

AI Takes Over the World

May Statistics Surprisingly Strong Amid Restatements, 2Q Guidance Weak

It's official: Artificial Intelligence is taking over the world. Not only is AI single-handedly accounting for semiconductor industry growth this year, but the Philadelphia Semiconductor Index Option (SOX) has numerically exceeded the S&P500 and continues to significantly outperform broader equity markets thanks to NVDA breaching a market cap of \$3 trillion (yes, that's a 'T'), while the 'Magnificent Seven' disproportionately lead equity markets by throwing tens of billions of dollars at AI infrastructure.

The problem is, of course, that underneath AI there isn't a whole lot going on. In semiconductors, the workhorse markets of PCs and smartphones have matured reflecting little or no unit growth, although increasing chip content per unit is at least offsetting declines. And most companies are *not* participating in AI euphoria with around half of the companies in my Tokeneke Universe having missed at least part of 1Q earnings expectations and experiencing share price declines so far this year, thereby rendering an equal weighting of share price performance significantly underperforming both the SOX and broader equity markets. A similar lack of breadth is evident in those broader equity markets, as well. In addition, the 2Q semiconductor business outlook is softer than average even with AI strength, based on company guidance during the 1Q earnings season.

Yes, AI is driving expected semiconductor revenue growth this year of +16% driven by memory products at +77% and the chip industry is significantly outperforming broader equity markets. In addition, May chip industry statistics came in—surprisingly—very strong. Unfortunately, even this was muddled by prior month restatements.

All of this renders stock picking across the sector *extremely* problematic. A few winners are doing extremely well and dragging up valuations and averages, while most equities are in a business and share price rut. The big question now is 'When will this AI momentum turn?' I don't know, but cautionary data points include that NVDA guidance has not exceeded the high-end of the range of Street expectations for the last two quarters, and early-bird MU recently offered May-ending quarter guidance that only just met expectations.

I continue to hope that AI cap ex euphoria ahead of revenue streams and profits lasts long enough for PCs, smartphones, automotive and the rest of the end-markets to return to growth. In the meantime, the SOX index remains over-extended versus the S&P500 and most fundamental valuations across the sector are not attractive. I would still be very careful and extremely selective approaching potential chip sector opportunities at this time.

Geopolitical Gymnastics Review: The new normal chaos is every semiconductor company preserving its supply chain and sales in a variety of ad hoc fashions by skipping around ever-evolving US, Chinese and now European technology sanctions, embargoes and tariffs. 'De-Sinicization' describes Chinese and Taiwanese companies expanding operations to more politically neutral countries like Singapore, while 'Geopolitically Dependable Capacity' describes TI's automotive customer supply requirements. 'Indigenization' includes government grants and loans incentivizing domestic semiconductor operations that includes multiple billions of dollars from the US, China, Japan, India, South Korea and Malaysia. The Chinese grow-your-own category is referred to as 'Huawei-ization' due to that company's political isolation from the US.

Memories Matter: Recall that my US-equity-based Tokeneke Universe does *not* include some three-quarters of industry memory business from Samsung, SK Hynix and Kioxia. While my Universe does include Micron and Western Digital, it will probably under-perform expected industry growth in 2024 due to under-representation of more robust expected memory growth now over +75% thanks to AI. My Tokeneke Universe also does *not* include very large international players (aforementioned memory guys plus MediaTek, Infineon, Renesas, Rohm, Winbond, Macronix, Nanya, Novatek, Realtek) although it does include wafer foundries (TSMC, UMC, GlobalFoundries, Skywater Tech, Tower Semi) and IP companies (Rambus, Xperi, Ceva, InterDigital, Arm, Adeia) that count as costs associated with manufacturing rather than industry sales. I also normalize fiscal quarters to the best fitting two out of three months. Unreported acquisition stub-periods and mergers exiting the sector can also make a difference.

While these differences are significant, most US-based investors experience the sector from the Tokeneke Universe perspective. The Philadelphia Semiconductor Index Option (SOX) is similarly under-represented in memories, although this is sometimes mitigated by the inclusion of equipment firms supplying to memory firms.

