

## **US** Semiconductors

# Tariff turbulence: Al surprisingly still the resilient neighborhood

**Industry Overview** 

#### Cloud customers can sustain inflation, other areas can't

Semiconductors are not exposed to reciprocal tariffs in the first round, but the overhang persists, and we expect all semiconductor stocks to be exposed to enhanced market volatility. Not many chips are imported directly but via assembled electronics that are exposed to tariffs, so there is a significant indirect impact regardless. However, once the dust clears, we believe fundamentally estimates could stay more resilient for: 1) Al buildout: companies exposed to largely domestic US cloud customers who can afford to pay more for mission-critical Al deployments, and 2) Chip complexity/R&D roadmaps: semicap vendors (also benefit from reshoring) and design software (EDA). Cloud capex can still suffer due to macro uncertainty, but should continue to grow YoY, and in many cases valuations of top AI semis is already reflecting those potential (modest) cuts. Meanwhile, chipmakers exposed to more cyclically sensitive consumer (PC, smartphone), industrial and auto markets could face greater estimate pressure in the near-to-medium term. We continue to focus on stocks with the best scale, profit margins, balance sheets including top picks NVDA, AVGO, LRCX and CDNS. If our AI thesis comes through and investor look for beta, higher AI exposure SMidcap beneficiaries could include MRVL, COHR, CRDO. However, if the market remains defensive then historically TXN, ADI, CDNS and SNPS have declined less than the broader index.

#### We saw this movie in 2018/19 also

This current ~28% SOX selloff since its 10-Jul-24 peak reminds us of the ~26% correction back in 2018 that lasted over 9 months from Mar-Dec'18. Recall the reasons in 2018 that sound similar to the current environment: 1) a weakening macro backdrop impacting industrial, cloud, and smartphone end market demand, 2) trade/geopolitical uncertainty from tariffs and China restrictions (i.e. Huawei), and 3) excess balance sheet and channel inventories. The 2018 SOX downturn presaged a 2019 semiconductor industry sales decline, and we could be in front of a similar decline now in CY26. (In early 2018, we forecasted semi ex-memory growth of +6%/+5% in 2018/2019, however actual performance was +7.8%/-2.6%, respectively). However, also important to recall that even though semi sales declined in 2019, the SOX index rebounded strongly up 62% vs SPX up 29%. Furthermore, a similar SOX decline in CY22 presaged semi sales decline in CY23 though accompanied by a +61% move in the SOX index.

#### Top picks: NVDA, AVGO, LRCX, CDNS

Geopolitical uncertainty is a major headwind for a global sector such as semis. Semis were spared in the first round, which leaves open the uncertainty. We are also still to learn about the implementation of Al diffusion rules (see <u>our related published note on this topic</u>). However, we assume the strength of the Al buildout is robust enough to offset some of the macro headwinds. Second, balance sheets of infrastructure buildout customers (US cloud, sovereign entities, Stargate, EU etc.) suggest that they would either find a way to negotiate with the current White House (promise of greater US investments etc.) to soften the impact. We continue to favor large-cap stocks with fundamental strength including NVDA, AVGO, LRCX and CDNS.

BofA Securities does and seeks to do business with issuers covered in its research reports. As a result, investors should be aware that the firm may have a conflict of interest that could affect the objectivity of this report. Investors should consider this report as only a single factor in making their investment decision.

Refer to important disclosures on page 9 to 12. Analyst Certification on page 8. Price
Objective Basis/Risk on page 5.

Timestamp: 02 April 2025 10:40PM EDT

#### 02 April 2025

Equity
United States
Semiconductors

Vivek Arya Research Analyst BofAS +1 646 855 1755 vivek.arya@bofa.com

**Duksan Jang** Research Analyst BofAS +1 646 556 4825 duksan.jang@bofa.com

Michael Mani Research Analyst BofAS +1 646 855 2232 michael.mani@bofa.com

Liam Pharr Research Analyst BofAS +1 646 855 3146 liam.pharr@bofa.com

#### Glossary:

ADI: Analog Devices AVGO: Broadcom CDNS: Cadence COHR: Coherent CRDO: Credo

LRCX: Lam Research MRVL: Marvell NVDA: Nvidia

SNPS: Synopsys

TXN: Texas Instruments SOX: Semiconductor Index

SPX: S&P 500 Index Al: Artificial Intelligence EU: European Union

EDA: Electronic Design Automation

**US: United States** 

ODM: Original Design Manufacturer

PC: Personal Computer IP: Intellectual Property IoT: Internet of Things P2T: Peak to Trough

# **Reciprocal Tariff Details**

Baseline 10% tariff on all foreign exports will take effect on April 5. The higher reciprocal tariffs will take effect on April 9. For instance, China will be subject to 34% reciprocal tariff on top of existing 20% tariffs, totaling 54% tariff for any exports into the United States.

**Exhibit 1: Reciprocal Tariff Rate** 

All China-made products will be subject to 34% additional tariffs (total of 54%)

	Tariffs charged to USA	USA discounted
	(incl. currency manipulation and trade barriers)	reciprocal tariffs
Mexico	=	0% (for now)
Canada	-	0% (for now)
China	67%	34%
European Union	39%	20%
Vietnam	90%	46%
Taiwan	64%	32%
Japan	46%	24%
India	52%	26%
South Korea	50%	25%
Thailand	72%	36%
Switzerland	61%	31%
Indonesia	64%	32%
Malaysia	47%	24%
Cambodia	97%	49%
United Kingdom	10%	10%
South Africa	60%	30%
Brazil	10%	10%
Bangladesh	74%	37%
Singapore	10%	10%
Israel	33%	17%
Source: BofA Global Rese	earch. The White House	

BofA GLOBAL RESEARCH

All major server ODMs have a global manufacturing footprint, spanning US, Mexico, Europe, Taiwan, Malaysia, and/or Singapore. While semis are directly not exposed to the reciprocal tariffs in the first round, we note they go inside the assembled electronics (such as servers) that are then imported to the US.

