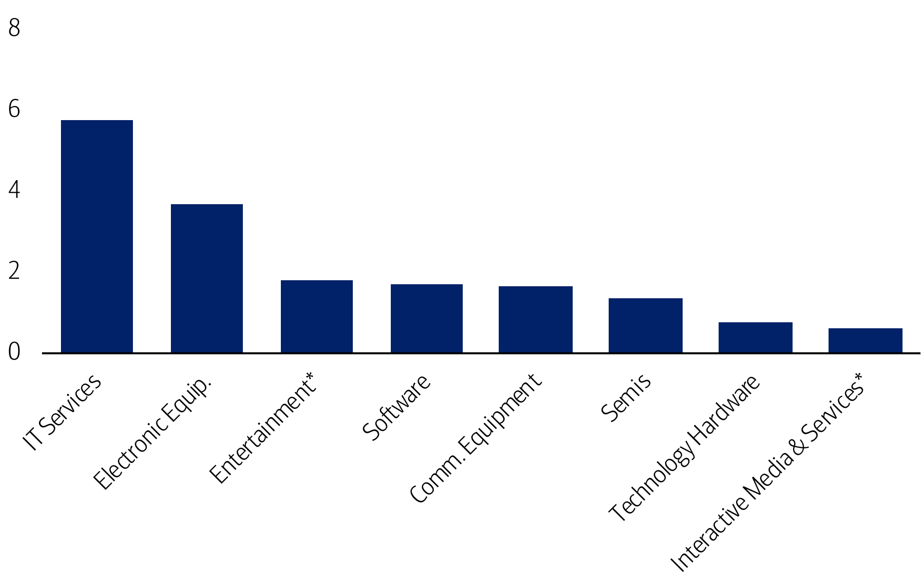
Exhibit 35: Interactive Media & Services, Tech Hardware and Semis are among the most labor-light industries within Tech

Number of employees per $1M in sales for Tech and select Communication Services industries* (as of 5/22)



Note: Employee data is based on data as of latest fiscal year, sales are latest 12 months

Source: BofA US Equity & Quant Strategy, FactSet

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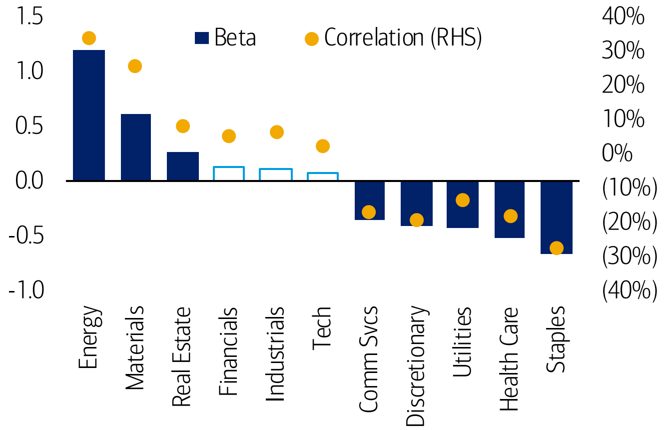
The macro guide to Tech

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 41).

When analyzing these indicators, it is important to note that the duration profile (the time to recover one's initial investment) has lengthened considerably over time, so risks from rates and inflation may be higher today than they have been historically, as shown in Exhibit 3.

Exhibit 36: Inflation: statistically not significant for Tech, but negatively correlated to 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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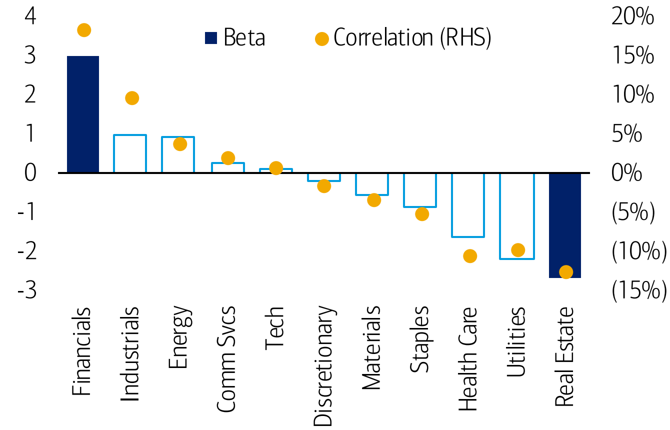
Exhibit 37: Rates have historically not been statistically significant to TMT, but have shown strong correlations in recent years (Exhibit 3)

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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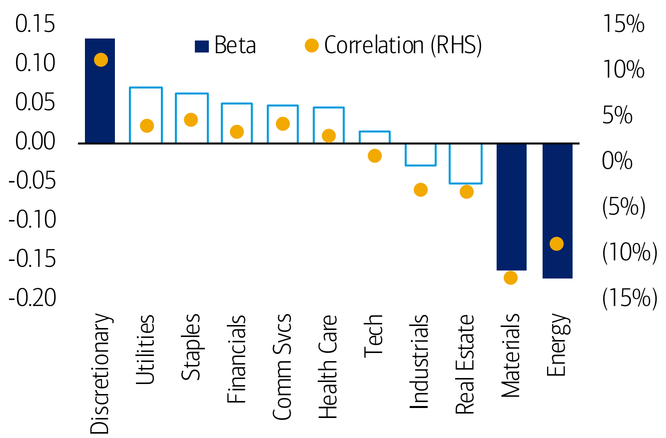
Exhibit 38: USD: statistically not significant for TMT

S&P 500 sectors' relative performance sensitivity to USD (1972-present)



Source: BofA US Equity & Quant Strategy, FactSet, Bloomberg
Note: Empty bars indicate not statistically significant

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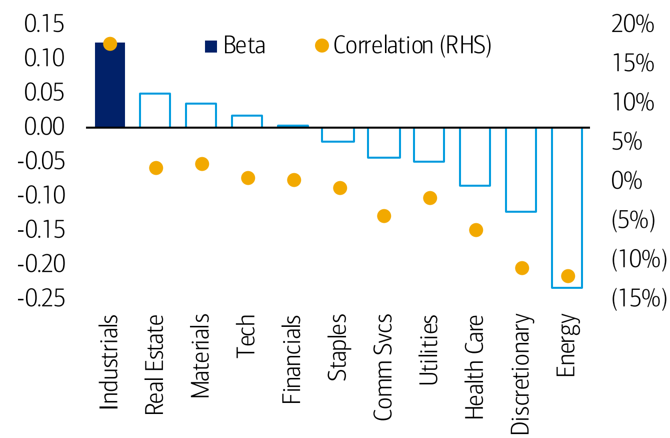
Exhibit 39: GDP: statistically not significant for TMT

S&P 500 sectors' relative performance sensitivity to GDP (1979-present)



Source: BofA US Equity & Quant Strategy, FactSet, Bloomberg
Note: Empty bars indicate not statistically significant

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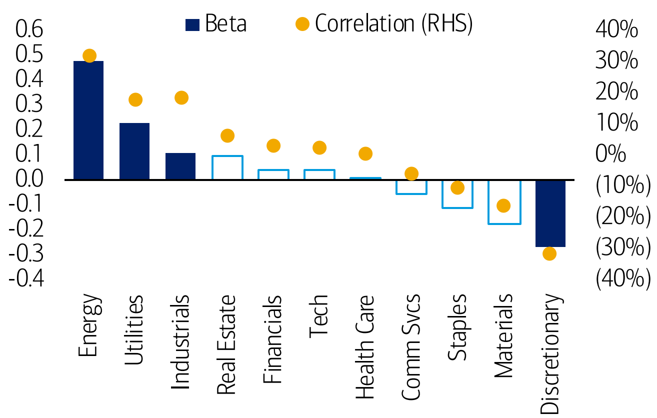
Exhibit 40: Capex: statistically not significant for TMT

S&P 500 sectors' relative performance sensitivity to S&P 500 capex (1985-present)



Source: BofA US Equity & Quant Strategy, FactSet, Bloomberg
Note: Empty bars indicate not statistically significant

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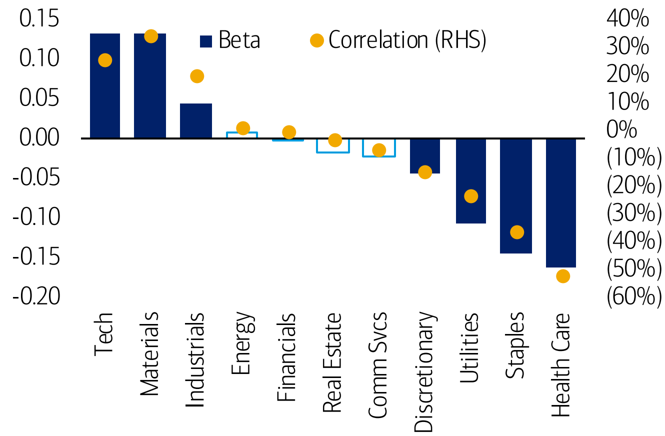
Exhibit 41: Tech is the most sensitive sector to China

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

BofA GLOBAL RESEARCH

Micro: analyst views

Enterprise software

Brad Sills, Koji Ikeda, CFA, and Michael Funk

Industry backdrop: Current sentiment favoring larger cap GARP names...
We believe current market environment favors enterprise software names that are larger cap with a GARP profile. The enterprise software space has sharply corrected since the beginning of this year (BofA enterprise software group down 42% vs. NASDAQ down 23% as of 5/27/22 close), which has been largely driven by valuation compression that has been fueled by rising interest rate risks, inflation risks, global macro risks, and recession risks. With the backdrop of an uncertain future, we believe the current tolerance for growth without profits operating models have waned, with investors now more focused on larger scale companies with durable revenue growth, positive free cash flow, and high liquidity.

While most enterprise software companies reported relatively good earnings results in the most recent quarters, our recent deep dive (Recession Testing Software Group and Revisiting Valuations at New Lows 11 May 2022 into the fundamental effects to software businesses during the past two recessions (Great Recession, tech bubble recession), suggest that most software companies will not see meaningful effects to the operating model until 1-2 quarters into the official start of a recession. Nonetheless, given the corrections experienced during the Great Recession and the tech bubble recession, we believe investors are currently favoring large cap GARP names, which may be able to weather potentially slower growth or recessionary future better than SMID can software, given its profitable free cash flow profile. Three key topics among investors today within the enterprise software category are:

1. **Russia/Ukraine conflict, Europe, China, Inflation risks.** We believe that overall, investors accept that the current global macro environment will likely result in some disruption across the enterprise software space. Going forward, we believe a generally accepted disruption profile for each of these risks will emerge. For example, at the early onset of the Russia/Ukraine conflict, it was relatively quickly determined that a 50bps to 150bps growth headwind was “about right” across the group, with a higher degree of scrutiny placed on names with outsized Russia/Ukraine exposure.

2. **Hiring environment.** Over the past several years, the war for talent was a major concern among all software categories, which drove wage inflation, and at times hiring plan shortfalls. Furthermore, the pandemic has spurred new demands from employees for flexible work schedules, including full-time work-from-home or hybrid arrangements. However, over the past several months, it appears the hiring demand environment could be slowing, with a number of public and private tech companies recently announcing layoffs. How companies react to the changing hiring environment over the next several quarters could play a meaningful role into the growth profiles and the innovation cycles for the businesses over the medium term.

3. **Compensation structures: cash vs. stock?** The broad pullback in public company share prices and valuations puts into question employees’ stock compensation given RSUs and options may be now out of the money. This raises the question of how management teams will balance employee compensation in the future to balance retention, while keeping in mind the profitability profile and cash balance of the business if there is a higher shift to cash compensation away from stock.

...but the pullback across the space creates lots of potential 2H catch up stories
The broader pullback in the enterprise software space was especially felt with unprofitable SMID-cap names, particularly companies that recently went public in 2021 or late 2020. That being said, we believe this creates an interesting setup into the

second half of 2022 for a catch up trade for most of these names, as there should be more visibility into the potential effects of most of the macro concerns driving the uncertainty today (Russia/Ukraine, EMEA, China, Inflation and interest rates, etc.). As the visibility into the potential near/mid/long-term effects of the multiple macro risks improve, we believe SMID-cap names that are best positioned and most shielded from the effects could benefit in the second half of 2022.

