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Are we partying like it's 1999 again?

From the Field
September 2024

Key Insights

- Questions have surfaced about the strength and sustainability of the amazing artificial intelligence (AI) rally that has been leading markets this year.
- While there are similarities, there are also major differences that cast the AI theme in a more positive light than the dotcom boom and bust of the late 1990s.
- The foundations of the AI cycle appear solid, based on real demand and profit potential, with most funding coming from IT giants flush with cash rather than debt.

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With the amazing artificial intelligence (AI) rally that has been leading markets this year, questions have surfaced about the strength and sustainability of this major move, particularly given the recent market rotation away from the sector. Our clients often ask me how the current AI boom compares with the earlier dotcom bubble (and subsequent bust). In this note I try to answer that question, which should be helpful in showcasing how we think about AI, taking into account a broad range of views and opinions from our portfolio managers and analysts.

The inevitable comparison with the dotcom rally and the question "Is this 2000 all over again?" implies the unasked question: "Is the precursor to a looming bust?" Or do we dare to use the most dangerous words in finance—"This time is different?"

The answer, frustratingly, is it is probably both. There are certainly similarities, but there are also some major differences that we believe cast the AI theme in a more positive light than the dotcom episode of the late 1990s that ended abruptly in the year 2000.

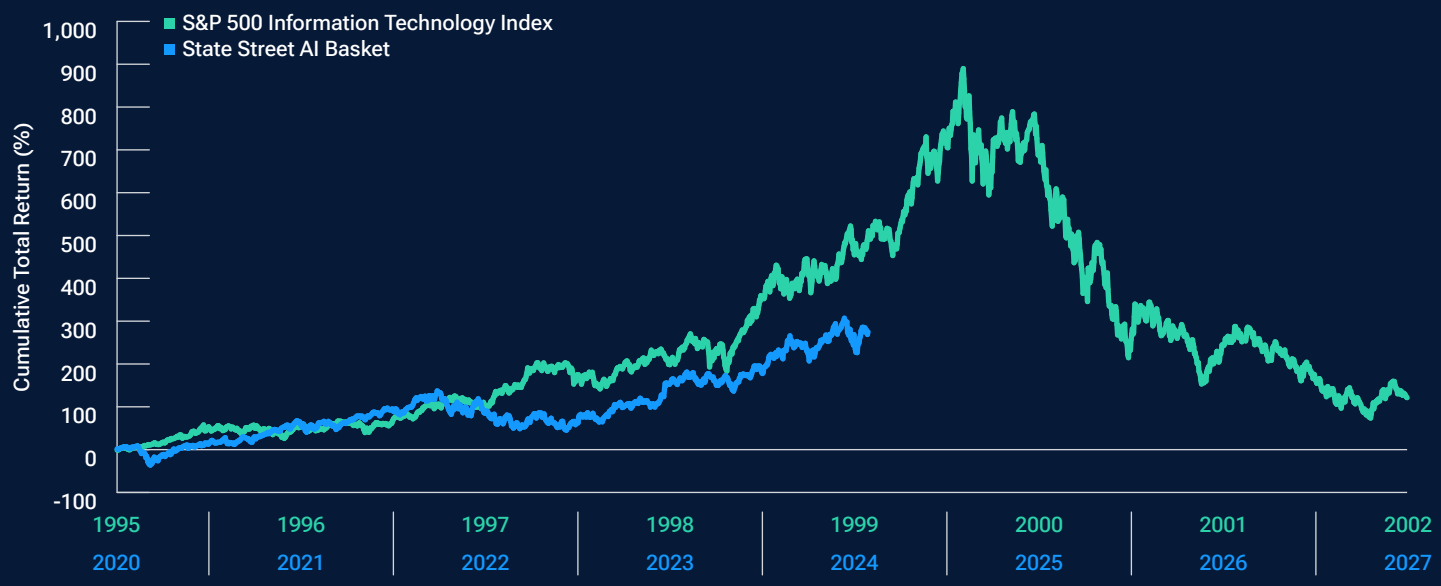
The Bad, the Good, the things you should think about...

The Bad....