**Exhibit 2: Server, AI server manufacturing location (with reciprocal tariff rate in parentheses)** All major server ODMs have manufacturing locations outside US/Canada/Mexico

	US (0%)	Mexico (0% for now)	Europe (20%)	Taiwan (32%)	Malaysia/Singapore (24%/10%)
Dell (via Ingrasys)	✓	$\checkmark$	✓	✓	$\checkmark$
Flex	✓	$\checkmark$	✓	✓	$\checkmark$
HP Enterprise	✓		✓		
Sanmina	✓	$\checkmark$	$\checkmark$		$\checkmark$
Super Micro	✓		✓	✓	✓
Wiwynn		$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$
Source: BofA Global Research	h, Bloomberg				

BofA GLOBAL RESEARCH

The SOX has seen similar periods of decline in 2018 and 2022, experiencing -22% and -41% P/E multiple compressions respectively. During these periods, diversified names (namely TXN and ADI) have outperformed the SOX while EDA names (SNPS, CDNS) have also historically held up well. INTC has been the largest outperformer in 2025 and similarly outperformed the SOX in 2022, only seeing a -26% P/E multiple compression (vs. -41% SOX), the least out of our selected companies.



#### Exhibit 3: P/E multiple compression during 2018, 2022, and 2025 SOX peak-to-trough corrections

Diversified names (TXN, ADI) have historically outperformed while EDA names (SNPS, CDNS) have similarly held up well.

P/E Movements		2018			2022		2025			
	SOX Peak	SOX Trough	P/E Compression	SOX Peak	SOX Trough	P/E Compression	SOX Peak	SOX Trough	P/E Compression	
Dates	3/12/2018	12/18/2018		12/27/2021	10/14/2022		7/10/2024	4/2/2025		
SOX	15.51	12.07	-22%	21.57	12.82	-41%	30.24	19.98	-34%	
SPX	17.39	14.81	-15%	21.56	15.31	-29%	21.79	20.50	-6%	
Nasdaq	21.98	18.42	-16%	31.56	21.16	-33%	34.53	24.71	-28%	
NVDA	35.34	20.11	-43%	60.71	27.04	-55%	41.51	23.10	-44%	
INTC	14.29	10.54	-26%	14.10	10.47	-26%	22.65	33.69	49%	
AVGO	13.02	10.65	-18%	20.20	10.53	-48%	30.44	24.11	-21%	
AMD	27.34	31.83	16%	46.78	13.79	-71%	40.53	20.53	-49%	
MRVL	17.98	10.86	-40%	42.19	14.04	-67%	40.78	21.21	-48%	
TXN	21.05	16.74	-20%	23.74	16.56	-30%	34.41	30.26	-12%	
ADI	17.05	15.94	-7%	22.98	14.44	-37%	31.83	25.29	-21%	
NXPI	16.49	8.99	-45%	19.36	10.10	-48%	18.94	15.73	-17%	
MCHP	17.14	10.25	-40%	18.52	10.09	-46%	31.14	39.53	27%	
ON	15.15	9.29	-39%	21.40	11.48	-46%	17.34	14.50	-16%	
AMAT	13.44	9.27	-31%	19.71	10.37	-47%	27.34	15.30	-44%	
LRCX	13.88	8.78	-37%	20.34	9.21	-55%	30.77	18.96	-38%	
KLAC	14.74	9.97	-32%	20.72	11.48	-45%	30.91	20.99	-32%	
SNPS	23.20	19.58	-16%	46.94	27.54	-41%	43.13	27.72	-36%	
CDNS	24.98	22.21	-11%	53.62	32.82	-39%	49.41	37.97	-23%	

Source: BofA Global Research, Bloomberg

BofA GLOBAL RESEARCH

# Exhibit 4: Since 2010, TXN, ADI, SNPS, CDNS, INTC, and AVGO have outperformed during SOX declines of more than 10% P2T.

Average declines when SOX declines more than 10% P2T from 2010

Average Declines when SOX declines >10% from	2010
SOX	-18.9%
SPX	-8.3%
Nasdaq	-11.1%
NVDA	-22.4%
INTC	-15.7%
AVGO	-15.0%
AMD	-26.1%
MRVL	-19.8%
ARM	-30.7%
TXN	-13.8%
ADI	-14.4%
NXPI	-21.0%
MCHP	-19.3%
ON	-23.7%
AMAT	-21.9%
LRCX	-20.5%
KLAC	-18.8%
SNPS	-12.0%
CDNS	-11.8%
Source: BofA Global Research, Bloomberg	

BofA GLOBAL RESEARCH

# Exhibit 5: Thus far, from SOX peak in July 2024, AVGO, TXN, MRVL, ADI, and CDNS have been the largest outperformers.

Security price movements during current SOX price correction

SOX P2T Price Movements (7/1	0/24-4/2/25)	
Security	Movement	Rel. to SOX
SOX	-26.8%	0.0%
SPX	0.7%	27.5%
Nasdaq	-5.6%	21.2%
NVDA	-18.2%	8.7%
INTC	-37.0%	-10.1%
AVGO	-1.4%	25.5%
AMD	-44.0%	-17.2%
MRVL	-15.6%	11.3%
ARM	-42.0%	-15.2%
TXN	-12.5%	14.3%
ADI	-16.3%	10.6%
NXPI	-31.4%	-4.6%
MCHP	-49.0%	-22.2%
ON	-46.8%	-20.0%
AMAT	-42.1%	-15.2%
LRCX	-34.6%	-7.7%
KLAC	-23.1%	3.7%
SNPS	-29.2%	-2.4%
CDNS	-17.2%	9.7%

Source: BofA Global Research, Bloomberg

BofA GLOBAL RESEARCH



#### Exhibit 6: Annual average price movements by subsector compared to major indices

Historically, Compute/IP and Auto/Industrial/IoT have outperformed in down years (2018, 2022)