Top large cap pick: NOW

ServiceNow (NOW, $95bn): ServiceNow develops and sells a hosted subscription-based suite of services designed to automate various functions (IT, HR, Customer workflows). ServiceNow screens well in our 4M's framework for software investing: 1) Moat: large installed base of over 7,400 mid and large enterprise customers (incl 85%+ of the F500), 2) a large Market across ITSM, ITOM, and custom applications, 3) Margin: strong unit economics (we estimate an LTV/CAC >10x) and has demonstrated profitability/25%+ FCF margin, and 4) world class Management team with an established track record of strong execution. ServiceNow recently (5/24) raised at its analyst day its FY24/26 revenue outlooks to $11bn+ (from $10bn+) and $16bn+ (from $15bn+), respectively, demonstrating a multi-pronged growth oppty led by 1) upsell of multiple suites (IT, customer & employee), 2) multiple modules (20 in each), and 3) premium editions (~30% ITSM pro and est <10% enterprise mix with target of 50% & 20%). While NRR (125%) remains the core growth driver (80% of growth), a somewhat renewed focus on winning new accounts is also likely to sustain stable customer adds (100 qtrly in FY21), targeting 50,000 commercial accounts (>1,000 employee size firms), compared to 7,400 customers today, implying only 15% penetration. We believe LT ServiceNow will continue its strong beat and raise cadence and continue to post upside each quarter to its reported + LT estimates as it consolidates a vast market of workflow automation and custom apps, all while coming from a position of strength in its core IT workflow automation roots. Reiterate Buy and PO.

Semiconductors

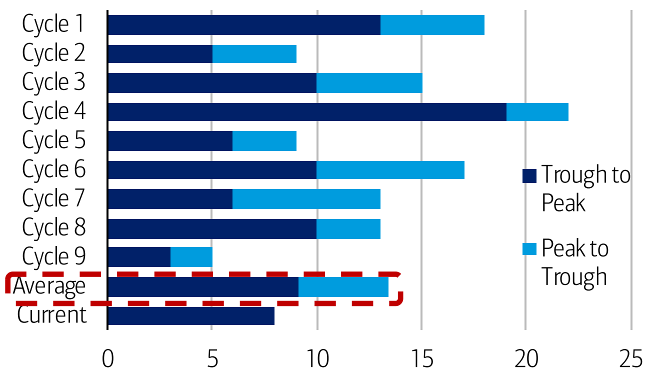
Vivek Arya, Jamie Zakalik, Blake Friedman

Industry backdrop: Where are we in the semis cycle?

Our analysis suggests there have been 8-9 cycles since 1990 and each lasted about 14-15 quarters on average. Further, a typical 'upturn', or period of trough to peak sales, typically lasts 8-9 quarters vs. a typical 'downturn', or period of peak to trough sales, lasts 5-7 quarters. In the current cycle, absolute $ sales troughed in 2Q20 during the height of the COVID-19 pandemic lockdowns, which suggests we are currently 8 quarters into the growth cycle, which according to historical average cycles would suggest we could be nearing a near-term cycle peak. In terms of YoY industry sales growth, sales trough in 2Q19 (-6% YoY) and peaked in 2Q21 (+32% YoY). Sales have been decelerating every quarter since (though still up >20% as of 1Q22 data). This suggests we are already 4 quarters into the YoY down-cycle, which suggests sales could trough sometime in the next 3-4 quarters if this current cycle follows historical norms.

Exhibit 42: Absolute $ Sales Semi Cycle

We are 8 quarters into abs. $ semi sales up-cycle



Source: BofA Global Research , SIA

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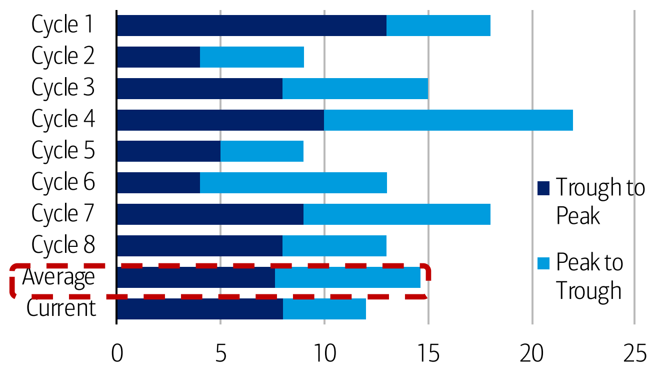
Exhibit 43: YoY Sales growth Semi Cycle

We are 4 quarters into YoY semis sales growth down-cycle



Source: BofA Global Research, SIA

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Historically, it also important to note semis growth is rarely negative when global GDP was >3%. When global GDP did grow 3%+, semi sales grew ~2x GDP growth, boosted by rising chip content. We note while the most recent CY19 downturn had semi sales down -10%, core-semi sales declined only -2% (memory saw a more drastic 33% decline).

Exhibit 44: Global GDP and YOY change in semiconductor sales from 1995-2021

With the exception of 2012, semi sales ex-memory have always been positive when global GDP was >3%

Year	Real GDP Growth (%)	Total Semis sales ($bn)	YoY Growth (%)	Memory sales ($bn)	YoY Growth (%)	Semis Sales, ex-mem ($bn)	YoY Growth (%)
1995	3.4%	$144.4	-	$53.5	-	$90.9	-
1996	3.9%	$132.0	-8.6%	$36.0	-32.6%	$95.9	5.5%
1997	4.0%	$137.2	4.0%	$29.3	-18.6%	$107.9	12.4%
1998	2.6%	$125.5	-8.5%	$23.0	-21.6%	$102.5	-4.9%
1999	3.5%	$149.4	19.0%	$32.3	40.6%	$117.1	14.2%
2000	4.8%	$204.4	36.8%	$49.2	52.3%	$155.2	32.5%
2001	2.4%	$139.0	-32.0%	$24.9	-49.5%	$114.1	-26.5%
2002	2.9%	$140.7	1.3%	$27.0	8.7%	$113.7	-0.4%
2003	4.3%	$166.4	18.3%	$32.5	20.2%	$133.9	17.8%
2004	5.4%	$213.0	28.0%	$47.1	45.0%	$165.9	23.9%
2005	4.9%	$227.5	6.8%	$48.5	2.9%	$179.0	7.9%
2006	5.4%	$247.7	8.9%	$58.5	20.5%	$189.2	5.7%
2007	5.6%	$255.6	3.2%	$57.9	-1.1%	$197.8	4.5%
2008	3.1%	$248.6	-2.8%	$46.3	-19.9%	$202.3	2.3%
2009	-0.1%	$226.3	-9.0%	$44.8	-3.3%	$181.5	-10.3%
2010	5.4%	$298.3	31.8%	$69.6	55.4%	$228.7	26.0%
2011	4.3%	$299.5	0.4%	$60.7	-12.7%	$238.8	4.4%
2012	3.6%	$291.6	-2.7%	$57.0	-6.2%	$234.6	-1.8%
2013	3.4%	$305.6	4.8%	$67.0	17.6%	$238.5	1.7%
2014	3.5%	$335.8	9.9%	$79.2	18.2%	$256.6	7.6%
2015	3.4%	$335.2	-0.2%	$77.2	-2.6%	$258.0	0.5%
2016	3.3%	$338.9	1.1%	$76.8	-0.6%	$262.2	1.6%
2017	3.7%	$412.2	21.6%	$124.0	61.5%	$288.2	9.9%
2018	3.6%	$468.8	13.7%	$158.0	27.4%	$310.8	7.8%
2019	2.9%	$412.3	-12.0%	$106.4	-32.6%	$305.9	-1.6%
2020	-3.1%	$440.4	6.8%	$117.5	10.4%	$322.9	5.6%
2021	6.1%	$555.6	26.2%	$153.8	30.9%	$401.8	24.4%

Source: IMF, SIA, BofA Global Research

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With regards to valuation, peak to trough multiples for the Philadelphia Semiconductor Index (SOX) compress ~27% on average in downturns, though the last 3 cycles have seen multiples decline over 30%. As profitability remains stronger versus prior times, there is opportunity for semiconductor stocks to sustain higher valuation through cycles. We note over the last 3-4 years, SOX NTM P/E average of 19x is well ahead of the average realized from 2012-2018 (15x NTM P/E).

Exhibit 45: SOX Index valuation compression in major cycles
On average, peak-to-trough SOX NTM P/E multiple compress 27% in downturns

	SOX Index Value						Valuation (SOX Index)		
Cycle	Peak Date	Trough Date	Peak Value	Trough Value	Number of Days	Percent Change	P/E @ Peak	P/E @ Trough	Delta (%)
1	2/17/2011	8/19/2011	473	326	127	(31%)	11.9x	9.4x	(21%)
2	6/1/2015	2/11/2016	746	559	177	(25%)	17.1x	13.1x	(23%)
3	3/12/2018	12/24/2018	1,446	1,069	199	(26%)	16.2x	11.0x	(32%)
4	2/13/2020	3/20/2020	1,960	1,299	25	(34%)	19.9x	13.3x	(33%)
Current	12/27/2021	5/24/2022	4,040	2,820	104	(30%)	22.0x	14.2x	(35%)
Average Cycle 1-4					132	(29%)	17.4x	12.2x	(27%)

Source: BofA Global Research, Bloomberg

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Key Catalysts for the industry:

- **Easing of China lockdowns:** COVID lockdowns have impacted demand and disrupted semiconductor manufacturing operations, capping revenue growth. Improvement in supply/demand situation could lead to accelerated growth
- **Funding of CHIPS Act:** Supporting the $50bn CHIPS Act could create positive sentiment around semis, as investment in the ecosystem could increase domestic manufacturing (particularly positive for semicaps)
- **Signs of improving consumer sentiment:** Any positive recovery in sales/momentum across smartphone/gaming/consumer exposed semis could change sentiment around industry.
- **Sustained enterprise momentum:** Continued recovery in enterprise and expanding server/networking equipment demand across hyperscalers could improve sentiment across infrastructure-exposed semis

Our top US semis large-cap pick for is Nvidia (NVDA). NVDA's unique combination of highly leverageable graphics silicon, software, scale, and systems expertise position it at the forefront of some the largest and fastest growth markets in tech including cloud computing/AI, gaming, edge processing, metaverse, and autonomous and electric vehicles. Despite Russia/China headwinds driving near-term gaming headwinds, we believe this offers a necessary reset in NVDA's consumer segments, helping de-risk numbers. Plus, NVDA's data center business is growing at a near 40% CAGR (CY21-24), now nearly half the business, driving an improving margin profile (and sustaining a high multiple). Moving forward, the company should benefit from numerous product launches across data center (Grace CPU, Hopper GPU), gaming (Lovelace RTX 40xx cards), automotive (Drive Orin SoC), and several other markets, supporting consistent 20%+ topline growth. Reiterate Buy and PO.