I always think it makes sense to get the negatives out of the way first, as this gives us something to look forward to. There are undeniable comparisons that can be made between the dotcom bubble period of 1995–2000 and the current hyperenthusiasm for AI. Figure 1 on the next page shows an eerie similarity between the runup in stocks during the internet bubble and the group of stocks that are behind the rollout of artificial intelligence.

S&P 500 IT Index total return compared with State Street's AI stocks basket

(Fig. 1) AI versus the internet



Returns run from December 30, 1994 to December 31, 2002 for the S&P 500 IT Index, and from December 31, 2019 to August 30, 2024 for the State Street AI Basket.
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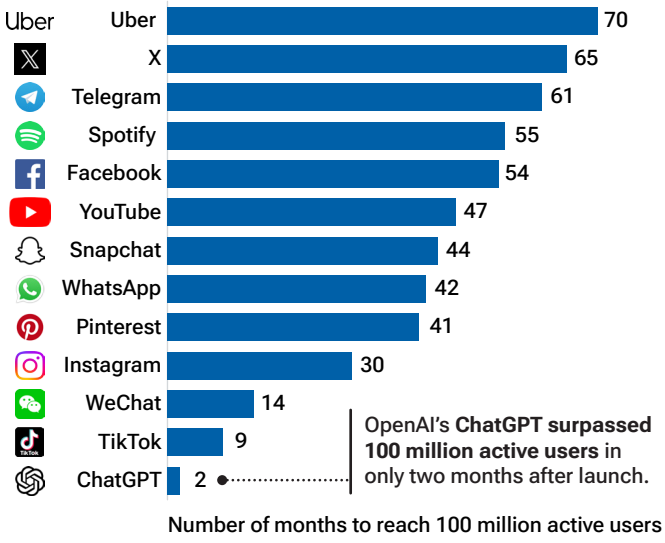
State Street AI basket: State Street selects a large basket of stocks that have exhibited elevated sensitivity (or beta) to mentions of AI in the media since 2015. State Street uses natural language processing to scan thousands of digital media sources each day and quantify the tone and intensity of specific narratives. State Street basket is an equal weighted basket of the following: Twilio INC—A, Synopsys INC, Rambus INC, Pure Storage INC—CLASS A, Onto Innovation INC, ON Semiconductor, NVIDIA Corp, Nutanix INC—A, Marvell Technology INC, Juniper Networks INC, Jabil INC, Gartner INC, GoDaddy INC—CLASS A, Fortinet INC, F5 INC, DXC Technology CO, Salesforce INC, Broadcom INC, Arista Networks INC, Advanced Micro Devices, Accenture PLC-CL A, Axcelis Technologies INC, Workday INC–CLASS A.
Source: Historical data, Standard & Poor's and State Street.

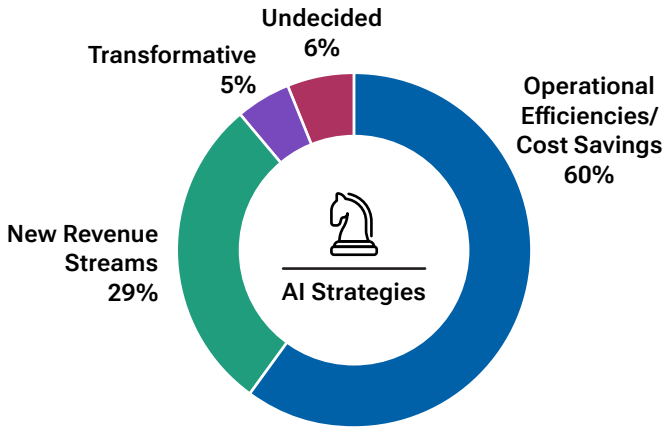
Consumer app adoption

(Fig. 2) Demand is real—speed of adoption is remarkable



Corporates' developing AI use

(Fig. 2)



As of December 31, 2023. Sources: visualcapitalist.com/threads-100-million-users/ (LHS);
(RHS) Bank of America Survey, April 2024.
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The Good...

The first thing I would stress is that the demand situation today is very different from that of the internet bubble. The internet bubble was driven largely by the supply-side buildout of fiber and routers on the assumption that demand would follow (the "build it and they will come" school of thought). Whereas today, the demand for AI is being built on expectations of profitability based on business models and applications that are being rolled out concurrently.