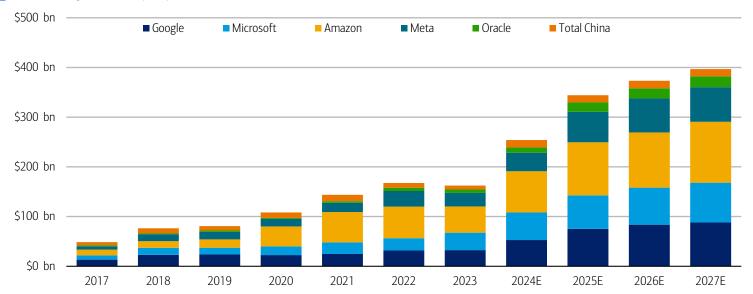
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025 Q1
SOX	13%	-11%	8%	32%	30%	-4%	38%	42%	-10%	62%	47%	45%	-38%	61%	25%	-15%
SPX	13%	0%	13%	30%	11%	-1%	10%	19%	-6%	29%	16%	27%	-19%	24%	23%	-4%
Nasdaq	17%	-2%	16%	38%	13%	6%	8%	28%	-4%	35%	44%	21%	-33%	43%	29%	-9%
Software	25%	-7%	16%	30%	13%	12%	5%	42%	12%	34%	52%	12%	-36%	59%	23%	-9%
Avg. Sector Movements																
Compute/IP	-3%	-3%	2%	37%	27%	9%	29%	40%	2%	57%	81%	42%	-28%	65%	11%	-13%
Smartphones	40%	-8%	28%	11%	38%	-9%	20%	11%	-21%	87%	36%	6%	-38%	24%	-9%	-5%
Auto/Industrial/IoT	28%	-13%	13%	38%	24%	5%	27%	33%	-19%	50%	33%	32%	-18%	24%	-10%	-9%
Semicap	11%	7%	21%	39%	16%	-11%	26%	51%	-17%	95%	58%	63%	-30%	47%	1%	-2%
Memory/Storage	-22%	-5%	49%	105%	31%	-48%	16%	28%	-31%	64%	11%	43%	-50%	66%	2%	-1%
Foundry	10%	3%	33%	2%	28%	2%	26%	38%	-7%	57%	88%	-15%	-31%	28%	46%	-15%
Smidcaps	28%	-39%	11%	56%	2%	6%	36%	31%	-28%	56%	49%	39%	-44%	28%	22%	-25%
Mag 7	-14%	3%	30%	62%	23%	32%	8%	47%	-3%	48%	79%	36%	-48%	86%	42%	-13%

Source: BofA Global Research, Bloomberg

BofA GLOBAL RESEARCH

### Exhibit 7: We continue to expect total cloud capex to grow over 30% YoY in 2025E to over \$360bn

BofAe annual global cloud capex spend



Source: BofA Global Research, company reports, Bloomberg

BofA GLOBAL RESEARCH

#### **Exhibit 8: Stocks mentioned**

Stocks mentioned in this report

BofA Ticker	Bloomberg Ticker	Price	PO	Rating					
ADI	ADI US EQUITY	\$199.59	\$280.00	B-1-7					
AVGO	AVGO US EQUITY	\$172.09	\$260.00	C-1-7					
CDNS	CDNS US EQUITY	\$264.94	\$350.00	B-1-9					
COHR	COHR US EQUITY	\$67.54	\$125.00	C-1-9					
CRDO	CRDO US EQUITY	\$43.04	\$75.00	C-1-9					
LRCX	LRCX US EQUITY	\$73.78	\$110.00	C-1-7					
MRVL	MRVL US EQUITY	\$63.23	\$120.00	C-1-7					
NVDA	NVDA US EQUITY	\$110.42	\$200.00	C-1-7					
SNPS	SNPS US EQUITY	\$438.55	\$630.00	B-1-9					
TXN	TXN US EQUITY	\$178.19	\$220.00	B-2-7					
Source: BofA Global	Source: BofA Global Research, Bloomberg								

BofA GLOBAL RESEARCH



#### **Exhibit 9: 2024 End Market Poster**

Semiconductor company exposure to various end markets, customers, and products.