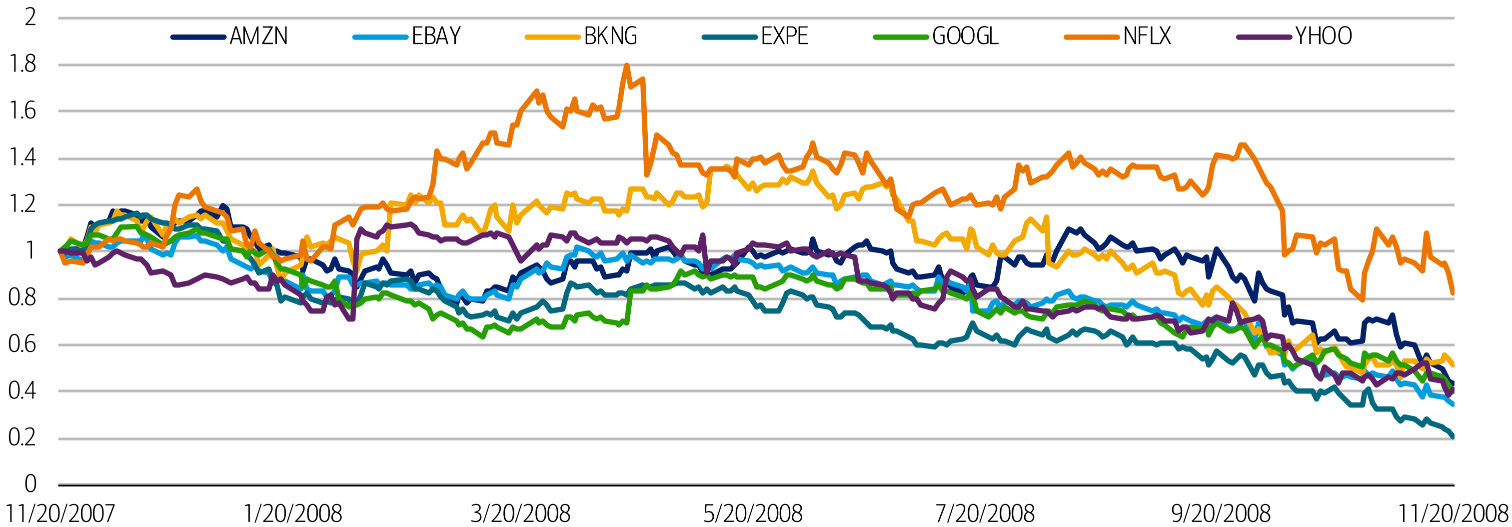
Internet/e-commerce

Justin Post, Nat Schindler, Michael McGovern, Vincent Huebner

Recession risk dominating Internet sentiment

Internet stock sentiment is tied to the outlook for consumer spending and GDP. Our BofA Economists recently lowered their outlook for US GDP growth, and our strategists have suggested the S&P is discounting over a 30% chance of a recession based on stock performance. For our Internet coverage universe, stocks are down close to 50% on average YTD, and valuations (Sales, EBITDA, PE) suggest that the stocks may be discounting an even higher recession probability. We note that the Internet group did not perform well into the 2008-2009 recession, all stocks we covered in consumer Internet at the time were negatively impacted, there was no place to "hide" in the sector (Netflix outperformed the group for the trailing 12 months into the sector bottom, down roughly 20%).

Exhibit 46: Return from November 2007 to GFC Trough
Netflix performed best in the 12 months prior to the GFC



Source: BofA Global Research, Bloomberg

BofA GLOBAL RESEARCH

The good news for stock performance from here is that the US could avoid a recession, as employment data remains strong. Also, large cap. Internet valuations are in the lower half of historical ranges, and a 10 turn P/E multiple premium to the S&P entering 2022 has evaporated, similar 2008 and 2020 recessions. Biggest risk from here, in our view, is not multiple compression vs S&P, but that 2023 estimates are revised down.

Recession stocks and risk on stocks

Given expected US interest rate hikes over the next few months, we now believe a sustainable risk-on trade is unlikely until the Fall (unless the Ukraine conflict is resolved), or not until 2023 if the US enters a 4Q recession. We outline top stocks for recession and for a potential/eventual "risk-on" scenario below.

Recession scenario – Top stocks are Alphabet, Facebook & Match:

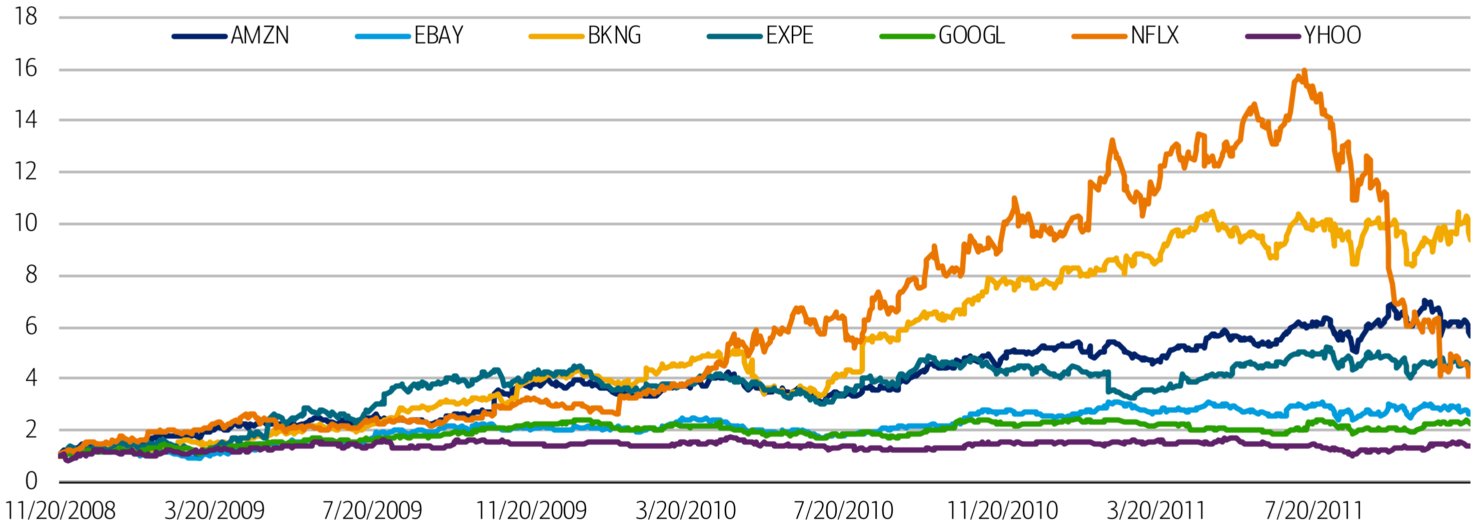
Looking back at the 2008-2009 recession, Alphabet's revenue growth missed expectations and slowed to 5%. However, OpEx fell y/y, operating margins increased from 41% to 46%, and EPS grew 30% y/y. While revenue estimate cuts for advertising stocks are very likely in a recession scenario, we think both Meta ($12bn in est. Reality Labs losses) and Alphabet ($5bn in other bets losses) have the most potential investment spending and bonus accrual flexibility that could enable these companies to grow earnings in a moderate recession scenario. We also like Match, where revenues could be more resilient to a recession, the company has strong margins (limiting balance sheet risk or refinancing risk), and the stock has a more attractive FCF valuation multiple vs most of its Internet peers.

Risk on Trade – Share gainers including Amazon, Airbnb, DoorDash, Snap:

For a more positive "risk-on" environment we prefer share gainers, which outperformed after the Nov. 2008 sector bottom. Amazon has depressed revenue growth, margins and earnings on unusual 2Q eCommerce comps and overcapacity, and has ability to grow into capacity and realize earnings above Street estimates over the next 12-24 months. We think Amazon will gain share in eCommerce following massive fulfilment investment, Snap can gain share in media as new surfaces are monetized, Airbnb will have strongest multi-year growth in travel as Alternative Accommodations take share (though we prefer OTAs today), and DoorDash can gain share in delivery. During the 5-day stock recovery in March, for large caps (over $25bn), Snap outperformed in Media Airbnb in Travel, Dash in transportation, while eBay was up 12% vs Amazon at 11%.

Exhibit 47: Return from GFC Trough-2012

Booking performed best in the 3 years following the GFC



Source: BofA Global Research, Bloomberg

BofA GLOBAL RESEARCH

Networking & Security

Tal Liani, Jonathan Eisenson, Madeline Brooks, Tomer Zilberman

Industry backdrop heading into the 2H

Macro headwinds creating volatility: Rising inflation and interest rates, as well as concerns over growth sustainability drove a sector-wide correction to stock valuation levels, with cybersecurity valuations falling from a mean of 10.5x CY23 EV/Sales to about 7x, a decrease of -33% YTD, while networking valuations have been cut by -21% YTD. Implicitly, higher risk and interest rates imply greater required return, which in turn increases the WACC in any DCF calculation, hence the compression in valuations. We expect these headwinds to persist in the near to mid-term as rate hikes continue and inflation climbs.

Poor visibility into the supply chain: The supply chain continues to remain challenged with both cybersecurity and networking vendors expecting constraints to remain until at least 2023 (vs. prior expectations of easing in 2H22). However, we note that the vendors have poor visibility into the supply chain with some companies, such as Arista and F5, noting an uptick in supplier de-commitments. Arista management noted purchasing components in the broker market for up to 100x the normal cost, supporting top-line growth but negatively impacting margins in the last quarter. We flag the risk of an increasing number of supplier de-commitments across vendors, as well as the risk of the broker market drying up, impacting ability to ship and thus revenue growth, such as what F5 experienced in 1Q22. We note that cyber companies are more resilient to supply chain given the software and service nature of their businesses and demand for cybersecurity services is also more resilient than networking with an almost inelastic demand curve when compared to economic conditions.

Long-term 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. Cybersecurity 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 the current upcycle will continue in the intermediate term as Cloud Titans address traffic growth with new data center buildouts, Service Providers invest in 5G, and Cable Operators drive fiber deeper into the neighborhood and invest in capacity upgrades via new protocols.

Top stock ideas: QCOM, CRWD, ZS, JNPR

Our top picks heading into the BofA tech conference and 2H22 are QCOM, CRWD, ZS, and JNPR. We favor stocks that continue to execute ahead of Street expectations despite macro headwinds and ongoing supply chain constraints.

- **Qualcomm (QCOM; $156.5bn):** Qualcomm's stock has declined 24% YTD and underperformed the market by 2%, yet we remain positive given the company's strong leadership position in handsets and management's strategy for diversifying revenues beyond mobile into adjacent markets like radio frequency front-end (RFFE), IoT, and autos. Qualcomm has consistently posted stronger-than-expected fundamentals, with revenues growing 41% in the latest quarter (to $11.2bn) and operating margins reaching 39%, up from 34% only one year prior, largely driven by continued positive mix shifts by key OEMs to high and premium-tier smartphones. Qualcomm largely focuses on higher-tier devices, and despite some recent weakness for lower-tier handsets, the company continues to see strong traction across all technologies. In the most recent quarter, management also discussed its growth at Samsung, with Snapdragon chips now accounting for 75% of all Galaxy S22 smartphone volume, up from 40% of S21 volume. Lastly, we recently published a deep dive (see linked report) about several key investor concerns such as Qualcomm's exposure to the Chinese smartphone market and the risk of losing Apple's contribution to semiconductor revenues in coming years. We note that growth within the Android ecosystem, where major OEMs like Xiaomi, Oppo, Vivo, and Honor continue to transition to premium-tier snapdragon, and growth of non-handset segments should more than offset the expected decline in Apple revenues, with Qualcomm's leadership position within China also not believed to be at risk. Reiterate Buy and PO.

- **CrowdStrike (CRWD; $38.2bn):** Following a 20% reduction in the share price YTD, we believe CrowdStrike's stock is attractive for a few reasons. First, we believe the market opportunity is vast, and the company continues to grow its TAM by introducing additional modules, supported by the increasing importance of data-driven resources and the evolving threat landscape. The company keeps delivering better-than-expected results, driven by continued zero trust adoption, legacy displacements, and migration to cloud. We highlight limited competition for cloud-based, next-generation endpoint solutions, which results in sustainably high ARR growth rates, at 60-70% YoY. CRWD has managed to double its market share in the Endpoint Protection Platform (EPP) market to 12% in the last two years by helping customers migrate from legacy antivirus to Cloud-based solutions, with 22 value-add modules addressing different aspects of security. At the recent analyst day, Management highlight that EPPs have only reached 35% penetration within enterprises, which is closer to 3% and 1% across the mid-market and SMBs, respectively. We believe CrowdStrike should continue to gain share as the digital transformation and cloud adoption create more complex enterprise networks with more total endpoints. Reiterate Buy and PO.