The left-hand graphic in Figure 2 shows exactly how speedy the adoption of AI has been compared to previous popular internet apps. This rapid rate of adoption is because of what AI sets out to do in terms of driving revenues and profitability for companies. We have already seen examples of this with some of the mega cap companies talking about how AI algorithms have driven increased user engagement with their clients, in turn driving increased revenues for them.

The right-hand graphic in Figure 2 shows that less than 10% of companies don't already have a plan for implementing AI in their daily operations. Again, this is likely because they can already see benefits from AI in terms of both labor efficiency and capital productivity. Which all point toward an increasingly positive impact on the bottom line.

Another major difference emerges when one considers the kind of companies that are behind the current burst of growth in tech. The internet bubble in the late 1990s was largely driven by telecom and communication equipment companies that bought into the hype of the internet and felt that they had to invest in the significant infrastructure requirements that were demanded by the internet businesses that were emerging at that time, be it Amazon (hooray!) or Pets.com (who?). That massive buildout of fiber was largely funded by debt and convertible equity.

On the demand side, the bulk of demand for the networking equipment, servers, storage, etc., was coming from internet businesses that were using the financing provided by venture capital. This, in itself, is not an issue until you realize that most of these businesses did not have a viable business model and thus, ultimately, they found it difficult to pay their bills. Hence, the inevitable bust in the dotcom bubble that began on March 10, 2000.

This time around is different: The bulk of the demand for AI capabilities and much of the required funding are being provided by the mega-cap platform companies (aka the "Magnificent Seven") out of their significant free cash flow streams and net cash balances. The demand side is arguably the most interesting area to think about. Large mega cap technology companies like Amazon, Microsoft, Apple, etc., have essentially become quasi-monopolies or oligopolies due in large part to the benefit of scale in their businesses combined with strong network effects.

Now, however, AI is rapidly lowering barriers to entry such that the incumbent tech giants could be challenged by upstarts, whether it's the likes of OpenAI, Perplexity, or Anthropic, to name just a few. So, in a sense, for the incumbent mega-caps, it becomes a question of needing to invest, not just to thrive but also to survive. For example, if Microsoft Azure is investing in AI hardware and technology in order to provide better solutions to customers, Amazon Web Services (AWS) has to do the same. If Meta is using AI to improve algorithms to increase digital advertising revenue, Google has to do the same, and so on and so forth. A virtuous cycle in productivity is underway that has the potential to benefit both consumers and investors, thanks to AI.

> "...the demand for AI is being built on expectations of profitability based on business models and applications that are being rolled out concurrently....

Welcome to the Ultimate Fighting Championship 2024 mega-cap IT style!

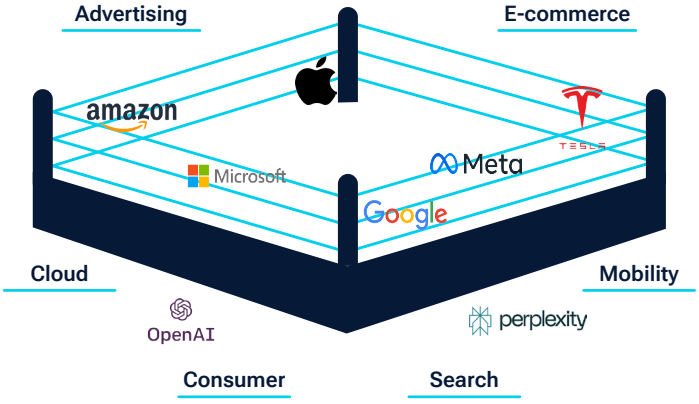
Funding is clearly not the major issue. While the headline number of close to USD 200 billion of estimated capex AI spend in 2024 is massive, it is less than the cumulative free cash flow generated by the mega-cap IT companies in their last fiscal year (leaving aside the fact that they also have large net cash balance sheets).

Another major difference between today and the dotcom bubble is in valuations. While people worry about the pricey valuations of AI stocks today, they pale in comparison to what happened during the dotcom bubble over 25 years ago.

Today, the market appears to be trading mega-cap tech and AI-related names with a fairly healthy amount of skepticism in terms of their multiples. That is not what happened during the internet bubble (as we can see in the table and chart in Figure 4 on the following page). It is embarrassing today to mention that during the internet bubble we even came up with novel ways of valuing companies, such as multiples of "clicks" and "eyeballs." If we ever start valuing AI companies on the basis of electric vehicles per graphics processing unit (GPU), then that is the time investors should really start to worry.