Company	Ticker	Auto	Industrial	Consume	r PC S	martphone	Data Ctr. Compute	Data Ctr./Telco Networking	Mobile Infra	Key Customers	Key Products
AMD	AMD	5%	6%	12%	24%	0%	48%	2%	3%	Microsoft, Dell, HP, Meta, Sony	CPU, GPU, FPGA
Allegro Microsystems	ALGM	75%	16%	7%	2%	0%	0%	0%	0%	-	Power Mgmt, Sensors
Ambarella	AMBA	26%	61%	13%	0%	0%	0%	0%	0%	Motorola, Bosch, Amazon	Video and Image Processors
ams OSRAM	AMS	39%	27%	8%	1%	21%	4%	1%	0%	Apple	LEDs, Optical
Analog Devices	ADI	30%	47%	11%	2%	1%	0%	3%	7%	Apple	Analog
Broadcom	AVGO	1%	3%	9%	1%	26%	14%	46%	0%	Apple, Cisco	RF, Networking, Storage, ASIC
Coherent	COHR	3%	37%	1%	1%	5%	24%	21%	8%	-	Optical, Specialty Lasers
Cirrus Logic	CRUS	2%	1%	11%	5%	81%	0%	0%	0%	Apple	Audio Codecs, Amplifiers, Power Mgmt
Diodes	DIOD	19%	24%	19%	13%	8%	12%	5%	0%	Apple	Analog, Discretes
GlobalFoundries	GFS	19%	17%	0%	3%	43%	10%	8%	0%	Qualcomm, AMD	-
Infineon Technologies	IFX	53%	25%	8%	2%	2%	8%	1%	1%	-	MCU, Discretes, Sensors
Intel	INTC	3%	4%	1%	56%	0%	24%	10%	3%	Dell, Lenovo, HP, Google	CPU, FPGA
Kioxia	-	2%	4%	5%	33%	34%	16%	0%	7%	-	NAND
Lattice Semiconductor	LSCC	1%	49%	8%	0%	0%	30%	9%	12%	-	FPGA
Lumentum	LITE	1%	13%	0%	0%	5%	20%	60%	2%	Apple, Huawei, Ciena	Optical, Lasers
M/A-COM Technology Solutions	MTSI	1%	49%	0%	0%	0%	25%	5%	20%	-	Power RF, Optical, Discretes
Marvell	MRVL	4%	3%	5%	0%	0%	11%	70%	8%	WDC, Cisco, Arista, Samsung	Networking, Storage, DPU
MaxLinear	MXL	1%	25%	8%	2%	0%	2%	21%	42%	Commscope	WiFi, Optical, Transceivers
MediaTek	-	2%	0%	25%	6%	52%	0%	15%	0%	Samsung, Huawei	Modem
Microchip Technology	MCHP	18%	43%	11%	3%	0%	14%	6%	5%	-	MCU, Analog, FPGA
Micron Technology	MU	15%	4%	5%	12%	23%	38%	3%	0%	Apple, Dell, Nvidia	DRAM, NAND
Monolithic Power Systems	MPWR	19%	7%	9%	14%	1%	40%	0%	10%	-	Analog
Murata Manufacturing	-	20%	10%	2%	18%	24%	0%	7%	20%	Samsung	Discretes, Sensors
Nanya Technology	-	17%	5%	48%	10%	4%	6%	0%	10%	Huawei, Kingston	DRAM
Novatek	-	6%	4%	47%	33%	11%	0%	0%	0%	-	Display Drivers
Nvidia	NVDA	1%	1%	1%	12%	0%	70%	15%	0%	Microsoft, Meta, Dell, SMCI	GPU, DPU
NXP	NXPI	56%	19%	1%	0%	11%	0%	2%	11%		MCU, Power RF, Connectivity, Discretes
Onsemi	ON	55%	25%	5%	2%	2%	7%	2%	3%	-	Analog, Discretes, Sensors
Qorvo	QRVO	2%	4%	3%	0%	74%	0%	5%	12%	Apple, Samsung	RF, Discretes
Qualcomm	-	9%	1%	6%	1%	74%	0%	3%	7%	Apple, Samsung, Xiaomi	RF, Modem
Renesas Electronics		50%	15%	9%	5%	5%	10%	3%	5%	-	MCU, Analog, Power Mgmt
ROHM		47%	18%	21%	7%	5%	3%	1%	0%	-	Discretes
Samsung Electronics	-	5%	4%	13%	4%	38%	33%	1%	4%	Apple, Samsung, Amazon	DRAM, NAND, Sensors, Display Drivers
Semtech	SMTC	3%	39%	9%	5%	5%	24%	15%	0%	Trend-tek, Frontek, Samsung	Analog, Power Mgmt, Discretes
Silicon Motion		1%	3%	1%	50%	16%	29%	0%	0%	Intel, Micron	Storage
SK hynix	-	2%	3%	10%	8%	28%	48%	2%	0%	Apple, Amazon, Microsoft, Dell	•
Skyworks Solutions		5%	4%	4%	0%	68%	0%	2%	17%	Apple, Samsung	RF, Power Mgmt
Sony	-	7%	12%	3%	0%	78%	0%	0%	0%	Apple, Samsung	Image Sensors
STMicroelectronics	STM	39%	25%	7%	3%	16%	4%	2%	4%	Apple, Samsung, Tesla	MCU, Analog, Discretes, Sensors
Synaptics	SYNA		6%	47%	16%	17%	0%	4%	0%	Samsung, Apple	Connectivity, Display Drivers, Sensors
Taiwan Semi Manufacturing	TSMC	5%	7%	2%	4%	36%	46%	1%	1%	Apple, AMD, Qualcomm, Nvidia	, ,
Texas Instruments	TXN	34%	39%	6%	3%	4%	6%	2%	7%	Apple, AMD, Qualcomm, Midia Apple	Analog, MCU
Vishay	-	28%	53%	8%	2%	1%	3%	3%	3%	, ppic	Discretes, Optical
Western Digital	WDC		1%	0%	49%	19%	31%	0%	0%	- Dell	NAND
Wolfspeed	WOLF		88%	0%	0%	0%	0%	0%	0%	Dell -	Power RF, Discretes
wonspeed		1270	00%	U%0	U*/0	U70	U7/0	U%0	U%0		FOWEI NI , DISCIPLES

**Source:** BofA Global Research, Company Reports

BofA GLOBAL RESEARCH

# Price objective basis & risk

#### Analog Devices Inc. (ADI)

Our \$280 PO is based on 35x CY2026E P/E, at the high end of the 15x-38x range, and justified based on ADI's best-in-class profitability and differentiated/secular comms exposure.

Downside risks to our price objective: 1) Economic downturn, which could reduce demand for automotive, industrial products, impacting gross margins, especially given recent capital expenditures and higher fixed cost footprint. 2) Inability to realize the



planned cost synergies from the Maxim combination. 3) Competition from larger vendors that have lower-cost production facilities. 4) Exposure to US-China tensions/tariffs via Chinese automotive market.

#### **Broadcom Inc (AVGO)**

Our \$260 price objective for Broadcom is based on 32x CY26E P/E, the upper end of its 7x-35x historical range, though justified given double-digit EPS growth and best-in-semis profitability, FCF generation, and returns.

Downside risks to our price objective are: 1) semiconductor cycle risks, including sensitivity to fundamental or sentiment shifts in AI theme, 2) high exposure to Apple and Google with potential design out risks, 3) competitive risks in networking, smartphone, storage, enterprise software markets, including rising NVDA competition in networking, 4) frequent acquirer of assets, which increases financial and integration risks, and 5) large \$60bn net-debt.

#### Cadence (CDNS)

Our \$350 PO is based on 46x CY26E P/E, at upper end of historical 22x-52x trading range and justified in our view given the strategic importance of EDA in an increasingly fragmented global electronics supply chain.

Downside risks are: (1) Share loss in existing markets to primary competitors, (2) a broader economic downturn dampens semis R&D spending and corresponding spend on EDA tools and services, (3) escalation of US-China trade war limits CDNS' ability to sell to key customers, (4) semiconductor industry consolidation accelerates which could diminish customer spending power, (5) venture into adjacent system analysis market fails to meaningfully accelerate revenue growth and incremental investments suppress margin expansion.

#### Coherent Corp (COHR)

We assign a \$125 PO based on 26x CY26E P/E, near the high end of the historical 5x-27x range, but justified given potential sales upside from hyperscaler upgrades and solid margin expansion opportunities under new management team.

Upside risks to our PO are 1) better than expected datacom/AI and telco capex trends, 2) cyclical recovery in industrial, auto markets, 3) faster implementation of cost cutting and restructuring measures.

Downside risks to our PO are 1) lumpy and cyclical telecom/hyperscaler capex trends, 2) sentiment around AI exposure and high volatility, 3) high debt balance which could limit operating leverage, and 4) high competition in optical transceivers potentially leading to a price war.