Surprisingly Strong May Growth: Worldwide chip industry revenues for May grew by +4.1% sequentially on a three-month rolling average basis, according to statistics released by the Semiconductor Industry Association (SIA) last Friday—and would have been even greater if April's numbers hadn't been revised upward. This very strong growth surprised me given soft 2Q guidance, although I think previous month's restatements disproportionately

impacted growth rate calculations. May has averaged growth of +1.8% with a high of +6.5%, a low of -7.5%, and only six declines in the last 38 years, including one in the last 19. The Americas led once again with growth of +6.5% followed by China at +5.0%, Asia-Pacific at +3.0% and Japan at +1.6. Europe lagged again with a decline of -1.0%. See the Charts on Page 3 of this report.

Next month's release of June statistics is likely to be weaker than normal, in my opinion, based on weak 2Q guidance during 1Q earnings season—although restatements could be a wild-card again. June has averaged growth of +0.7% with a high of +5.3%, a low of -9.2%, and 16 declines in the last 38 years, including four of the last 12.

Weak 2Q Outlook: The 2Q outlook is soft but was salvaged by NVDA near the end of the 1Q reporting season. The specific weighted average guidance for 2Q revenue across my Tokeneke Universe at the conclusion of 1Q earnings season calls for a sequential gain of +3.4% (or +2.3% excluding NVDA) ranging from +0.6% to +6.1%. So far there have been only three preannouncements: SIMO exceeding the high-end of its range; WOLF reiterating; and INTC expecting to come in below the mid-point of its original range due to banned shipments to Huawei. (I guess preannouncements just aren't a thing anymore.) The 2Q is seasonally a recovery quarter with an average sequential revenue increase of +4.2%, a high of +20.0%, a low of -19.9%, and eight declines in the last 38 years—including only two of the last 12, according to industry statistics.

Creative Banking: Infinera finally found a buyer in Nokia last month. Nokia will pay in three options: all cash at \$6.65/share of INFN; all shares at 1.7896 shares of NOK ADS's for each share of INFN; or a mix of \$4.66/share of INFN in cash PLUS 0.5355 shares of NOK. And then there is a limit to NOK shares provided at 30% of the deal total, while Nokia is doing a share repurchase to limit dilution. (I guess this is what happens when bankers have too much time on their hands.) Also Semtech got a new CEO and three firms announced 10:1 stock splits: NVDA, AVGO and LRCX (LAM Research). Pending deals include Western Digital's plan to split its hard-drive and flash operations into separate companies 2H24, and Silicon Motion suing MaxLinear for backing out of its takeover.

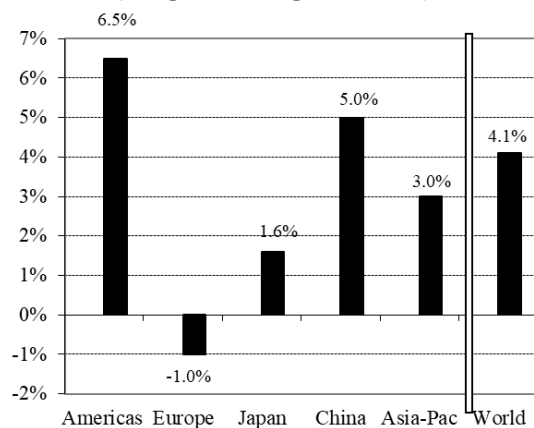
Semiconductor Equities Outperform, But Lack Breadth: Once again, semiconductor sector share prices outperformed broader equity market gains last month and continue to outperform on a year-to-date basis, although the average across my Universe continues to underperform. During June the Philadelphia Semiconductor Index Option (SOX) advanced by +6.8% while 28 out of 55 stocks in my Universe barely eked-out growth of +0.6%. Year-to-date the SOX is significantly outperforming broader equity markets with a gain of +31.1%, although only 29 out of 55 stocks in my Universe have advanced by an underperforming average of +8.0%. Broader equity markets have gained with the NASDAQ, S&P500 and DOW up by +18.1%, +14.5%, and +3.8%, respectively.