The AI boom is partly funded by the large-cap IT platform stocks as they strive to maintain leadership

(Fig. 3) The incumbent's dilemma—"thrive vs. survive"



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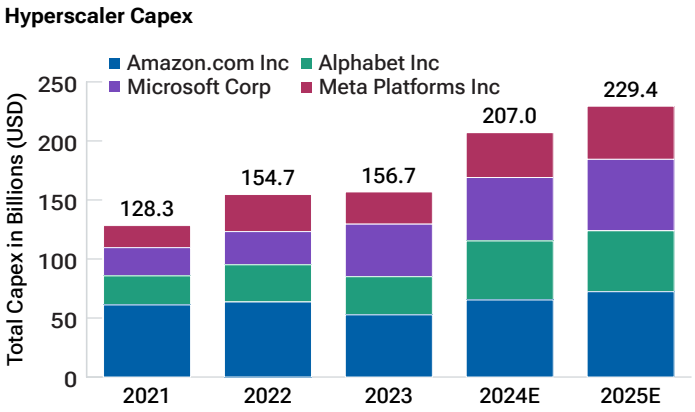
Source: T. Rowe Price.

(Fig. 3) The AI buildout is funded by cash flow



As of August 31, 2024.
E = Estimates.
Actual outcomes may differ materially from estimates. Estimates are subject to change.
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Source: Bloomberg Finance L.P.

Comparison of two-year forward P/E and enterprise/sales ratios

(Fig. 4) Mega-cap and tech valuations—now and then

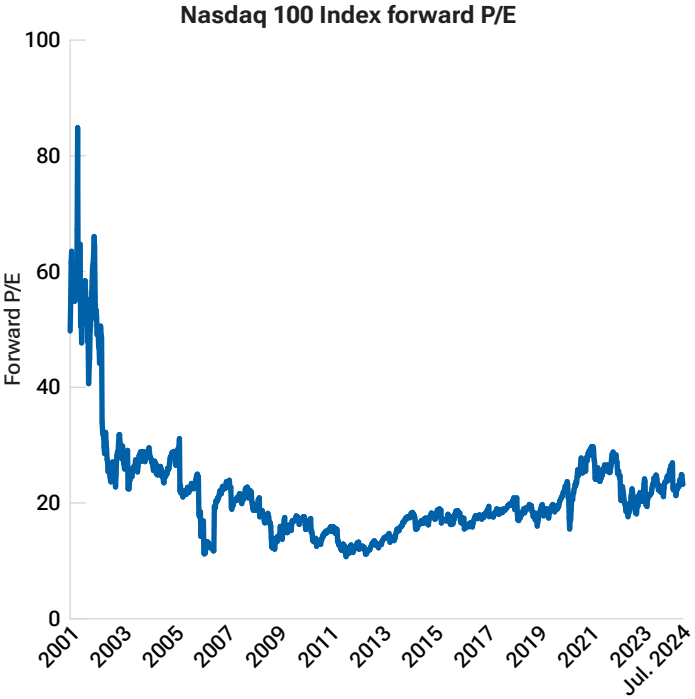
Mega-cap valuations are not as excessive

		Size		Valuation	
		Market Weight	Market Cap (USD bn)	FY2 Fwd. P/E	FY2 Fwd. EV/Sales
Big Tech	Apple	7.0%	3,482	30.7x	8.4x
	Microsoft	6.5	3,101	27.1	9.8
	NVIDIA	6.2	2,928	29.8	16.4
	Alphabet	3.7	1,897	19.0	5.1
	Amazon	3.5	1,872	30.5	2.7
	Meta Platforms	2.4	1,139	21.5	7.1
	Tesla	1.3	684	67.5	5.7
	Big Tech Aggregate	**30.5%**	**15,086**	**32.3x**	**7.9x**
As of August 30, 2024					
	Microsoft	4.5%	581	53.2	19.2
Tech Bubble	Cisco Systems	4.2	543	101.7	17.5
	Intel	3.6	465	42.1	11.5
	Oracle	1.9	245	84.6	19.0
	IBM	1.7	218	23.5	2.3
	Lucent	1.6	206	37.9	4.1
	Nortel Networks	1.5	199	86.4	6.4
	Tech Bubble Aggregate	**19.0%**	**2,457**	**52.0**	**8.2**

As of March 10, 2000.
The specific securities identified and described are for informational purposes only and do not represent recommendations.
Actual outcomes may differ materially from forward estimates.
Sources: Bloomberg, Goldman Sachs Global Investment Research.