#### Credo Technology (CRDO)

Our \$75 PO is based on 56x CY26E P/E, in line with high-growth compute/optical semiconductor peers trading 20x-73x.

Downside risks to our PO are: (1) increased competition from large cap peers Marvell/Broadcom, (2) delayed adoption of active electrical cable (AEC) products, (3) downturn in spending across hyperscalers and network operators, (4) Inability for CRDO to scale and meet demand from products beginning to ramp, (5) supply chain headwinds limiting available capacity.

Upside risks are: (1) unforeseen, accelerated AEC engagements, (2) sudden rebound in ramp for higher margin optical DSP products, (3) prudent opex/margin management to support EPS in downcycle.



#### Lam Research Corp. (LRCX)

We assign a \$110 PO based on 25x CY26E PE, near the high-end of LRCX's 10-30x range, justified by mid-teens EPS CAGR over time, etch/deposition product leadership, rising etch/deposition intensity, share gains, growing foundry/logic exposure over memory, and robust FCF generation.

Upside risks are tech inflections, F/L share gains, NAND upgrades.

Downside risks are slower than expected capital spending cycle, delay in memory capacity adds, market share loss in etch or clean segments, merger & integrations risk, macro headwinds, customer consolidation and China.

#### Marvell Technology, Inc. (MRVL)

Our \$120 PO is based on a 34x FY27E/CY26E pf-EPS, which is well supported by the nearly 40% compounded annual EPS growth potential next several years and near the normal 1x-2x range for high growth semi peers.

Downside risks: 1) Integration risks in recent deals, 2) financial risks related to going to net debt from net cash position, and in achieving expected cost synergies in a timely manner, and 3) cyclical industry risks including potential slowdown in legacy hard disk drive, infrastructure spending, and storage assets, 4) competitive risks against larger well-resourced rivals.

#### **NVIDIA Corporation (NVDA)**

Our \$200 PO is based on 33x CY26E PE ex cash, within NVDA's historical 25x-56x forward year PE range, which we believe is justified given stronger growth opportunities ahead as gaming cycle troughs and data center demand potentially faces strong, long-term demand dynamics.

Downside risks are: 1) weakness in consumer driven gaming market, 2) Competition with major public firms, internal cloud projects and other private companies in Al and accelerated computing markets, 3) Larger than expected impact from restrictions on compute shipments to China, or additional restrictions placed on activity in the region, 4) Lumpy and unpredictable sales in new enterprise, data center, and autos markets, 5) Potential for decelerating capital returns, and 5) Enhanced government scrutiny of NVDA's dominant market position in Al chips.

#### Synopsys (SNPS)

Our \$630 PO is based on 38x 2026E P/E, near the upper end of company's historical trading range (19x-49x), justified in our view as EDA investment accelerates as chip complexity rises.

Downside risks are (1) variability in IP/hardware sales creates issues in timing of revenue recognition, (2) competitors develop unique software capabilities displacing SNPS at core customers, (3) heightened geopolitical tensions lead to further restrictions on supplying firms in China with EDA technology, (4) uncertainty over proposed M&A transaction going through China approval, (5) exposure to Intel turmoil.

Upside risks are (1) share gains in existing markets versus primary competitors, (2) increased government investment in semiconductor R&D and development as nations develop internal ecosystems, (3) material M&A that enables consistent margin expansion or further accelerates sales CAGR, (4) faster-than-expected cost improvements driving higher operating margin.

#### **Texas Instruments Inc. (TXN)**

Our \$220 PO is based on 34x CY26E P/E, at the high-end of its historical 16x-36x range, which we believe is warranted based on TXN's best-in-class FCF generation and returns,



and based on incremental cash flow from US CHIPS Act grants.

Risks to our price objective: 1) Macro/cyclical risks given high exposure to automotive, industrial, and telco capex markets, also makes TXN susceptible to any potential global trade tensions/tariffs, 2) Increasing capex intensity and higher depreciation burden could be a headwind to gross margins, 3) Increased R&D spending pressure to maintain an edge versus the competition, 4) Inventory cycles and potential double ordering by customers that can often create mismatches between real supply and demand, 5) exposure to several mature markets such as PC and other consumer.

### **Analyst Certification**

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



#### **US - Semiconductors and Semiconductor Capital Equipment Coverage Cluster**

Investment rating	Company	BofA Ticker	Bloomberg symbol	Analyst
BUY				
	Advanced Energy Industries	AEIS	AEIS US	Duksan Jang
	Analog Devices Inc.	ADI	ADI US	Vivek Arya
	Applied Materials, Inc.	AMAT	AMAT US	Vivek Arya
	Arm Holdings	ARM	ARM US	Vivek Arya
	Broadcom Inc	AVGO	AVGO US	Vivek Arya
	Cadence	CDNS	CDNS US	Vivek Arya
	Camtek	CAMT	CAMT US	Vivek Arya
	Coherent Corp	COHR	COHR US	Vivek Arya
	Credo Technology	CRDO	CRDO 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, Inc.	MRVL	MRVL US	Vivek Arya
	MKS Instruments	MKSI	MKSI US	Vivek Arya
	Nova	NVMI	NVMI US	Vivek Arya
	NVIDIA Corporation	NVDA	NVDA US	Vivek Arya
	NXP Semiconductors NV	NXPI	NXPI US	Vivek Arya
	onsemi	ON	ON US	Vivek Arya
	Synopsys	SNPS	SNPS US	Vivek Arya
NEUTRAL				
	Advanced Micro Devices, Inc	AMD	AMD US	Vivek Arya
	Ambarella	AMBA	AMBA US	Vivek Arya
	Axcelis Technologies	ACLS	ACLS US	Duksan Jang
	GlobalFoundries	GFS	GFS US	Vivek Arya
	Intel	INTC	INTC US	Vivek Arya
	Micron Technology, Inc	MU	MU US	Vivek Arya
	Texas Instruments Inc.	TXN	TXN US	Vivek Arya
UNDERPERFORM				
	Lattice Semiconductor	LSCC	LSCC US	Duksan Jang
	Lumentum Holdings	LITE	LITE US	Vivek Arya
	Microchip	MCHP	MCHP US	Vivek Arya
	Qorvo Inc.	QRVO	QRVO US	Vivek Arya
	Skyworks Solutions, Inc.	SWKS	SWKS US	Vivek Arya
	Teradyne	TER	TER US	Vivek Arya
	Wolfspeed Inc	WOLF	WOLF US	Vivek Arya
	•			