- **Zscaler (ZS; $21.9bn):** Zscaler continues to execute well amidst a challenging macro environment, and is poised to benefit from secular trends including enterprise digitalization and the adoption of zero trust architectures. 3Q results beat across the board, with billings of $345mn growing over 50% YoY for the ninth quarter in a row. The company's platform approach has been highly successful, with the majority of net new customers now purchasing ZIA and ZPA together, with a growing trend of customers also purchasing ZDX due to the complementary nature of the product portfolio. Zscaler has also seen significant up-sell momentum, with a net dollar retention rate that continuously trends above 125%. In the recent 3Q earnings call, management highlighted continued strong demand and outsized growth opportunity, despite tough macro headwinds, and plans to maintain the current balance between reinvestment in growth and operating leverage, with a focus on continuing to build a robust sales org. We believe Zscaler exhibits a superior growth trajectory compared to peers, and we expect continued outperformance driven by their strong product portfolio coupled with favorable industry tailwinds. Reiterate Buy and PO.

- **Juniper (JNPR; $9.9bn):** We continue to be positive on Juniper and we believe the acceleration in order growth (four consecutive quarters of double-digit growth on an adjusted basis) will translate into higher revenue growth in 2022 and 2023, especially once supply chain constraints begin to alleviate. However, we flag the risk of tough comps ahead as the upcoming 2Q22 will be the first quarter that laps the strong order growth seen. Juniper sees strong order momentum across customer verticals and solutions, with solid underlying demand for Cloud and Data Centers and strong spending growth among Service Providers driving the growth. Juniper's Mist acquisition is helping the company grow its Enterprise business, from being historically weak to the largest customer vertical in the company's history in 1Q22 at ~37% of total revenue. We recently published an in-depth primer (note) (see note linked) on the Networking sector and Juniper's positioning in both the switching and routing markets. Reiterate Buy and PO.

IT Hardware

Wamsi Mohan, Ruplu Bhattacharya, Esha Vaish, Jong Lee

2H: supply/freight issues; concerns on spend sustenance

The S&P500 Information Technology index has declined -19% YTD, underperforming the S&P 500 broader index, which has fallen -13% YTD. This suggests that investors are more bearish on IT Hardware stocks vs. the overall market, which is most related to concerns around sustenance of enterprise spending (given recent weakness in consumer spending). Industry experts have indicated that IT spending is likely to outperform GDP in S/T, and we see some parts of hardware more at risk (consumer PCs, 2H demand signals weak for storage, consumer end market linked hardware names, autos exposed hardware manufacturers). We see greater resilience in our IT transformation and hybrid cloud linked names (including IBM).

Heading into C2H22, the other issues for our coverage universe is supply and freight issues (we expect them to persist at least till end of 2022 vs. earlier expectation that issues would ease in 2H). Despite recent China lockdowns, we see AAPL navigating supply issues, and IBM as limited in exposure (given large software portfolio). IBM has limited exposure to China, and its software/consulting portfolio is un-impacted.

Multiple re-rate creating larger M&A opportunity

We see IBM likely to be a key name in M&A through this cycle, given that the business is primed to generate $17bn of excess FCF after dividends across 3-years and has additional debt headroom available/scope for equity raise. In our opinion, the focus is likely to be on software targets, where multiples have seen large de-rate given current macro environment uncertainty and concerns around spending.

IT Hardware Top Picks: AAPL and IBM

Our recent analysis showed (see our 3 May 2022 IT Hardware Industry report) that AAPL and IBM have shown resilience in earnings during recessions and outperformed vs. the average peak-to-trough declines of 40-60% seen across our universe in past downturns.

AAPL has been able to grow earnings, even during the last two downturns, due to new product category launches including the introduction of the iPhone in 2007. We see several tailwinds for AAPL currently, both on hardware (AR/VR-led iPhone upgrade cycle, new revenue stream from new products) and services side (acceleration in services, growth in users and average selling prices, increased penetration of IB). Reiterate Buy. Our PO of $200 is based on approx. 30x our C23E EPS of $6.64.

IBM has seen its stock price decline 20-40% during recessions; but during 2007-2009 saw a strong recovery in earnings coming out of the recession. In our view IBM has a better cost basis to weather a downturn currently given: (1) the spin-off of its infrastructure services business Kyndryl and the sale of the health assets improves margins and FCF proportionate to new revenue base, (2) half of revenue streams are recurring (in software and services) and that provides greater stability to earnings, (3) labor shortages/inflation greater cyclical demand for parts of IBM portfolio, including automation and tech consulting, and (4) recent mainframe refresh creating boost for infrastructure revenues at least through C1H23. In our recent investor call (see our 16 May 2022 IBM CEO call note), CEO Arvind Krishna stated that he would expect IBM to meet mid-term guidance even with some economic slowdown given increasing software/consulting mix. Reiterate Buy. Our PO of $165 is based on 15x our C23 EPS est. of $10.94.

Appendix

Table 1: Relative Valuation (vs. S&P 500) for Information Technology (based on data from 1986 - 05/22)
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**
Communication Equipment (5)	1.31	0.96	-26%	0.97	1.37	42%	0.84	1.13	35%
Electronic Equipment Instruments & Components (8)	1.05	0.87	-18%	1.23	1.27	4%	1.07	1.07	0%
IT Services (19)	1.70	1.54	-10%	1.39	1.19	-14%	1.29	1.13	-13%
Semiconductors & Semiconductor Equipment (20)	1.26	1.25	-1%	1.04	1.01	-3%	0.92	1.05	13%
Software (16)	2.66	2.02	-24%	1.52	1.55	2%	1.47	1.27	-13%
Technology Hardware Storage & Peripherals (6)	6.22	1.24	-80%	1.19	0.96	-20%	1.23	0.97	-21%

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

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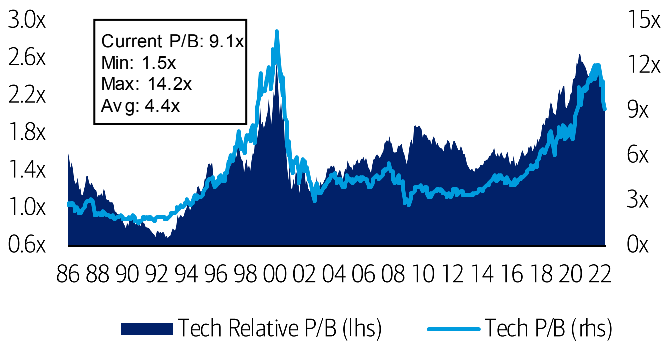
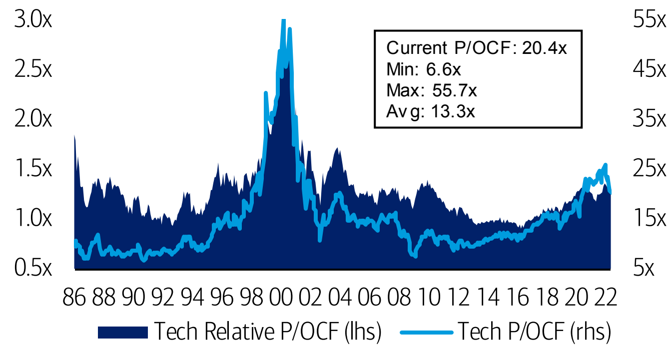
Exhibit 48: Technology trades at 9.1 P/B vs. 4.4 historically
Technology P/B and Relative P/B Vs. S&P500, 1986-05/22



Source: Compustat, BofA US Equity & US Quant Strategy

BofA GLOBAL RESEARCH

Exhibit 49: Technology trades at 20.4 P/OCF vs. 13.3 historically
Technology P/OCF and Relative P/OCF vs. S&P500, 1986-05/22



Source: Compustat, BofA US Equity & US Quant Strategy

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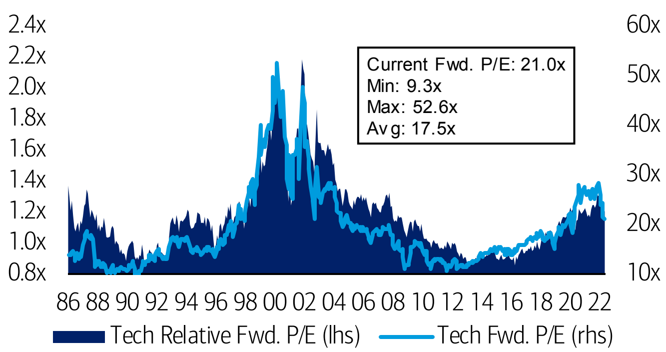
Exhibit 50: Technology trades at 21.0 Fwd. P/E vs. 17.5 historically
Technology Fwd. P/E and Relative Fwd. P/E vs. S&P500, 1986-05/21



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

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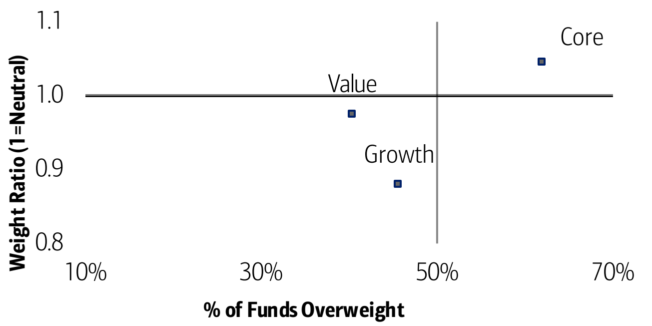
Long-only fund positioning

Information Technology

Exhibit 51: Value and Growth Managers are both u/w Info Tech Sector
Fund Managers' positioning in Technology sector, April 2022



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

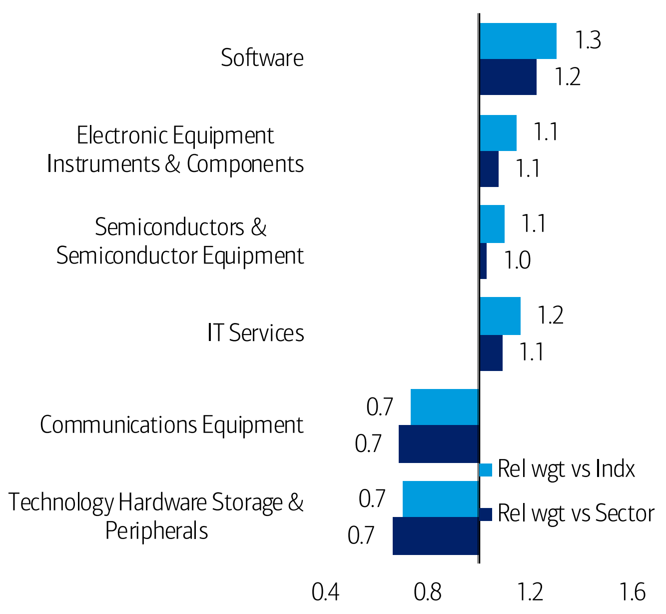
Exhibit 52: Most overweight stocks in Information Technology
April 2022

Ticker	Company Name	Industry	Rel Wt	% Funds Holding Stock
APH	Amphenol Corp-A	Electronic Equip.	2.30	13%
CTSH	Cognizant Tech-A	IT Services	2.08	16%
INTU	Intuit Inc	Software	2.00	37%
NOW	Servicenow Inc	Software	1.87	31%
NTAP	Netapp Inc	Hardware Storage & Periph.	1.85	8%
AVGO	Broadcom Inc	Semis	1.82	22%
TEL	Te Connectivity	Electronic Equip.	1.77	14%
ROP	Roper Technologi	Software	1.74	15%
JNPR	Juniper Networks	Communications Equip.	1.67	3%
FISV	Fiserv Inc	IT Services	1.66	18%

Source: BofA US Equity & US Quant Strategy, FactSet Ownership. The BofA Fundamental analysts' stock recommendations are included for informational purposes only and are not used in this Quantitative model. The 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 53: Fund managers are most o/w Software and most u/w Tech hardware storage & peripherals
Industry Exposure (All Styles), April 2022