Nasdaq 100 forward P/E

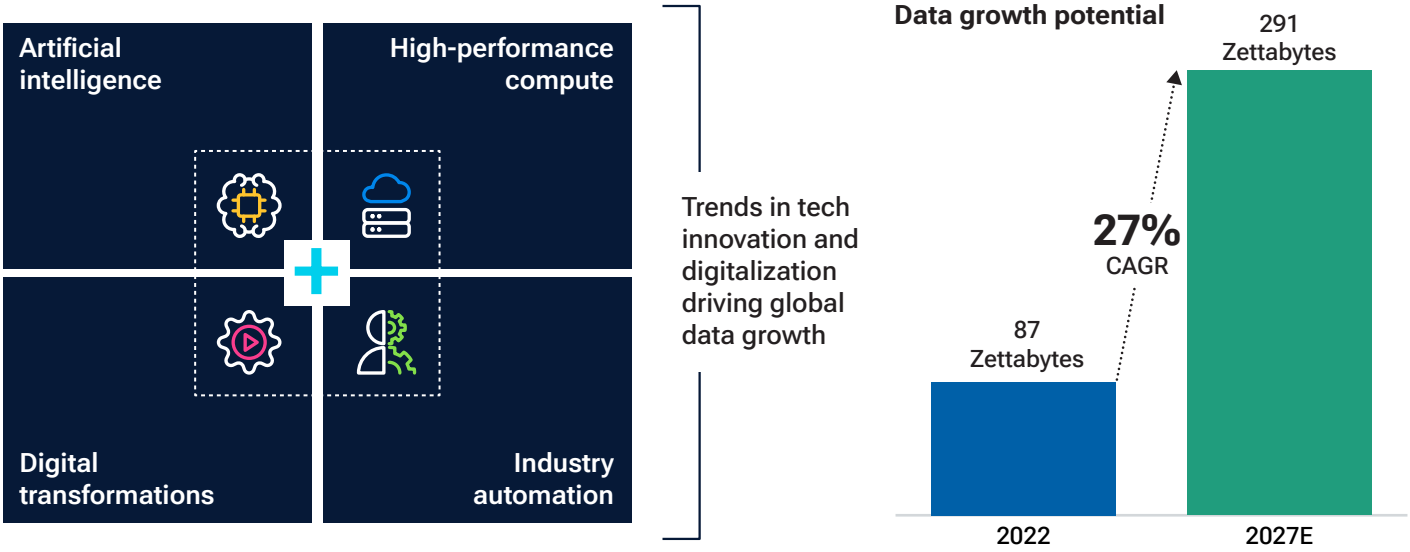
(Fig. 4) Index-level multiples are also more reasonable



As of July 26, 2024.
Source: Bloomberg Finance L.P.
Actual outcomes may differ materially from forward estimates.

Global AI data demand may grow by 27% CAGR over 2022–2027

(Fig. 5) Investment implications—AI continues to drive data growth



Source: Vertiv Investor Conference, November 29, 2023.
Actual outcomes may differ materially from estimates (E). Estimates are subject to change.

Some key things for investors to think about...

So where does that leave us in terms of investment implications? The first thing we need to look at is understanding the value chain in AI.

We begin with the **chip ecosystem** that is supporting the production of the hardware that enables AI application development. These are the companies like NVIDIA and AMD that design the advanced GPU chips and the foundries (TSMC) and semiconductor equipment companies.

Next, we have the **infrastructure and enablers** that build on the hardware to provide the cloud infrastructure, database solutions, etc., to store and analyze the massive quantities of data required by all AI applications.