# **Disclosures**

# **Important Disclosures**

Equity Investment Rating Distribution: Technology Group (as of 31 Mar 2025)

Coverage Universe	Count	Percent	Inv. Banking Relationships R1	Count	Percent
Buy	207	53.08%	Buy	102	49.28%
Hold	92	23.59%	Hold	49	53.26%
Sell	91	23.33%	Sell	24	26.37%

Equity Investment Rating Distribution: Global Group (as of 31 Mar 2025)

Coverage Universe	Count	Percent	Inv. Banking Relationships R1	Count	Percent
Buy	1867	54.40%	Buy	1108	59.35%
Hold	774	22.55%	Hold	466	60.21%
Sell	791	23.05%	Sell	368	46.52%

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



FUNDAMENTAL EQUITY OPINION KEY: Opinions include a Volatility Risk Rating, an Investment Rating and an Income Rating. VOLATILITY RISK RATINGS, indicators of potential price fluctuation, are: A - Low, B - Medium and C - High. INVESTMENT RATINGS reflect the analyst's assessment of both a stock's absolute total return potential as well as its attractiveness for investment relative to other stocks within its Coverage Cluster (defined below). Our investment ratings are: 1 - Buy stocks are expected to have a total return of at least 10% and are the most attractive stocks in the coverage cluster; 2 - Neutral stocks are expected to remain flat or increase in value and are less attractive than Buy rated stocks and 3 - Underperform stocks are the least attractive stocks in a coverage cluster. An investment rating of 6 (No Rating) indicates that a stock is no longer trading on the basis of fundamentals. Analysts assign investment ratings considering, among other things, the 0-12 month total return expectation for a stock and the firm's guidelines for ratings dispersions (shown in the table below). The current price objective for a stock should be referenced to better understand the total return expectation at any given time. The price objective reflects the analyst's view of the potential price appreciation (depreciation).

# Investment rating Total return expectation (within 12-month period of date of initial rating) Ratings dispersion guidelines for coverage cluster<sup>R2</sup>

 Buy
 ≥ 10%
 ≤ 70%

 Neutral
 ≥ 0%
 ≤ 30%

 Underperform
 N/A
 ≥ 20%

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

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

BofAS or one of its affiliates acts as a market maker for the equity securities recommended in the report: Analog Devices, Broadcom, Cadence, Coherent, Credo Technology, Lam Research, Marvell, NVIDIA, Synopsys, Texas Instr.

BofAS or an affiliate was a manager of a public offering of securities of this issuer within the last 12 months: Broadcom Inc, Cadence, Synopsys.

The issuer is or was, within the last 12 months, an investment banking client of BofAS and/or one or more of its affiliates: Analog Devices, Broadcom Inc, Cadence, Coherent, Lam Research, Marvell Tech, NVIDIA, Synopsys, Texas Instrument.

BofAS or an affiliate has received compensation from the issuer for non-investment banking services or products within the past 12 months: Analog Devices, Broadcom Inc, Cadence, Coherent, Credo Technology, Lam Research, Marvell Tech, NVIDIA, Synopsys, Texas Instrument.

The issuer is or was, within the last 12 months, a non-securities business client of BofAS and/or one or more of its affiliates: Analog Devices, Broadcom Inc, Cadence, Coherent, Credo Technology, Lam Research, Marvell Tech, NVIDIA, Synopsys, Texas Instrument.

BofAS or an affiliate has received compensation for investment banking services from this issuer within the past 12 months: Analog Devices, Broadcom Inc, Cadence, Coherent, Lam Research, NVIDIA, Synopsys, Texas Instrument.

BofAS or an affiliate expects to receive or intends to seek compensation for investment banking services from this issuer or an affiliate of the issuer within the next three months: Analog Devices, Broadcom Inc, Cadence, Coherent, Lam Research, Marvell Tech, Synopsys, Texas Instrument.

BofAS together with its affiliates beneficially owns one percent or more of the common stock of this issuer. If this report was issued on or after the 9th day of the month, it reflects the ownership position on the last day of the previous month. Reports issued before the 9th day of a month reflect the ownership position at the end of the second month preceding the date of the report: Analog Devices, Broadcom Inc, Lam Research, Marvell Tech, NVIDIA, Texas Instrument.

BofAS or one of its affiliates is willing to sell to, or buy from, clients the common equity of the issuer on a principal basis: Analog Devices, Broadcom, Cadence, Coherent, Credo Technology, Lam Research, Marvell, NVIDIA, Synopsys, Texas Instr.

The issuer is or was, within the last 12 months, a securities business client (non-investment banking) of BofAS and/or one or more of its affiliates: Analog Devices, Broadcom Inc, Cadence, Coherent, Credo Technology, Lam Research, Marvell Tech, NVIDIA, Synopsys, Texas Instrument.

BofA Global Research personnel (including the analyst(s) responsible for this report) receive compensation based upon, among other factors, the overall profitability of Bank of America Corporation, including profits derived from investment banking. The analyst(s) responsible for this report may also receive compensation based upon, among other factors, the overall profitability of the Bank's sales and trading businesses relating to the class of securities or financial instruments for which such analyst is responsible.

### **Other Important Disclosures**

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

Prices are indicative and for information purposes only. Except as otherwise stated in the report, for any recommendation in relation to an equity security, the price referenced is the publicly traded price of the security as of close of business on the day prior to the date of the report or, if the report is published during intraday trading, the price referenced is indicative of the traded price as of the date and time of the report and in relation to a debt security (including equity preferred and CDS), prices are indicative as of the date and time of the report and are from various sources including BofA Securities trading desks.

The date and time of completion of the production of any recommendation in this report shall be the date and time of dissemination of this report as recorded in the report timestamp.

Recipients who are not institutional investors or market professionals should seek the advice of their independent financial advisor before considering information in this report in connection with any investment decision, or for a necessary explanation of its contents.