Source: BofA US Equity & US Quant Strategy

BofA GLOBAL RESEARCH

Exhibit 54: Most underweight stocks in Information Technology
April 2022

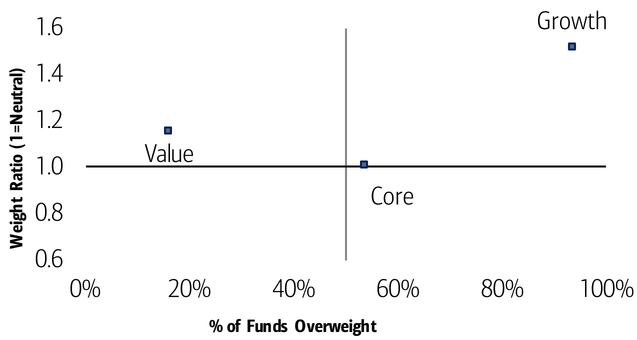
Ticker	Company Name	Industry	Rel Wt	% Funds Holding Stock
JKHY	Jack Henry	IT Services	0.01	4%
CTXS	Citrix Systems	Software	0.04	4%
IBM	Ibm	IT Services	0.05	13%
SEDG	Solaredge Techno	Semis	0.08	4%
SWKS	Skyworks Solutio	Semis	0.08	7%
STX	Seagate Technolo	Hardware Storage & Periph.	0.12	5%
WDC	Western Digital	Hardware Storage & Periph.	0.16	4%
QRVO	Qorvo Inc	Semis	0.17	4%
ENPH	Enphase Energy	Semis	0.23	9%
IPGP	Ipg Photonics	Electronic Equip.	0.23	3%

Source: BofA US Equity & US Quant Strategy, FactSet Ownership. The BofA Fundamental analysts' stock recommendations are included for informational purposes only and are not used in this Quantitative model. The 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 55: Growth managers are 40% overweight Communication Services sector
Fund Managers' positioning in Communication Services sector, April 2022



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

BofA GLOBAL RESEARCH

Exhibit 56: Most overweight stocks in Communication Services
April 2022

Ticker	Company Name	Industry	Rel Wt	% Funds Holding Stock
DISH	Dish Network-A	Media	2.73	4%
MTCH	Match Group Inc	Interactive Media & Services	2.71	17%
NFLX	Netflix Inc	Entertainment	2.20	38%
FOXA	Fox Corp - A	Media	2.00	6%
FB	Meta Platforms-A	Interactive Media & Services	1.91	60%
CHTR	Charter Commun-A	Media	1.73	19%
CMCSA	Comcast Corp-A	Media	1.70	32%
GOOG	Alphabet Inc-C	Interactive Media & Services	1.52	54%
GOOGL	Alphabet Inc-A	Interactive Media & Services	1.26	67%
LYV	Live Nation Ente	Entertainment	1.11	8%

Source: BofA US Equity & US Quant Strategy, FactSet Ownership. The BofA Fundamental analysts' stock recommendations are included for informational purposes only and are not used in this Quantitative model. The 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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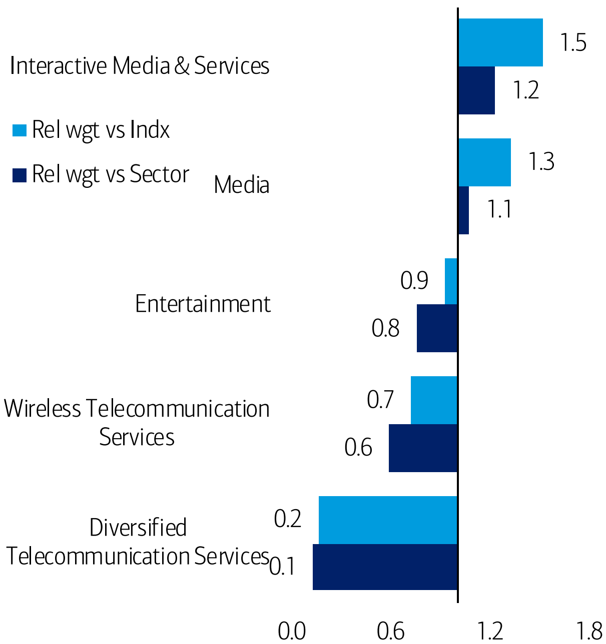
Exhibit 57: Fund managers are most o/w Interactive Media & Svcs
Industry Exposure (All Styles), April 2022



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

BofA GLOBAL RESEARCH

Exhibit 58: Most underweight stocks in Communication Services
April 2022

Ticker	Company Name	Industry	Rel Wt	% Funds Holding Stock
WBD	Warner Bros Disc	Media	0.01	3%
LUMN	Lumen Technologi	Diversified Telecom	0.03	4%
PARA	Paramount Glob-B	Media	0.03	5%
T	At&T Inc	Diversified Telecom	0.08	10%
VZ	Verizon Communic	Diversified Telecom	0.23	22%
NWS	News Corp-Cl B	Media	0.26	2%
OMC	Omnicom Group	Media	0.40	7%
IPG	Interpublic Grp	Media	0.45	8%
DIS	Walt Disney Co/T	Entertainment	0.50	41%
ATVI	Activision Blizz	Entertainment	0.58	15%

Source: BofA US Equity & US Quant Strategy, FactSet Ownership. The BofA Fundamental analysts' stock recommendations are included for informational purposes only and are not used in this Quantitative model. The 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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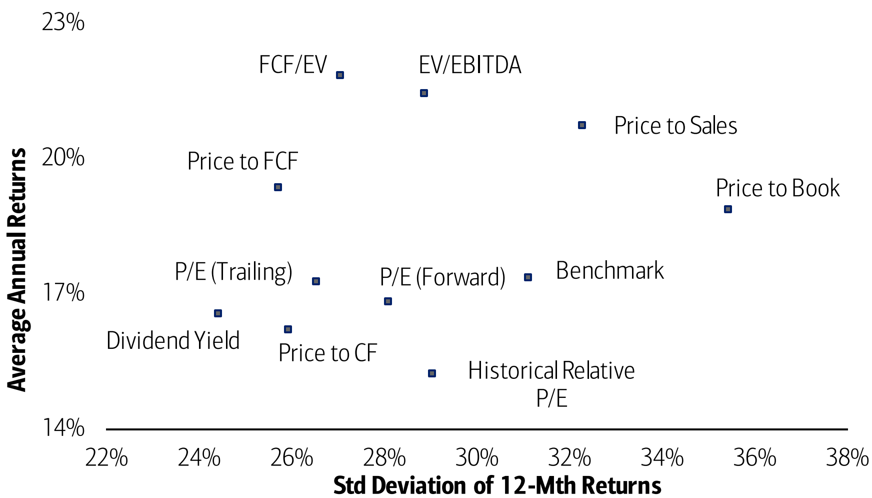
Factors to watch

Exhibit 59: Most predictive long-short factors for TMT
Analysis spans 1985 to May 2022, 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, ROE (1-Yr)
Media & Entertainment	Price to Sales, EV/EBITDA	12-Mth Return and 1-Mth Reversal, Trading Volume	PEG Ratio	ROE (1-Yr)

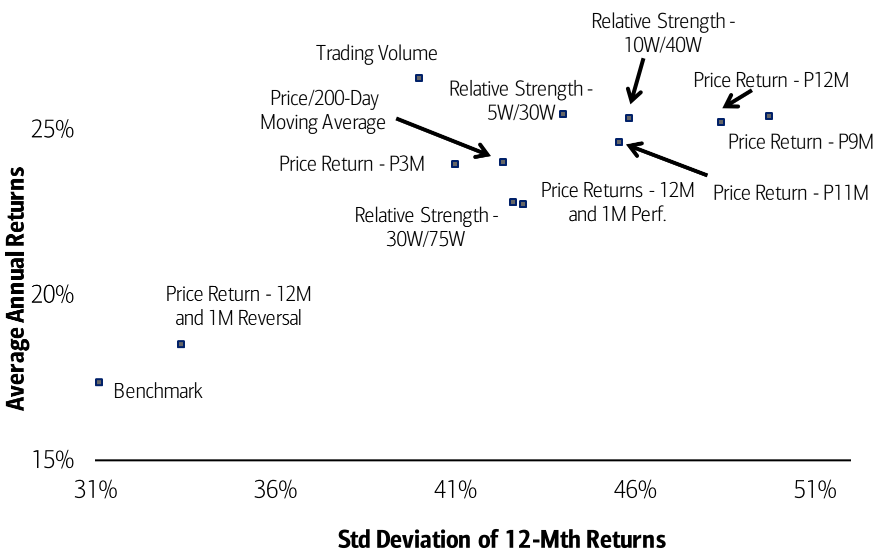
Source: BofA US Equity & US Quant Strategy
Note: Based on factors with best return vs. hit rate combo in charts below. This performance is back-tested and does not represent the actual performance of any account or fund. Back-tested performance depicts the theoretical (not actual) performance of a particular 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 60: Valuation Strategies for Information Technology: Top Quintile Returns (1985 to 2022)
FCF/EV outperformed the index most



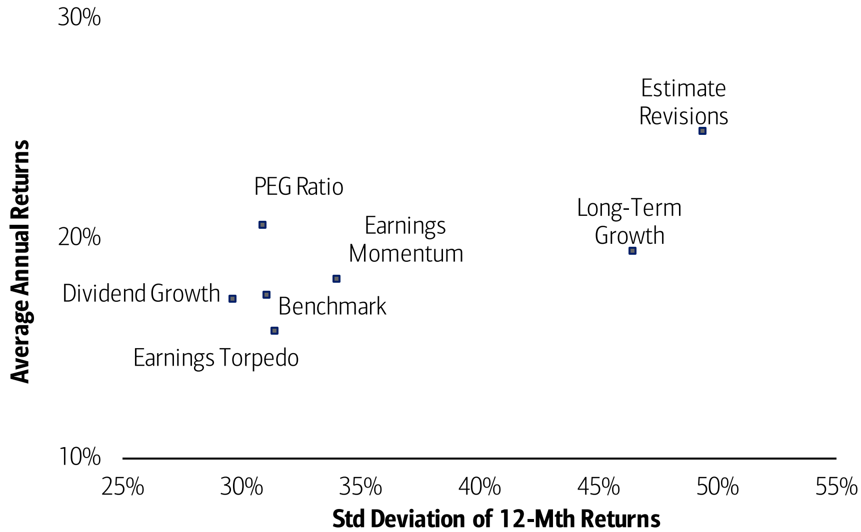
Source: BofA US Equity & Quant Strategy
BofA GLOBAL RESEARCH

Exhibit 61: Momentum Strategies for Information Technology: Top Quintile Returns (1985 to 2022)
Trading Volume outperformed the index most



Source: BofA US Equity & Quant Strategy
BofA GLOBAL RESEARCH

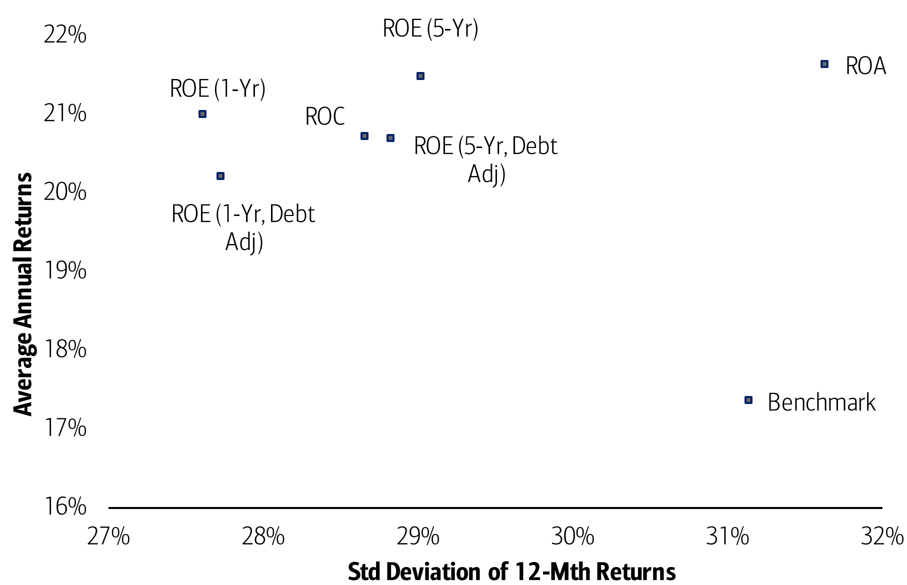
Exhibit 62: Growth Strategies for Information Technology: Top Quintile Returns (1985 to 2022)
EPS Revisions outperformed the index most



