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AI Capex: A Vertiginous Dialectic

Whether or not AI constitutes a bubble is the dominant question for financial markets today. There are really three distinct AI questions: 1) By how much can AI raise productivity? 2) Does AI inevitably imply job destruction? 3) Are the flow of capital into AI capex, and associated revenue projections overdone? This note focuses mainly on the latter question, with our recent AI note analyzing the former two.

The projections for data center construction place it on a par with historic major capex waves. Indeed, on some metrics the capex intensity is unique, as is the growth rate of revenues required to justify it.

We show scenarios for what different rates of productivity growth mean for AI valuations. In addition, the change in funding to include debt and vendor financing raises risks, though admittedly this has only emerged recently.

A particular concern is the need for evidence of rapid broadening and growth of revenues on a time scale shorter than the rapid depreciation cycle of chips. Thus, our main concern is not valuation per se, but the risk of an "air pocket" where investors lack information about the revenue trajectory from AI on a timescale significantly shorter than the depreciation cycle. The other concern is the deterioration in funding quality during the last year.

The consequence is that we are not bearish, but we do think there is complacency about volatility and that risks of a drawdown are elevated. Therefore, a key question is what constitutes a defensive trade today? We suggest global healthcare, low volatility and EAFE income as trades that can be put on today, alongside a position in the market that is ultimately strategically positive.

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Investors are grappling with a host of issues relating to AI. We would classify three of the biggest conundrums as the inter-related and thorny questions of 1) What is the potential productivity gain from AI? 2) How much of a productivity gain comes from displacing labor vs enhancing labor, with the attendant worry of what this means for the jobs market? 3) Does the extraordinary flow of capital into AI capex constitute a bubble? In this note we focus on the latter question.

When we meet with clients, the term "AI bubble" is now frequently used by investors. In fact, the sheer casualness with which that phrase is cast around sits oddly juxtaposed with the evidence of flows still accruing into equities and the wave of capital seeking a home in AI-linked investments across private markets.

We should remark upfront in our note the irony of all this. In those prelapsarian days before COVID, the discussion was about the falling need for physical capex. There were serious academic discussions about how the nature of capitalism was changing if there was no longer any need for capital.[1] Yet now we are witnessing what, on some metrics, might be the most intense wave of capex in history. Thus, rather than pondering what capitalism looks like without a need for capital, we are instead left contemplating what capitalism looks like without a need for labor. This is a very abrupt change of profound importance philosophically. It matters financially, too. We note in fact that this could be part of a deeper challenge to capitalism—see our recent discussion in Dystopian Symbiosis: Passive Investing and Platform Capitalism.

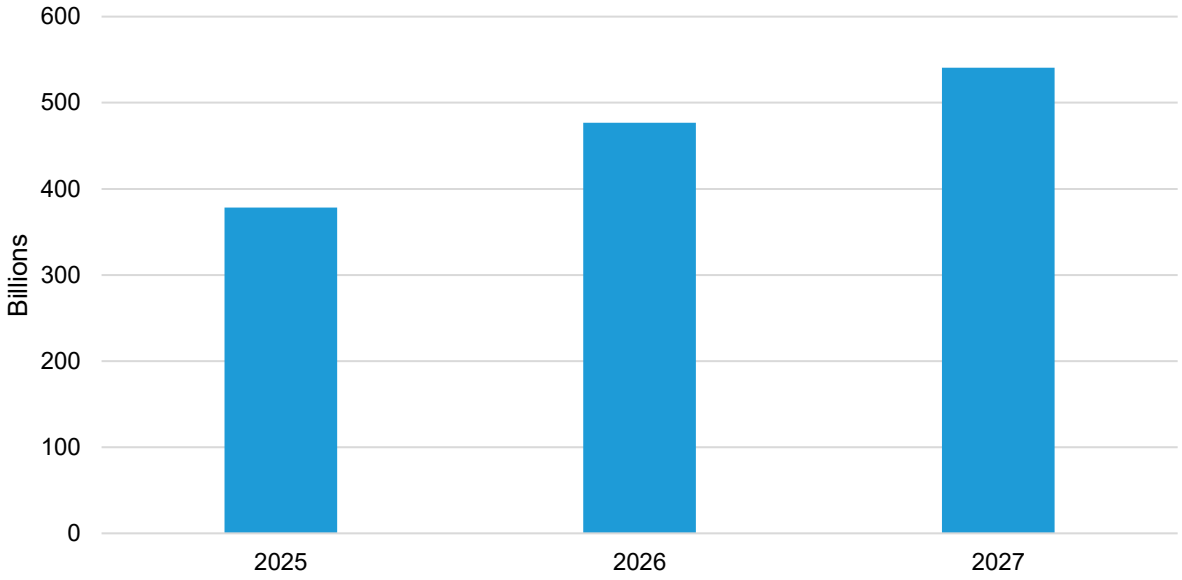
The use cases of AI are slowly emerging, albeit it's frankly too early to really lay out a high confidence path. However, memories of the tech bubble frequently emerge in conversations with clients, as do analogies with the railway-building frenzy of the nineteenth century and other episodes where the adoption and economic benefits of a new technology took much longer than investors first hoped, and where the ultimate beneficiaries were not clear. The case for and against the bubble-like quality of AI presents itself as a vertiginous dialectic that permeates the outlook for most asset classes. On the one hand, companies have never grown as fast as the numbers required to justify current valuations; on the other hand, these are already companies that are bringing in revenue, unlike in the tech bubble. More fundamentally, there is a promise of untold productivity growth, and yet on the other side the realization that such growth might come at the expense of a job-free future, with profound social questions in the form of inequality, not to mention planetary impact.