Officers of BofAS or one or more of its affiliates (other than research analysts) may have a financial interest in securities of the issuer(s) or in related investments. Refer to BofA Global Research policies relating to conflicts of interest.

"BofA Securities" includes BofA Securities, inc. ('BofAS') and its affiliates. Investors should contact their BofA Securities representative or Merrill Global Wealth Management financial advisor if they have questions concerning this report or concerning the appropriateness of any investment idea described herein for such investor. "BofA Securities" is a global brand for BofA Global Research.

Information relating to Non-US affiliates of BofA Securities and Distribution of Affiliate Research Reports:

BofAS and/or Merrill Lynch, Pierce, Fenner & Smith Incorporated ("MLPF&S") may in the future distribute, information of the following non-US affiliates in the US (short name: legal name, regulator): Merrill Lynch (South Africa): Merrill Lynch South Africa (Pty) Ltd., regulated by The Financial Service Board; MLI (UK): Merrill Lynch International, regulated by the Financial Conduct Authority (FCA) and the Prudential Regulation Authority (PRA); BofASE (France): BofA Securities Europe SA is authorized by the Autorité de Contrôle Prudentiel et de Résolution (ACPR) and regulated by the ACPR and the Autorité des Marchés Financiers (AMF). BofA Securities Europe SA ("BofASE") with registered address at 51, rue La Boétie, 75008 Paris is registered under no 842 602 690 RCS Paris. In accordance with the provisions of French Code Monétaire et Financier (Monetary and Financial Code), BofASE is an établissement de crédit et d'investissement (credit and investment institution) that is authorised and supervised by the European Central Bank and the Autorité de Contrôle Prudentiel et de Résolution (ACPR) and the Autorité des Marchés Financiers. BofASE's share capital can be found at <a href="https://www.bofaml.com/BofASEdisclaimer">www.bofaml.com/BofASEdisclaimer</a>; BofA Europe (Milan): Bank of America Europe Designated Activity Company, Milan Branch, regulated by the Bank of Italy, the European Central Bank (ECB) and the Central Bank of Ireland (CBI); BofA Europe (Frankfurt): Bank of America Europe Designated Activity Company, Frankfurt Branch regulated by BaFin, the ECB and the CBI; BofA Europe (Madrid): Bank of America Europe Designated Activity Company, Sucursal en España, regulated by the Bank of Spain, the ECB and the CBI; Merrill Lynch (Australia): Merrill Lynch (Hong Kong): Merril



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

(Asia Pacific) Limited, regulated by the Hong Kong Securities and Futures Commission (HKSFC); Merrill Lynch (Singapore): Merrill Lynch (Singapore) Pte Ltd, regulated by the Monetary Authority of Singapore (MAS); Merrill Lynch (Canada): Merrill Lynch Canada Inc, regulated by the Canadian Investment Regulatory Organization; Merrill Lynch (Mexico): Merrill Lynch Mexico, SA de CV, Casa de Bolsa, regulated by the Comisión Nacional Bancaria y de Valores; BofAS Japan: BofA Securities Japan Co., Ltd., regulated by the Financial Services Agency; Merrill Lynch (Seoul): Merrill Lynch International, LLC Seoul Branch, regulated by the Financial Supervisory Service; Merrill Lynch (Taiwan): Merrill Lynch Securities (Taiwan) Ltd., regulated by the Securities and Futures Bureau; BofAS India: BofA Securities India Limited, regulated by the Securities and Exchange Board of India (SEBI); Merrill Lynch (Israel): Merrill Lynch Israel Limited, regulated by Israel Securities Authority; Merrill Lynch (DIFC): Merrill Lynch (DIFC): Merrill Lynch (DIFC): Merrill Lynch (Brazil): M Valores Mobiliários, regulated by Comissão de Valores Mobiliários; Merrill Lynch KSA Company: Merrill Lynch Kingdom of Saudi Arabia Company, regulated by the Capital Market Authority. This information: has been approved for publication and is distributed in the United Kingdom (UK) to professional clients and eligible counterparties (as each is defined in the rules of the FCA and the PRA) by MLI (UK), which is authorized by the PRA and regulated by the FCA and the PRA - details about the extent of our regulation by the FCA and PRA are available from us on request; has been approved for publication and is distributed in the European Economic Area (EEA) by BofASE (France), which is authorized by the ACPR and regulated by the ACPR and the AMF; has been considered and distributed in Japan by BofAS Japan, a registered securities dealer under the Financial Instruments and Exchange Act in Japan, or its permitted affiliates; is issued and distributed in Hong Kong by Merrill Lynch (Hong Kong) which is regulated by HKSFC; is issued and distributed in Taiwan by Merrill Lynch (Taiwan); is issued and distributed in India by BofAS India; and is issued and distributed in Singapore to institutional investors and/or accredited investors (each as defined under the Financial Advisers Regulations) by Merrill Lynch (Singapore) (Company Registration No 198602883D). Merrill Lynch (Singapore) is regulated by MAS. Merrill Lynch Equities (Australia) Limited (ABN 65 006 276 795), AFS License 235132 (MLEA) distributes this information in Australia only to 'Wholesale' clients as defined by s.761G of the Corporations Act 2001. With the exception of Bank of America N.A., Australia Branch, neither MLEA nor any of its affiliates involved in preparing this information is an Authorised Deposit-Taking Institution under the Banking Act 1959 nor regulated by the Australian Prudential Regulation Authority. No approval is required for publication or distribution of this information in Brazil and its local distribution is by Merrill Lynch (Brazil) in accordance with applicable regulations. Merrill Lynch (DIFC) is authorized and regulated by the DFSA. Information prepared and issued by Merrill Lynch (DIFC) is done so in accordance with the requirements of the DFSA conduct of business rules. BofA Europe (Frankfurt) distributes this information in Germany and is regulated by BaFin, the ECB and the CBI. BofA Securities entities, including BofA Europe and BofASE (France), may outsource/delegate the marketing and/or provision of certain research services or aspects of research services to other branches or members of the BofA Securities group. You may be contacted by a different BofA Securities entity acting for and on behalf of your service provider where permitted by applicable law. This does not change your service provider. Please refer to the Electronic Communications Disclaimers for further information.