Source: BofA US Equity & Quant Strategy

BofA GLOBAL RESEARCH

Exhibit 63: Quality Strategies for Information Technology: Top Quintile Returns (1985 to 2022)
ROA outperformed the index most

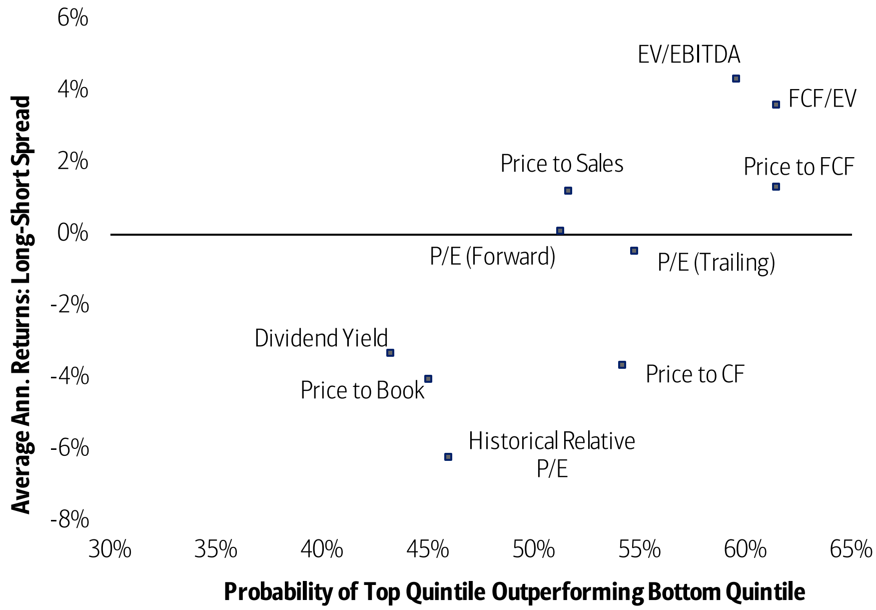


Source: BofA US Equity & Quant Strategy

BofA GLOBAL RESEARCH

Long-Short: Quintile 1 / Quintile 5 Spread

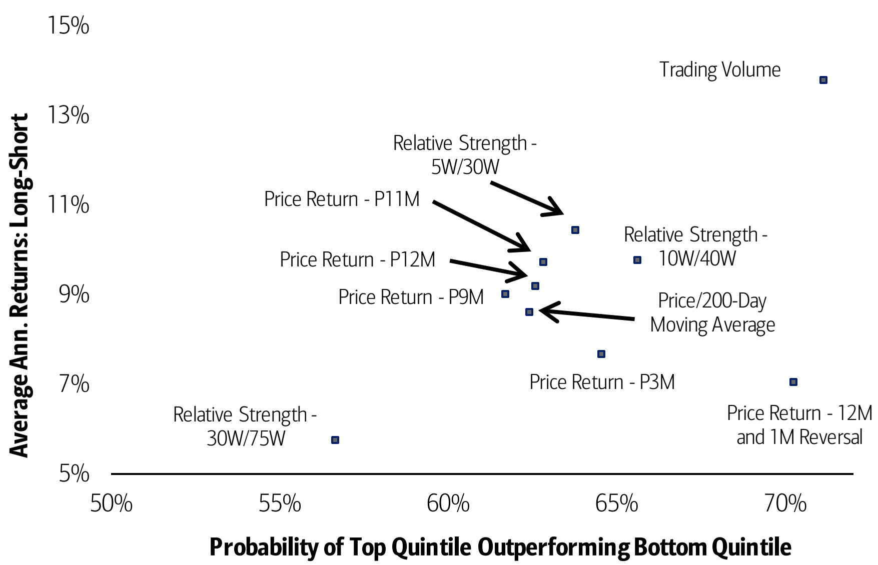
Exhibit 64: Valuation Strategies for Information Technology: Avg Long-Short Spreads vs. Consistency of Spreads (1985 to 2022)
EV/EBITDA and FCF/EV fared best



Source: BofA US Equity & Quant Strategy

BofA GLOBAL RESEARCH

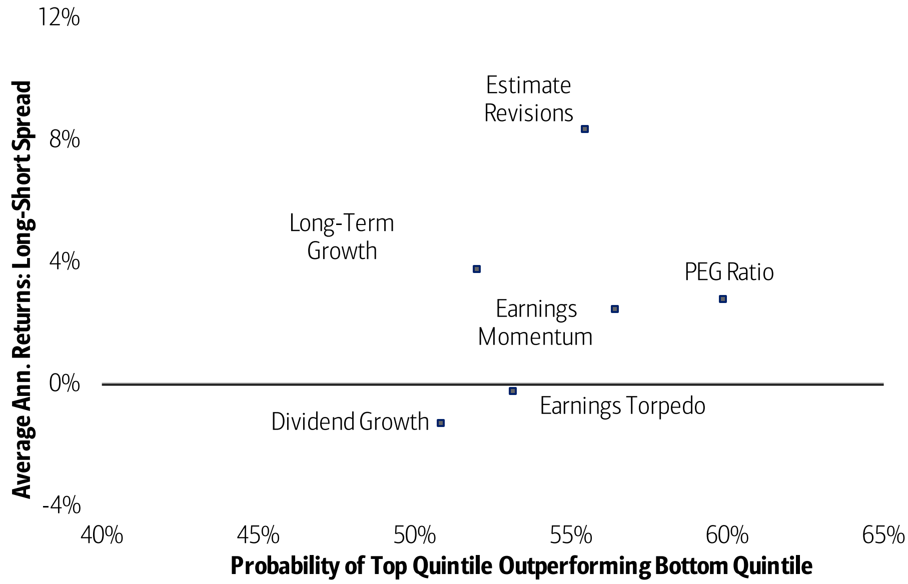
Exhibit 65: Momentum Strategies for Information Technology: Avg Long-Short Spreads vs. Consistency of Spreads (1985 to 2022)
High Trading Volume fared best



Source: BofA US Equity & Quant Strategy

BofA GLOBAL RESEARCH

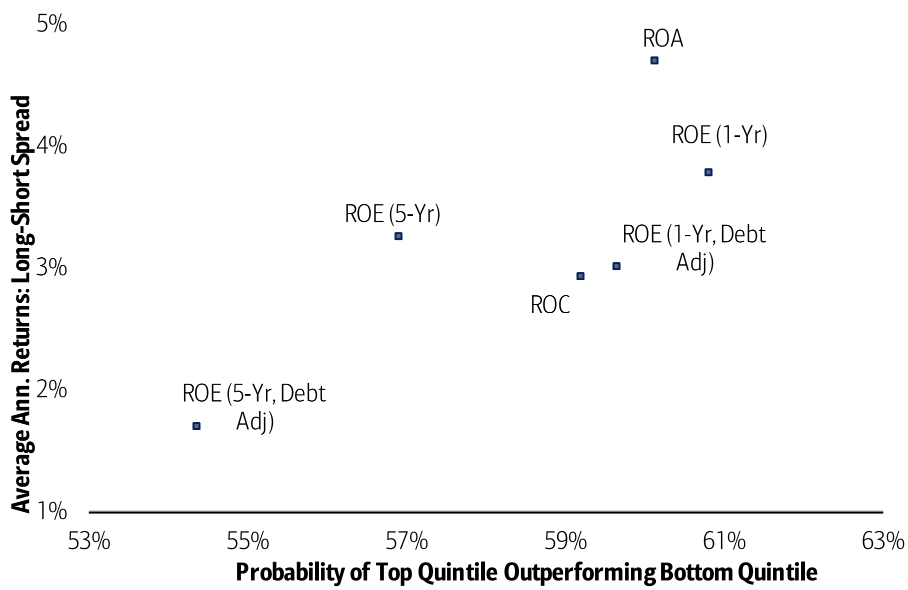
Exhibit 66: Growth Strategies for Information Technology: Avg Long-Short Spreads vs. Consistency of Spreads (1985 to 2022)
EPS Estimate Revisions fared best



Source: BofA US Equity & Quant Strategy

BofA GLOBAL RESEARCH

Exhibit 67: Quality Strategies for Information Technology: Avg Long-Short Spreads vs. Consistency of Spreads (1985 to 2022)
ROA fared best



Source: BofA US Equity & Quant Strategy

BofA GLOBAL RESEARCH

Tech factor performance

Note: The analysis of Russell 1000 Tech factor returns in Exhibit 59-Exhibit 67 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 68: Mentioned stocks and QRQ ratings
Stocks mentioned in the report

Ticker	Company name	Last price	BofA Rating	QRQ	Analyst
AMZN	Amazon.com, Inc.	$2,510	BUY	B-1-9	Post,Justin
FB	Meta Platforms Inc. Class A	$199	BUY	B-1-9	Post,Justin
MTCH	Match Group, Inc.	$84	BUY	B-1-9	Schindler,Nat
GOOGL	Alphabet Inc. Class A	$2,352	BUY	B-1-9	Post,Justin
GOOG	Alphabet Inc. Class C	$2,355	BUY	B-1-9	Post,Justin
ABNB	Airbnb, Inc. Class A	$121	NEUTRAL	C-2-9	Post,Justin
DASH	DoorDash, Inc. Class A	$73	BUY	C-1-9	McGovern,Michael
SNAP	Snap, Inc. Class A	$15	BUY	C-1-9	Post,Justin
QCOM	Qualcomm Incorporated	$146	BUY	B-1-7	Liani,Tal
JNPR	Juniper Networks, Inc.	$31	BUY	B-1-7	Liani,Tal
CRWD	CrowdStrike Holdings, Inc. Class A	$174	BUY	C-1-9	Liani,Tal
ZS	Zscaler, Inc.	$161	BUY	C-1-9	Liani,Tal
NOW	ServiceNow, Inc.	$505	BUY	B-1-9	Sills,Brad
NVDA	NVIDIA Corporation	$196	BUY	B-1-7	Arya,Vivek
AAPL	Apple Inc.	$151	BUY	B-1-7	Mohan,Wamsi
IBM	International Business Machines Corporation	$140	BUY	B-1-7	Mohan,Wamsi

Source: BofA Global Research

BofA GLOBAL RESEARCH

Price objective basis & risk

Airbnb (ABNB)

Our $160 price objective is based on 10x our 2023 Revenue estimate. This is a premium to our Marketplace comp group average at 6-10x reflecting still early alternative accommodation market penetration, category leadership, and significant margin growth opportunity from 2023 levels.

Risks are: 1) multiple compression given high relative valuation, 2) potential for increased competition from direct competitors or traffic aggregators (Google) driving up marketing spend, 3) growth or margin improvement below expectations on declining ADRs, and 4) listing supply limitations impact growth.

Alphabet (GOOGL / GOOG)

Our price objective of $2,940 is based on 20x 2023E core Google GAAP EPS plus cash. Alphabet has traded at an average multiple of 23x GAAP P/E over the last ten years and we think our multiple is reasonable vs. history given two-year average revenue growth rate of 16%.

Downside risks to our PO are: 1) Search revenue growth decelerates faster than anticipated due to market maturity, 2) mobile transition drives negative search behavior changes, 3) revenue growth pressure from competitor initiatives, 4) margins disappoint due to revenue mix and investment initiatives, and 5) negative regulatory changes, including EU antitrust. The stock has been subject to heavy volatility in the past based on revenue growth and margin trends and this volatility could increase if economic conditions deteriorate.

Amazon.com (AMZN)
Our PO of $3,770 is based on our SOP analysis that values the 1P retail business at 1.0x 2023E revenue (including subscription/Prime membership fees), 3P retail business at 3.0x 2023E Revenue, AWS at 9.0x 2023 Sales, and the advertising business at 5.0x 2023 Sales. For 2023E, our 8.5x AWS multiple is relatively in line with our SaaS comps at 8.4x, our 1.0x GMV multiple is a discount to our retail comps at 1.1x, and our 5.0x advertising multiple is approximately in line with our digital advertising comps at 4.6x. We use a premium for AWS given faster growth than large cap SaaS peers.