We try to think about the extraordinary capex plans for AI both from the point of view of the tech sector itself and also from the perspective of the US economy overall. In 2025, the amount spent on building data centers is likely to be approximately $400 billion. The amount forecast to be spent by the main hyperscalers by the end of 2027 is more than $1 trillion (*Display 1*). And it does not include all of OpenAI's spending, which alone has committed to 30GW of data center capacity from AMD, Broadcom, NVIDIA, Oracle and other partners, at a cost of more than $1.4 trillion.[2]

[1] See the very good discussion of this in Haskel and Westlake (2018) *Capitalism without capital Capitalism without Capital: The rise of the intangible economy,* Princeton University Press.

[2] https://www.axios.com/2025/10/28/openai-1-trillion-altman

DISPLAY 1: CONSENSUS CAPEX PROJECTIONS FOR THE MAJOR AI COMPANIES



Current analysis and forecasts do not guarantee future results.

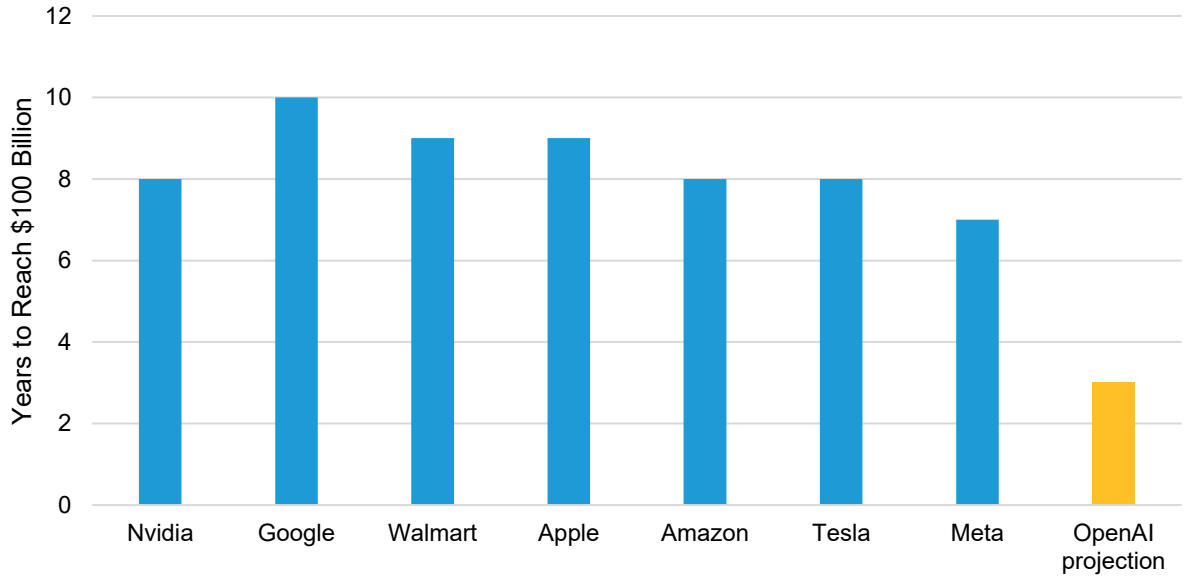
Note: The chart covers Apple, Google, META, Microsoft, Oracle and Amazon.