June				2Q				YTD				Indices			
Winners (28/55)		Losers		Winners (30/55)		Losers		Winners (29/55)		Losers		Jun		2Q	
ARM	35.8%	SQNS	-35.5%	AOSL	69.6%	PXLW	-61.9%	NVDA	149.5%	SQNS	-82.2%	SOX	6.8%	11.6%	31.1%
AOSL	27.5%	SMTC	-23.2%	HIMX	48.4%	QUIK	-35.2%	ARM	117.7%	WOLF	-47.7%	SMH	8.4%	15.9%	49.1%
HIMX	22.2%	LSCC	-21.9%	CRUS	37.9%	XPER	-31.9%	PI	74.1%	INTC	-38.4%	NASDAQ	6.0%	8.3%	18.1%
AVGO	20.8%	QUIK	-19.8%	NVDA	36.7%	INTC	-29.9%	ALAB	68.1%	MBLY	-35.2%	S&P500	3.5%	3.9%	14.5%
QRVO	17.9%	NLST	-16.5%	SITM	33.4%	LSCC	-25.9%	TSM	67.1%	MX	-35.1%	DOW	1.1%	-1.7%	3.8%
average stock +0.6%				average stock +2.1%				average stock +8.0%							
SOX +6.8%				SOX +11.6%				SOX +31.1%							

Stocks Still Scary: While AI is a huge growth opportunity that single-handedly boosted this year's chip industry forecast, the rest of the semiconductor industry's products and markets are experiencing malaise and/or transitions. In the meantime, the SOX index remains way over-extended versus the S&P500 (note the relative premium of the SOX in the chart on Page 4 of this report), and most fundamental valuations across the sector are not attractive. Net-net, I would remain very careful and extremely selective approaching potential chip sector opportunities at this time.

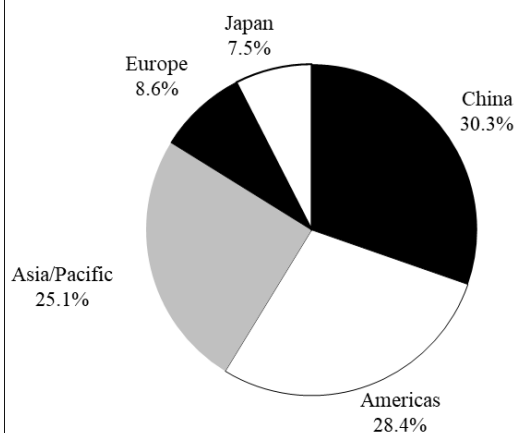
—Dan K. Scovel
Semiconductor Analyst

May 2024 Semiconductor Growth by Region
(compared with prior month)