This information has been prepared and issued by BofAS and/or one or more of its non-US affiliates. The author(s) of this information may not be licensed to carry on regulated activities in your jurisdiction and, if not licensed, do not hold themselves out as being able to do so. BofAS and/or MLPF&S is the distributor of this information in the US and accepts full responsibility for information distributed to BofAS and/or MLPF&S clients in the US by its non-US affiliates. Any US person receiving this information and wishing to effect any transaction in any security discussed herein should do so through BofAS and/or MLPF&S and not such foreign affiliates. Hong Kong recipients of this information should contact Merrill Lynch (Asia Pacific) Limited in respect of any matters relating to dealing in securities or provision of specific advice on securities or any other matters arising from, or in connection with, this information. Singapore recipients of this information should contact Merrill Lynch (Singapore) Pte Ltd in respect of any matters arising from, or in connection with, this information. For clients that are not accredited investors, expert investors or institutional investors Merrill Lynch (Singapore) Pte Ltd accepts full responsibility for the contents of this information distributed to such clients in Singapore.

#### General Investment Related Disclosures:

Taiwan Readers: Neither the information nor any opinion expressed herein constitutes an offer or a solicitation of an offer to transact in any securities or other financial instrument. No part of this report may be used or reproduced or quoted in any manner whatsoever in Taiwan by the press or any other person without the express written consent of BofA Securities. This document provides general information only, and has been prepared for, and is intended for general distribution to, BofA Securities clients. Neither the information nor any opinion expressed constitutes an offer or an invitation to make an offer, to buy or sell any securities or other financial instrument or any derivative related to such securities or instruments (e.g., options, futures, warrants, and contracts for differences). This document is not intended to provide personal investment advice and it does not take into account the specific investment objectives, financial situation and the particular needs of, and is not directed to, any specific person(s). This document and its content do not constitute, and should not be considered to constitute, investment advice for purposes of ERISA, the US tax code, the Investment Advisers Act or otherwise. Investors should seek financial advice regarding the appropriateness of investing in financial instruments and implementing investment strategies discussed or recommended in this document and should understand that statements regarding future prospects may not be realized. Any decision to purchase or subscribe for securities in any offering must be based solely on existing public information on such security or the information in the prospectus or other offering document issued in connection with such offering, and not on this document.

Securities and other financial instruments referred to herein, or recommended, offered or sold by BofA Securities, are not insured by the Federal Deposit Insurance Corporation and are not deposits or other obligations of any insured depository institution (including, Bank of America, N.A.). Investments in general and, derivatives, in particular, involve numerous risks, including, among others, market risk, counterparty default risk and liquidity risk. No security, financial instrument or derivative is suitable for all investors. Digital assets are extremely speculative, volatile and are largely unregulated. In some cases, securities and other financial instruments may be difficult to value or sell and reliable information about the value or risks related to the security or financial instrument may be difficult to obtain. Investors should note that income from such securities and other financial instruments, if any, may fluctuate and that price or value of such securities and instruments may rise or fall and, in some cases, investors may lose their entire principal investment. Past performance is not necessarily a guide to future performance. Levels and basis for taxation may change.

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

BofA Securities is aware that the implementation of the ideas expressed in this report may depend upon an investor's ability to "short" securities or other financial instruments and that such action may be limited by regulations prohibiting or restricting "shortselling" in many jurisdictions. Investors are urged to seek advice regarding the applicability of such regulations prior to executing any short idea contained in this report.

Foreign currency rates of exchange may adversely affect the value, price or income of any security or financial instrument mentioned herein. Investors in such securities and instruments, including ADRs, effectively assume currency risk.

BofAS or one of its affiliates is a regular issuer of traded financial instruments linked to securities that may have been recommended in this report. BofAS or one of its affiliates may, at any time, hold a trading position (long or short) in the securities and financial instruments discussed in this report.

BofA Securities, through business units other than BofA Global Research, may have issued and may in the future issue trading ideas or recommendations that are inconsistent with, and reach different conclusions from, the information presented herein. Such ideas or recommendations may reflect different time frames, assumptions, views and analytical methods of the persons who prepared them, and BofA Securities is under no obligation to ensure that such other trading ideas or recommendations are brought to the attention of any recipient of this information. In the event that the recipient received this information pursuant to a contract between the recipient and BofAS for the provision of research services for a separate fee, and in connection therewith BofAS may be deemed to be acting as an investment adviser, such status relates, if at all, solely to the person with whom BofAS has contracted directly and does not extend beyond the delivery of this report (unless otherwise agreed specifically in writing by BofAS). If such recipient uses the services of BofAS in connection with the sale or purchase of a security referred to herein, BofAS may act as principal for its own account or as agent for another person. BofAS is and continues to act solely as a broker-dealer in connection with the execution of any transactions, including transactions in any securities referred to herein.

#### Copyright and General Information:

Copyright 2025 Bank of America Corporation. All rights reserved. iQdatabase® is a registered service mark of Bank of America Corporation. This information is prepared for the use of BofA Securities clients and may not be redistributed, retransmitted or disclosed, in whole or in part, or in any form or manner, without the express written consent of BofA Securities. This document and its content is provided solely for informational purposes and cannot be used for training or developing artificial intelligence (AI) models or as an input in any AI application (collectively, an AI tool). Any attempt to utilize this document or any of its content in connection with an AI tool without explicit written permission from BofA Global Research is strictly prohibited. BofA Global Research information is distributed simultaneously to internal and client websites and other portals by BofA Securities and is not publicly-available material. Any unauthorized use or disclosure is prohibited. Receipt and review of this information constitutes your agreement not to redistribute, retransmit, or disclose to others the contents, opinions, conclusion, or information contained herein (including any investment recommendations, estimates or price targets) without first obtaining express permission from an authorized officer of BofA Securities.

Materials prepared by BofA Global Research personnel are based on public information. Facts and views presented in this material have not been reviewed by, and may not reflect information known to, professionals in other business areas of BofA Securities, including investment banking personnel. BofA Securities has established information barriers between BofA Global Research



information

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

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

Any information relating to sustainability in this material is limited as discussed herein and is not intended to provide a comprehensive view on any sustainability claim with respect to any issuer or security.

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

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

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

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

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

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

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