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.

Apple Inc. (AAPL)
Our PO of $200 is based on approx. 30x our C23E EPS of $6.64. Our target multiple compares to the long-term historical range of 9-34x (median 13x). We believe a multiple at the higher end of the historical range is justified given a large cash balance and opportunity to diversify into new end markets, increasing mix and diversity of services.

Downside risks are unexpected COVID-19 related shutdowns and production disruptions, worsening component availability and/or higher logistics costs, gross margin pressure from higher BOM costs, order cuts which in prior years have been in the Jan/Feb timeframe, delayed product launch, and increased competition. Other risks are potential trade conflicts, tariffs, a stronger USD, longer iPhone replacement cycles, commoditization in the smartphone market, intensifying competition in the tablet market, ability to manage beat and raise expectations for EPS estimates, and requirement to maintain pace of product innovation.

Upside risks are stronger than expected 5G cycle, gross margin upside from better mix of higher end iPhones, tailwinds from lower memory costs, and a faster than expected recovery in emerging markets.

CrowdStrike Holdings Inc. (CRWD)
Our PO of $210 is based on roughly 16.6x our CY23E EV/Sales. We choose EV/Sales as our target valuation metric due to CrowdStrike's early growth stage and investment period making the profitability level still in early stages. The multiple is in-line with, to slightly above, SaaS-based software peers (10-25x) and SaaS/cyber security peers (15-30x), but slightly below high-growth SaaS at roughly 30-40x. We believe a premium valuation is warranted due to CrowdStrike's higher growth profile and potential to take meaningful share in new markets that would increase TAM and potentially accelerate growth. The positives of CrowdStrike's high growth and long-term opportunities are somewhat offset by lower margins and expected growth deceleration.

Upside risks to our PO are: 1) faster-than-expected adoption of CrowdStrike's new cloud modules and 2) a faster displacement of legacy players with next-gen, cloud-native architectures.

Downside risks to our PO are: 1) investor sentiment and sensitivity to the premium valuation levels, 2) a lower take-rate of new offerings, 3) potential slowdown in new customer adoption and expansion deals, 4) risk of security breaches, and 5) an increase in competition from incumbent vendors and newer next-gen players.

DoorDash (DASH)

Our PO of $105 is based on our Gross Order Value multiple analysis. We apply a 0.7x 2023E GOV multiple, including the Wolt acquisition, and excluding 10% for Tips. We think a 0.7x bookings multiple is fair for an Online marketplace growing at a nearly 90% 3-Yr CAGR, with strong underlying profitability underpinning investment areas. Our 0.7x multiple is a premium to marketplace comps at just 0.3x, but they have traded down signifcantly in the recent market downturn. We think a premium for DoorDash is warranted given its higher growth profile and margins. Our 0.7x GOV multiple translates to an Enterprise Value of $43bn, or a market cap of $45bn including $2bn in Cash. We get to a $105 Price Objective based on 430mn shares, including about 40mn shares for the Wolt acquisition.

Risks are: 1) Slowing industry growth in 2021 puts premium valuations at risk, 2) DASH potentially faces tougher comps than competitors, 3) Entrenched incumbents in adjacent categories (including AMZN), 4) Regulatory battle is not over yet, despite Prop 22.

International Business Machines Corp. (IBM)

Our PO of $165 is based on 15x C23 EPS est. of $10.94. Our target multiple for IBM is still a 30% discount to large cap technology peers, as we believe there is still execution risk with its strategy to transform the business towards hybrid cloud and AI, although we do see improving growth and FCF trajectory with the Red Hat acquisition.

Downside risks to our price objective are: (1) failure to execute on the company's growth roadmap, (2) inability to realize expected cost savings from restructuring, (3) technology/competitor risk in hardware, software, and services, (4) unforeseen currency impacts on revenue and profits, (5) acquisition integration, given IBM's acquisitive nature, and (6) increased concern of economic uncertainty and tightening corporate IT budgets.

Upside risks are: (1) faster reacceleration of topline, (2) faster improvement in margins, (3) better than expected accretion from M&A, and (4) deliver upside to FCF.

Juniper Networks (JNPR)

Our $40 PO is based on roughly 18x our FY2023 EPS estimate, which is slightly above peers (avg. 14-16x) growing revenues in the mid-single digits and EPS in the high-single digits. Solid underlying demand for Cloud and Data Centers, strong spending growth among SPs, and Juniper's apparent order growth should help drive revenue growth acceleration in 2022 and onwards.

Downside risks to our price objective: 1) a slowdown in demand for high-end networking equipment due to a weak economic environment, 2) commoditization of networking hardware in the data center creating price pressure, 3) difficulty in penetrating new markets with new products, 4) competition in next-generation markets like SDN and NFV from larger competitor Cisco and start up companies, 5) a need to execute on new product cycles to support growth.

Upside risks to our price objective: 1) better than expected execution with new products that could translate into higher than anticipated growth rates, 2) any improvement in Cloud and Service Provider spending environments.

Match Group (MTCH)

Our PO of $168 is based on 40x our estimated 2022E EBITDA, which is a premium to peers due to its superior growth outlook and potential for faster than expected profit margin expansion.

Downside risks are: market share losses to an emerging dating business, potential for higher acquisition costs on mobile, lower conversion rates that lead to lower PMC growth, the need to acquire competing sites to maintain growth or market share, and higher-than-expected International investments. An extended outbreak of COVID-19 or a longer/secondary lockdown period would likely weigh on top-line. The biggest downside risk is lower revenue if Tinder experiences a decline in popularity or public perception.

Meta Platforms (FB)

Our $262 price objective is based on 18x 2023 GAAP EPS plus cash. On a total company basis, including metaverse investments, our valuation reflects a premium to the S&P 500, which we see as reasonable given superior growth, potentially under-monetized (Messenger, Marketplace, Reels) and large Metaverse investment pressuring earnings. The core FB valuation embedded in our PO is well below the S&P.

Risks are: 1) decline in user activity from competition such as TikTok impacts revenue growth, 2) margin profile of the company is more negative than expected as Meta diversifies away from advertising, 3) privacy issues impact revenue generation, 4) Messenger & WhatsApp monetization fails to materialize as expected, 5) potential for Street to assign a negative value for Metaverse investments (e.g. Reality Labs given massive investments), and 6) there is potential for a conglomerate or regulatory discount on the stock.

NVIDIA Corporation (NVDA)

Our $270 PO is based on 39x CY23E PE ex cash, within NVDA's historical 20x-67x forward PE range, and represents roughly 1.5x NVDA's long-term 25-30% EPS growth potential.

Risks to our price objective are: 1) exposure to PC market, 2) Competition with INTC & PLD companies in HPC/accelerated computing markets and MCU vendors in Autos. 3) Lumpy and unpredictable sales in new enterprise, data center, and autos markets, 4) Potential for decelerating capital returns, 5) potential for autos slowdown until ADAS becomes more meaningful, and 6) elevated opex growth.

Qualcomm (QCOM)

Our $180 PO is based on roughly 13.7x our FY23E P/E, with FY23 reflecting the second full year of Apple contributions to QCT and QTL in the model. Our multiple is a premium to mobile/large cap semiconductor peers (14x), which we believe is warranted given the stability of Qualcomm's high-margin royalty business now that Apple legal disputes have been resolved, as well as its high 5G baseband market share, and 5G RF front-end content market share.

Downside risks to our price objective are 1) worse-than-expected resolution terms with Huawei, 2) low adoption rate of smartphones worldwide due to global economic pressure, 3) pressure on semiconductor pricing or market share as the company grows presence in emerging markets, 4) increased semiconductor competition, 5) ability to maintain the royalty rate when the market expands to different types of devices, such as tablets and other mobile wireless devices, or different technology generations, 6) any future negative trade policies related to China

ServiceNow (NOW)

Our price objective of $680 is based on 45x our C23e FCF estimate of $2.95bn, representing an EV/FCF/Growth multiple of 1.7x our estimated two year FCF CAGR of 29%, a premium to the large cap GARP group trading at 1.2x EV/FCF/G.

Downside risks are: 1) ServiceNow shares currently trade at a premium versus its large cap software peer group, and we recognize the risk of a potential pullback in the event of changes to market sentiment or a disappointing bookings quarter, 2) an inability to maintain key product advantages may slow share gains and large established competitors in the space may pose threats to ServiceNow's goal of continuing to capture market share by competing on price, 3) application spending is highly cyclical, which could present a higher degree of risk for a bookings deceleration for ServiceNow and other application vendors in the event of an economic slowdown.

Snap (SNAP)

Our $30 PO is based on a 8x 2023E EV/Sales multiple, above median of the SMID online media peers (about 4.5x), which we believe is warranted given faster user growth and bigger ARPU monetization growth opportunity. We expect both market share gains and material margin improvement over the next three years.

Risks to our PO are: 1) deceleration in user growth that would raise concerns on long-term revenue opportunity, 2) pressure on usage due to competing services, and 3) "concept" valuation that has less earnings based support than peers.

Zscaler (ZS)

Our PO of $195 is based on roughly 18x CY23E EV/Sales. We note the rich valuation multiple, even within the group of cloud-based security solution providers. However, the multiple is a premium versus high-growth software peers (10-15x), which we justify by the higher growth profile. We believe a premium is warranted due to Zscaler's higher growth profile and potential to take meaningful share in new markets that would increase the TAM and potentially accelerate growth. The positives of Zscaler's high growth and longer-term opportunities balance the risk related to the current valuation premium, in our view.

Upside risks to our PO are: 1) faster-than-expected adoption of Zscaler's new products, such as Zscaler Private Access, 2) higher ASP uplift due to adoption of high-end offerings like the Cloud Next-generation firewall and Cloud Sandbox, and 3) a more significant shift to cloud-based security across enterprises of all sizes.

Downside risks to our PO are: 1) a lower take-rate of new offerings, 2) material slowdown in new customer adoption and expansion deals, 3) risk of network outages or security breaches, and 4) an increase in competition from incumbent vendors and newer start-ups.

Analyst Certification

We, Brad Sills, Justin Post, Michael McGovern, Nat Schindler, 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 financial advisor to IBM in connection with its proposed acquisition of Instana Inc, which was announced on November 18, 2020.

BofA Securities is currently acting as Financial Advisor to Amazon.com Inc in connection with its proposed acquisition of Metro-Goldwyn-Mayer Inc from MGM Holdings Inc, which was announced on May 26, 2021.

BofA Securities is currently acting as a financial advisor to International Business Machines Corp in connection with its proposed sale of healthcare data and analytics assets (part of the Watson Health business) to Francisco Partners, which was announced on January 21, 2022.

BofA Securities is currently acting as financial advisor to Google LLC in connection with its proposed equity investment in Bharti Airtel Ltd, which was announced on January 28, 2022.