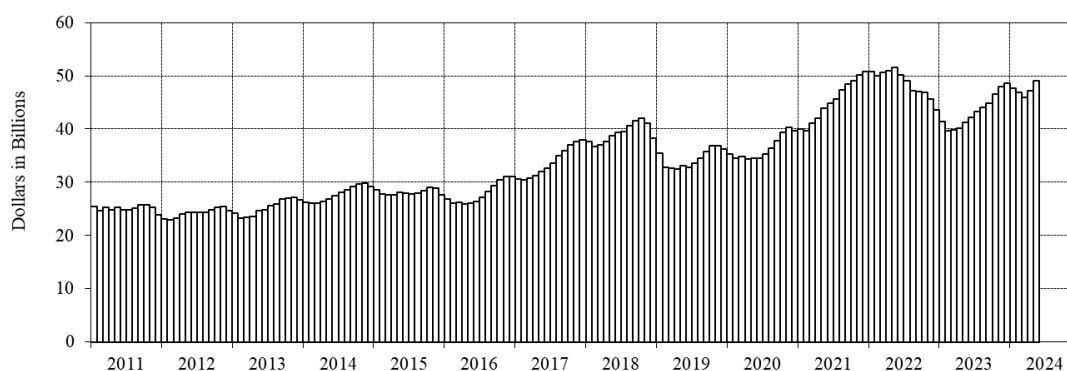
Source: WSTS and Tokeneke Research LLC

May 2024 Semiconductor Revenue by Region



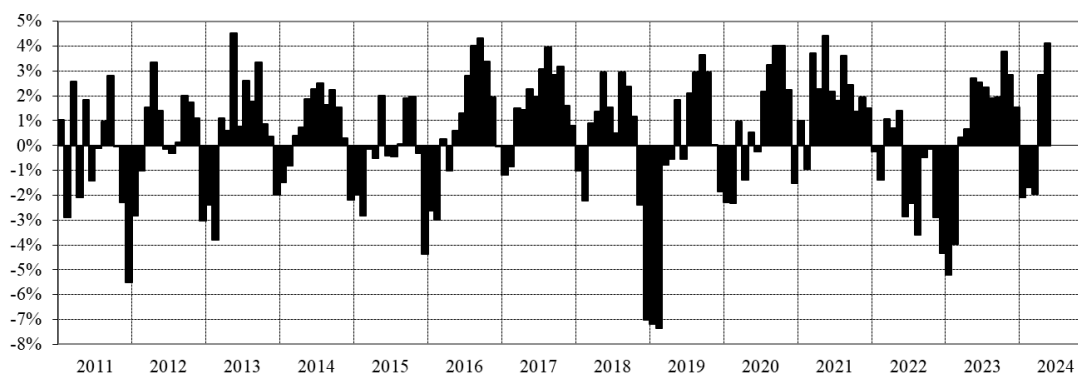
Source: WSTS and Tokeneke Research LLC

Worldwide Semiconductor Revenues
3-month Rolling Average



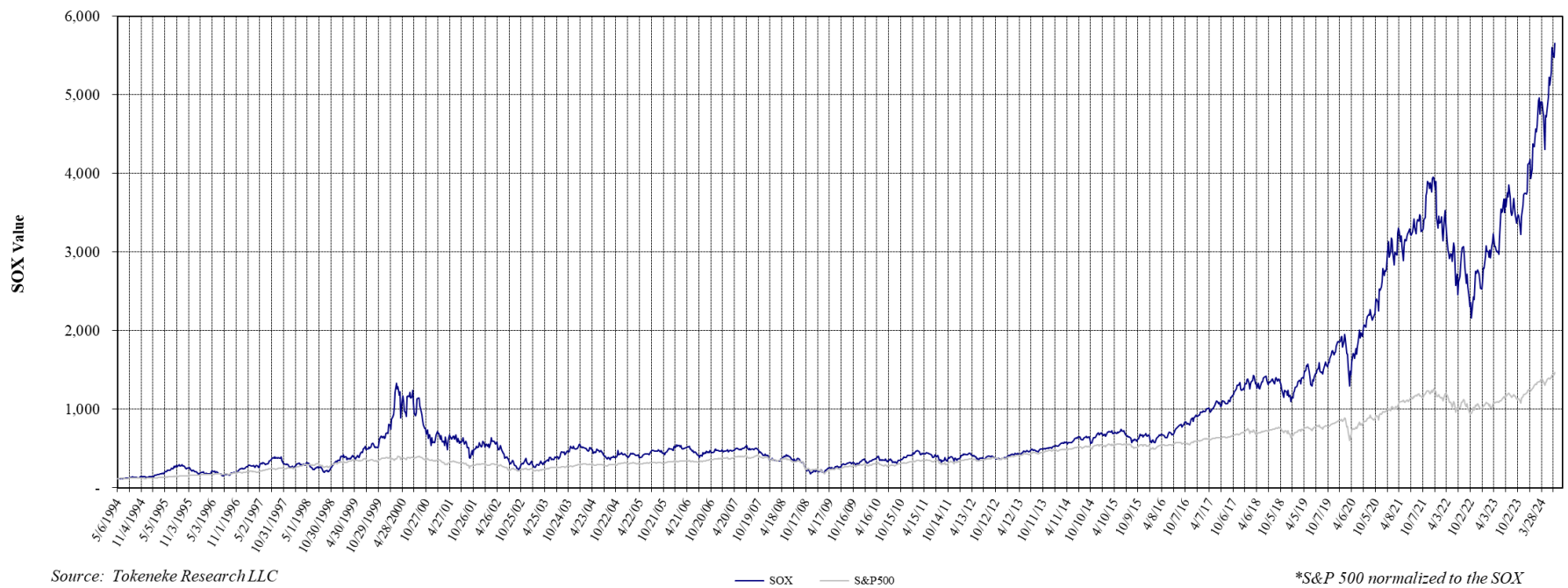
Source: WSTS and Tokeneke Research LLC

Worldwide Semiconductor Revenue Growth
Sequential 3-month Rolling Average



Source: WSTS and Tokeneke Research LLC

Weekly Philadelphia Semiconductor Index Option (SOX) vs. S&P 500



The Tokeneke Universe:

55 companies/tickers as of 6/12/24

Company	Ticker	Company	Ticker	Company	Ticker
Adeia	ADEA	Microchip Technology	MCHP	Rambus	RMBS
Analog Devices	ADI	Monolithic Power Systems (MPS)	MPWR	Silicon Motion	SIMO
Astera Labs	ALAB	Everspin Technologies	MRAM	SiTime	SITM
Ambarella	AMBA	Marvell	MRVL	SkyWater Technology	SKYT
Advanced Micro Devices (AMD)	AMD	M/A-COM Technology	MTSI	Silicon Laboratories	SLAB
Alpha Omega Semiconductor	AOSL	Micron Technology	MU	Semtech	SMTC
Arm Holdings	ARM	MagnaChip	MX	Sequans Communications	SQNS
Broadcom	AVGO	MaxLinear	MXL	STMicroelectronics	STM
CEVA	CEVA	Netlist	NLST	Skyworks Solutions	SWKS
Cirrus Logic	CRUS	NVIDIA	NVDA	Synaptics	SYNA
Diodes	DIOD	NXP Semiconductors	NXPI	Tower Semiconductor (TowerJazz)	TSEM
GlobalFoundries	GFS	ON Semiconductor	ON	Taiwan Semiconductor Mfg. Corp. (TSMC)	TSM
GSI Technology	GSIT	Impinj	PI	Texas Instruments (TI)	TXN
Himax Technologies	HIMX	Power Integrations	POWI	United Microelectronics Corp. (UMC)	UMC
InterDigital	IDCC	Pixelworks	PXLW	Vishay Intertechnology	VSH
Infinera	INFN	QUALCOMM	QCOM	Western Digital	WDC
Intel	INTC	Qorvo	QROV	WolfSpeed	WOLF