Resting upon this AI infrastructure, we have the **foundational models** like GPT-4, Llama, Gemini, etc., that have been developed on the infrastructure and equipment provided by the first two segments of the AI value chain. These foundational large language models (LLMs) are large, complex AI models trained on massive amounts of unlabeled or weakly labeled data. Unlike traditional AI models trained for specific tasks (e.g., image recognition, machine translation), foundational LLMs learn to interpret general patterns and relationships within the data. This ability allows them, in turn, to be adapted for a very wide range of downstream AI tasks.

And then, finally, at the top layer of the AI value chain, we have the **applications** that are developed on these models that have the potential to be monetized.

We are currently still largely in the "infrastructure buildout" phase of the AI boom, which explains why the semiconductors subsector has been such a stellar performer this year. While foundational models and applications are being created, given the rapid rate of change, it is much less clear how we can, at an early stage, identify the ultimate winners in this space. This is evidenced by how major software companies such as Adobe and Salesforce have traded recently due to worries that AI might disrupt their established businesses.

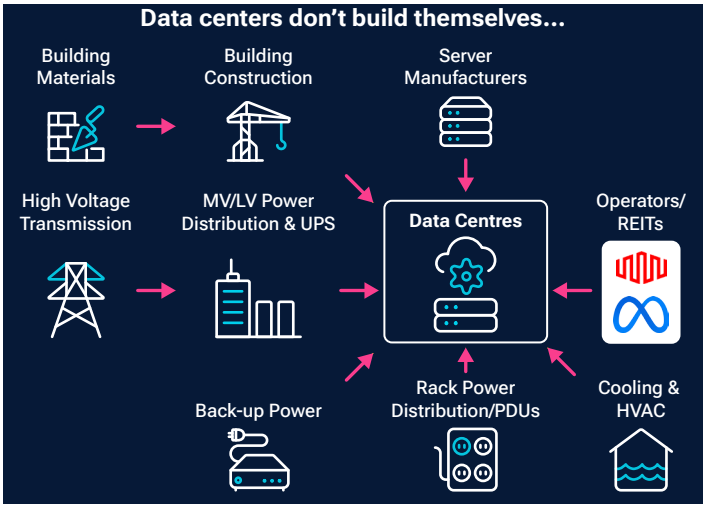
What are some of the investment implications of AI beyond the semiconductor and mega-cap tech companies?

Well, the first thing to note is that we continue to see an amazing growth in the amount of data to be used and stored. As Figure 5 shows, the amount of data generated is projected to grow from 87 zettabytes to 291 zettabytes over the next five years, a 27% estimated compound annual growth rate.

To put this in perspective, 1 zettabyte is equivalent to 1 trillion gigabytes (GB), and a typical high-definition movie could be between 5 GB to 10 GB of data. All this data require storage, servers, etc., which some computer hardware companies can provide.

AI is highly energy intensive and requires many new data centers

(Fig. 6) Investment implications—there is life beyond technology



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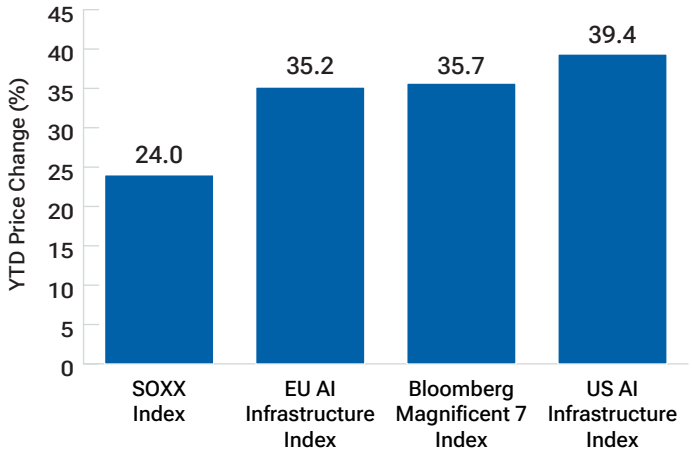
The market is paying attention



As of August 30, 2024.
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Source: Bloomberg Finance L.P.

Another investment implication is that there are actually very relevant ways to invest in AI outside of the traditional tech sectors that we usually tend to think about.

AI is incredibly energy intensive, and as we build out these data centers that are essentially "mini-cities" in terms of power consumption, there is an entire ecosystem of companies across energy and materials to industrials that are intrinsically important. This buildout requires electricity generation and transmission, which require electrical equipment, which in turn requires copper. Data centers generate tremendous amounts of heat, which then require specialized cooling solutions in turn that are provided by industrial companies.