US - Enterprise Software Coverage Cluster

Investment rating	Company	BofA Ticker	Bloomberg symbol	Analyst
BUY				
	Adobe	ADBE	ADBE US	Brad Sills
	Alarm.com	ALRM	ALRM US	Michael J. Funk
	AppLovin	APP	APP US	Omar Dessouky, CFA
	BigCommerce Holdings, Inc.	BIGC	BIGC US	Koji Ikeda, CFA
	Bill.com, Inc.	BILL	BILL US	Brad Sills
	CCC Intelligent Solutions	CCCS	CCCS US	Michael J. Funk
	Coupa Software Inc	COUP	COUP US	Brad Sills
	CS Disco, Inc.	LAW	LAW US	Koji Ikeda, CFA
	DocuSign	DOCU	DOCU US	Brad Sills
	Duck Creek Technologies, Inc.	DCT	DCT US	Michael J. Funk
	Dynatrace	DT	DT US	Koji Ikeda, CFA
	Elastic NV	ESTC	ESTC US	Koji Ikeda, CFA
	Enfusion, Inc.	ENFN	ENFN 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
	MeridianLink, Inc.	MLNK	MLNK US	Koji Ikeda, CFA
	Microsoft Corporation	MSFT	MSFT US	Brad Sills
	nCino, Inc.	NCNO	NCNO US	Brad Sills
	NICE Ltd.	NICE	NICE US	Michael J. Funk
	NICE Ltd.	NCSYF	NICE IT	Michael J. Funk
	Qualtrics	XM	XM US	Adam Bergere
	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
	Twilio	TWLO	TWLO US	Michael J. Funk
	UiPath	PATH	PATH US	Brad Sills
	Veritone, Inc.	VERI	VERI US	Koji Ikeda, CFA
	Weave	WEAV	WEAV US	Michael J. Funk
	Workday Inc.	WDAY	WDAY US	Brad Sills
	Zeta Global	ZETA	ZETA US	Koji Ikeda, CFA
	ZoomInfo	ZI	ZI US	Koji Ikeda, CFA
NEUTRAL				
	8x8	EGHT	EGHT US	Michael J. Funk
	Alteryx, Inc	AYX	AYX US	Koji Ikeda, CFA
	Amplitude, Inc.	AMPL	AMPL US	Koji Ikeda, CFA
	Avalara Inc	AVLR	AVLR US	Brad Sills
	AvidXchange, Inc.	AVDX	AVDX US	Brad Sills
	Bentley Systems	BSY	BSY US	Michael J. Funk
	BlackLine, Inc.	BL	BL 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
	Expensify	EXFY	EXFY US	Koji Ikeda, CFA
	Freshworks, Inc.	FRSH	FRSH US	Brad Sills
	Jamf	JAMF	JAMF US	Koji Ikeda, CFA
	JFrog Ltd	FROG	FROG US	Koji Ikeda, CFA
	Kaltura, Inc.	KLTR	KLTR US	Michael J. Funk
	LiveVox Holdings	LVOX	LVOX US	Michael J. Funk
	Oracle Corporation	ORCL	ORCL US	Brad Sills
	PowerSchool Holdings, Inc.	PWSC	PWSC US	Koji Ikeda, CFA
	Veeva Systems, Inc.	VEEV	VEEV US	Brad Sills
	Zendesk, Inc.	ZEN	ZEN US	Brad Sills
	Zoom Video Communications	ZM	ZM US	Michael J. Funk
UNDERPERFORM				
	Blackbaud, Inc.	BLKB	BLKB US	Koji Ikeda, CFA
	C3.ai	AI	AI US	Brad Sills
	Everbridge	EVBG	EVBG US	Koji Ikeda, CFA

US - Enterprise Software Coverage Cluster

Investment rating	Company	BofA Ticker	Bloomberg symbol	Analyst
	Five9	FIVN	FIVN US	Michael J. Funk
	Guidewire Software, Inc.	GWRE	GWRE US	Michael J. Funk
	Shopify, Inc.	SHOP	SHOP US	Brad Sills
	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
	AdTheorent	ADTH	ADTH US	Nat Schindler
	Alphabet	GOOGL	GOOGL US	Justin Post
	Alphabet	GOOG	GOOG US	Justin Post
	Amazon.com	AMZN	AMZN US	Justin Post
	Arhaus, Inc	ARHS	ARHS US	Curtis Nagle, CFA
	Booking Holdings Inc	BKNG	BKNG US	Justin Post
	Carvana Co	CVNA	CVNA US	Nat Schindler
	Chewy Inc	CHWY	CHWY US	Nat Schindler
	DoorDash	DASH	DASH US	Michael McGovern
	Duolingo	DUOL	DUOL US	Nat Schindler
	Electronic Arts	EA	EA US	Omar Dessouky, CFA
	Expedia	EXPE	EXPE US	Justin Post
	Fiverr	FVRR	FVRR US	Nat Schindler
	LendingTree	TREE	TREE US	Nat Schindler
	Match Group	MTCH	MTCH US	Nat Schindler
	Meta Platforms	FB	FB 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
	Snap	SNAP	SNAP US	Justin Post
	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
	The RealReal	REAL	REAL US	Michael McGovern
	Uber	UBER	UBER US	Justin Post
	Udemy Inc	UDMY	UDMY US	Nat Schindler
	Upwork Inc	UPWK	UPWK US	Nat Schindler
	Viant	DSP	DSP US	Nat Schindler
	Vroom Inc.	VRM	VRM US	Nat Schindler
	Wix.com	WIX	WIX US	Nat Schindler
	Xometry	XMTR	XMTR US	Nat Schindler
NEUTRAL				
	1stDibs.com	DIBS	DIBS US	Justin Post
	Airbnb	ABNB	ABNB US	Justin Post
	Beachbody	BODY	BODY US	Joanna Zhao
	Cardlytics	CDLX	CDLX US	Nat Schindler
	eBay	EBAY	EBAY US	Justin Post
	GoodRx	GDRX	GDRX US	Justin Post
	LegalZoom	LZ	LZ US	Nat Schindler
	Overstock.com Inc	OSTK	OSTK US	Curtis Nagle, CFA
	Pinterest	PINS	PINS US	Justin Post
	Upstart	UPST	UPST US	Nat Schindler
UNDERPERFORM				
	Netflix, Inc.	NFLX	NFLX US	Nat Schindler
	Opendoor Technologies	OPEN	OPEN US	Curtis Nagle, CFA
	Purple Innovation	PRPL	PRPL US	Curtis Nagle, CFA
	Redfin Corp	RDFN	RDFN US	Curtis Nagle, CFA
	Sleep Number Corp	SNBR	SNBR US	Curtis Nagle, CFA
	TripAdvisor	TRIP	TRIP US	Nat Schindler
	Trivago NV	TRVG	TRVG US	Nat Schindler
	Wayfair	W	W US	Curtis Nagle, CFA
	Wish	WISH	WISH US	Michael McGovern
	Zillow	ZG	ZG US	Curtis Nagle, CFA
	Zillow	Z	Z US	Curtis Nagle, CFA
RSTR				
	Twitter	TWTR	TWTR US	Justin Post

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
	Cellebrite	CLBT	CLBT US	Tal Liani
	CIENA	CIEN	CIEN US	Tal Liani
	Cisco Systems	CSCO	CSCO US	Tal Liani
	CrowdStrike Holdings Inc.	CRWD	CRWD US	Tal Liani
	CyberArk	CYBR	CYBR US	Tal Liani
	F5 Inc	FFIV	FFIV US	Tal Liani
	Juniper Networks	JNPR	JNPR US	Tal Liani
	KnowBe4	KNBE	KNBE US	Tal Liani
	Palo Alto Networks	PANW	PANW US	Tal Liani
	Ping Identity	PING	PING US	Tal Liani
	Qualcomm	QCOM	QCOM US	Tal Liani
	SentinelOne, Inc.	S	S US	Tal Liani
	Zscaler	ZS	ZS US	Tal Liani
NEUTRAL				
	AudioCodes	AUDC	AUDC US	Tal Liani
	Fortinet	FTNT	FTNT US	Tal Liani
UNDERPERFORM				
	Allot Communications	ALLT	ALLT US	Tal Liani
	Check Point Software Technologies	CHKP	CHKP US	Tal Liani
	CommScope	COMM	COMM US	Tal Liani
	Fastly	FSLY	FSLY US	Tal Liani
	SecureWorks	SCWX	SCWX US	Tal Liani
RSTR				
	Citrix Systems Inc	CTXS	CTXS US	Tal Liani
	NortonLifeLock	NLOK	NLOK 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
	Apple Inc.	AAPL	AAPL US	Wamsi Mohan
	CDW Corp	CDW	CDW US	Ruplu Bhattacharya
	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
	VIZIO	VZIO	VZIO US	Wamsi Mohan
	Western Digital Corporation	WDC	WDC US	Wamsi Mohan
NEUTRAL				
	Arrow Electronics Inc.	ARW	ARW US	Ruplu Bhattacharya
	Avnet Inc.	AVT	AVT US	Ruplu Bhattacharya
	Celestica	CLS	CLS US	Ruplu Bhattacharya
	Celestica	YCLS	CLS CN	Ruplu Bhattacharya
	Fathom Digital Manufacturing	FATH	FATH US	Wamsi Mohan
	Hewlett-Packard Enterprise	HPE	HPE US	Wamsi Mohan
	NetApp Inc.	NTAP	NTAP US	Wamsi Mohan
	Nutanix Inc	NTNX	NTNX US	Wamsi Mohan
	Pure Storage	PSTG	PSTG US	Wamsi Mohan
UNDERPERFORM				
	3D Systems Corporation	DDD	DDD US	Wamsi Mohan
	HP Inc.	HPQ	HPQ US	Wamsi Mohan
	Latch Inc.	LTCH	LTCH US	Wamsi Mohan
	Sanmina Corporation	SANM	SANM US	Ruplu Bhattacharya
	Stratasys Ltd.	SSYS	SSYS US	Wamsi Mohan
	Velo3D	VLD	VLD US	Wamsi Mohan
	Vishay Intertechnology, Inc.	VSH	VSH US	Ruplu Bhattacharya

US - Semiconductors and Semiconductor Capital Equipment Coverage Cluster

Investment rating	Company	BofA Ticker	Bloomberg symbol	Analyst
BUY				
	Advanced Micro Devices, Inc	AMD	AMD US	Vivek Arya
	Analog Devices Inc.	ADI	ADI US	Vivek Arya
	Applied Materials, Inc.	AMAT	AMAT US	Vivek Arya
	Broadcom Inc	AVGO	AVGO US	Vivek Arya
	Credo Technology	CRDO	CRDO 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
	Micron Technology, Inc	MU	MU US	Vivek Arya
	Nova	NVMI	NVMI US	Jamie Zakalik
	NVIDIA Corporation	NVDA	NVDA US	Vivek Arya
	NXP Semiconductors NV	NXPI	NXPI US	Vivek Arya
	onsemi	ON	ON US	Vivek Arya
	Teradyne	TER	TER US	Vivek Arya
	Texas Instruments Inc.	TXN	TXN US	Vivek Arya
	Valens Semiconductor	VLN	VLN US	Vivek Arya
NEUTRAL				
	Camtek	CAMT	CAMT US	Jamie Zakalik
	II-VI	IIVI	IIVI US	Vivek Arya
	Navitas Semiconductor	NVTS	NVTS US	Blake Friedman
	Qorvo Inc.	QRVO	QRVO US	Vivek Arya
	Rockley Photonics	RKLY	RKLY US	Vivek Arya
	Skyworks Solutions, Inc.	SWKS	SWKS US	Vivek Arya
UNDERPERFORM				
	Ambarella	AMBA	AMBA US	Vivek Arya
	Cadence	CDNS	CDNS US	Vivek Arya
	Cirrus Logic	CRUS	CRUS US	Vivek Arya
	Intel	INTC	INTC US	Vivek Arya
	Synopsys	SNPS	SNPS US	Vivek Arya
	Wolfspeed Inc	WOLF	WOLF US	Vivek Arya

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Equity Investment Rating Distribution: Technology Group (as of 31 Mar 2022)

Coverage Universe	Count	Percent	Inv. Banking Relationships [R1]	Count	Percent
Buy	242	60.50%	Buy	154	63.64%
Hold	87	21.75%	Hold	47	54.02%
Sell	71	17.75%	Sell	35	49.30%

Equity Investment Rating Distribution: Telecommunications Group (as of 31 Mar 2022)

Coverage Universe	Count	Percent	Inv. Banking Relationships [R1]	Count	Percent
Buy	74	63.25%	Buy	52	70.27%
Hold	20	17.09%	Hold	14	70.00%
Sell	23	19.66%	Sell	8	34.78%

Equity Investment Rating Distribution: Global Group (as of 31 Mar 2022)

Coverage Universe	Count	Percent	Inv. Banking Relationships [R1]	Count	Percent
Buy	1916	57.18%	Buy	1207	63.00%
Hold	705	21.04%	Hold	452	64.11%
Sell	730	21.78%	Sell	362	49.59%

[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%

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