Lattice Semiconductor	LSCC	QuickLogic	QUIK	Xperi	XPER
Mobileye Global	MBLY				

The Company

Tokeneke Research is an independent research firm specializing in semiconductor industry business issues, providing fundamental research focused on US equities across all market capitalizations within the sector to investors. The company was founded in 2005 and is based in Connecticut.

My Background

I have an electrical engineering degree, nearly 12 years of semiconductor industry experience, and was on Wall Street for nearly eight years where I was selected as Best On The Street semiconductor analyst by The Wall Street Journal in 2002.

I obtained my undergraduate BS degree in electrical engineering from the University of Washington, and my MBA from Santa Clara University. My industry experience consists of nearly 12 years in various technical sales and marketing roles at four different semiconductor firms located in Silicon Valley beginning with Advanced Micro Devices in 1984, followed by two small start-up companies, and ending at Cirrus Logic where I supported the firm's Japanese market development. I joined Fahnestock & Co. as a senior semiconductor analyst in 1996 and was recruited by Needham & Co. in April 2000.

My coverage as a sell-side analyst included the following: AMD, ALSC, ALTR, ARTI, ATML, CUBE, CY, ESST, GNSS, INTC, ISSI, LSI, MOSY, MU, OIIM, OVTI, RMTR, SIII, SMSC, STEC, SVTG, TDFX, TSRA, TXN, and ZRAN.

—Dan K. Scovel
Semiconductor Analyst

Tokeneke Research LLC

Rowayton, CT 06853

dscovel@tokenekeresearch.com

www.tokenekeresearch.com

203-554-4621

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