It is interesting to see that a basket of these "AI infrastructure" names in both the U.S. and Europe actually performed better than the Magnificent Seven and the Philadelphia Semiconductor (SOXX) Index year-to-date, indicating the broadening investment opportunities from AI.

Caveat emptor—secular trends can have hype cycles

We have seen before that significant product and technological innovations that promise to add immense value can also result in hype cycles in the stock market. Enthusiasm can wax and wane as investors continually readjust their expectations of the value creation that is likely to be realized. I've chosen a couple of examples from the recent past to demonstrate this.

Innovation #1—Autonomous and electric vehicles—hailed as a "better and cleaner manner of transportation."

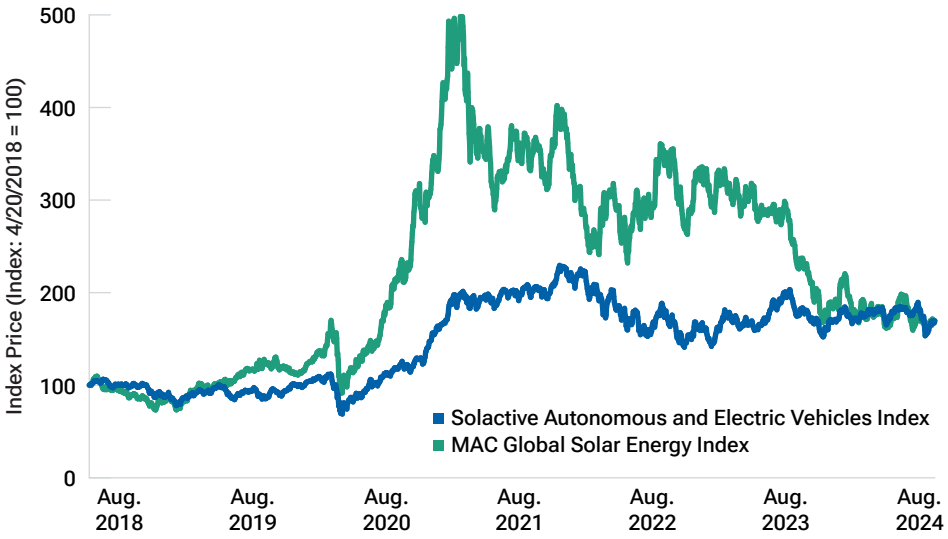
Innovation #2—Solar energy—a "better and sustainable way to generate electricity."

Few, if any, of us, doubt the value and sustainability of these innovations, but as we move from concept to production and mass adoption, market valuations have gyrated significantly (Fig. 7).

This reminds us that, as investors, we need to maintain the discipline to navigate the inevitable cycles that manifest.

Innovations cycles can be volatile

(Fig. 7) Indexed price



As of August 30, 2024.
Past performance is not a reliable indicator of future performance.
Sources: The MAC Global Solar Energy Index (SUNIDX) seeks to track the performance of companies in the global solar energy businesses. The Solactive Autonomous & Electric Vehicles Index tracks the price movements in shares of companies in the electric vehicles and autonomous driving segments.

Concluding thoughts

Generative AI may well prove to be a "generational investment opportunity," but that doesn't mean investors can afford to ignore potential risks around it. While parallels are being made by some to the earlier dotcom bubble, there are sufficient indications that the foundations of this AI cycle are solid, based upon real demand and profit potential.

Like the dotcom era, we think the best way to take advantage of generative AI in the early stages is via the "picks and shovels." This includes semiconductors, as the current generative AI buildout is incredibly semiconductor intensive due to its immense parallel processing requirements, but also other parts of the infrastructure layer and infrastructure plays that extend well beyond the tech industry. While parallels are easily made to the dotcom bubble, a key difference is that the bulk of funding for AI is coming from hyperscale IT giants that are flush with cash versus the dotcom communications providers that were drowning in IPO debt.

As a final thought, we, as investors, should remember that all things come in cycles. We must therefore resolve to navigate the hype that can arise in tech cycles like AI with care and prudence.

> "...the foundations of this AI cycle are solid, based upon real demand and profit potential.

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