As of October 31, 2025

Source: Bloomberg and AllianceBernstein (AB)

How is the AI sector going to achieve the revenue to pay for this? Taking OpenAI as a case in point, the firm projects that it will achieve $100 billion of revenue in 2028 and $200 billion in 2030. In the context of a transformational general-purpose technology, this is perhaps understandable. However, no company has ever grown this fast (*Display 2*).

DISPLAY 2: OPENAI IS PROJECTING UNPRECEDENTED GROWTH TO $100BN IN REVENUE



Current analysis does not guarantee future results.

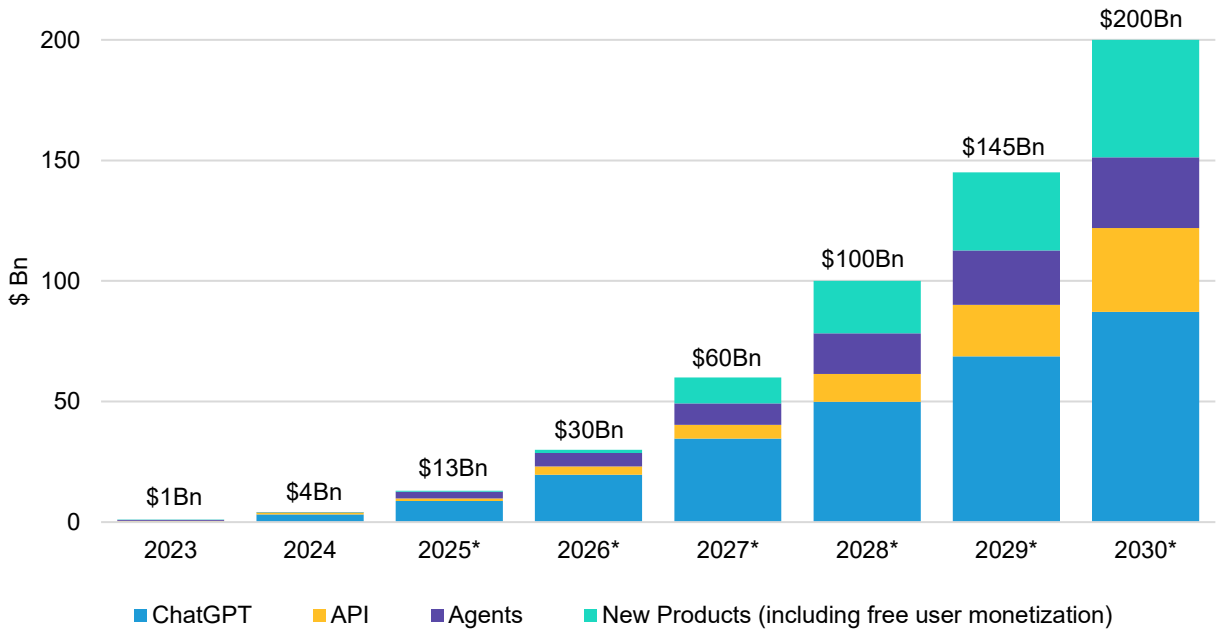
Note: The chart shows years taken to reach $100 billion in revenue. References to specific securities discussed are not to be considered recommendations by AllianceBernstein L.P. It is based on Epoch AI (www.epoch.ai) data.

As of December 1, 2025

Source: Epoch AI and AB

Of this revenue total, ChatGPT would only be just under half (though still significantly larger than the number of paying users today). In addition, there are planned new sources of revenue: e.g., tools for government and business, new shopping tools, video creation and highly personalized advertising. OpenAI is also considering becoming a supplier of computing resources (*Display 3*).

DISPLAY 3: PROJECTION OF RAPID RISE AND BROADENING OF OPENAI REVENUES
PROJECTION AS OF Q3 2025



Current analysis and forecasts do not guarantee future results.
As of November 15, 2025
Source: https://www.theinformation.com/ and AB

So, how likely is it that this can happen? It does not seem to be impossible, but a lot needs to go right. We explore this issue below when we consider how we know whether this path is achievable. One caveat is the power demand that it will require, which we treat in a separate section below.

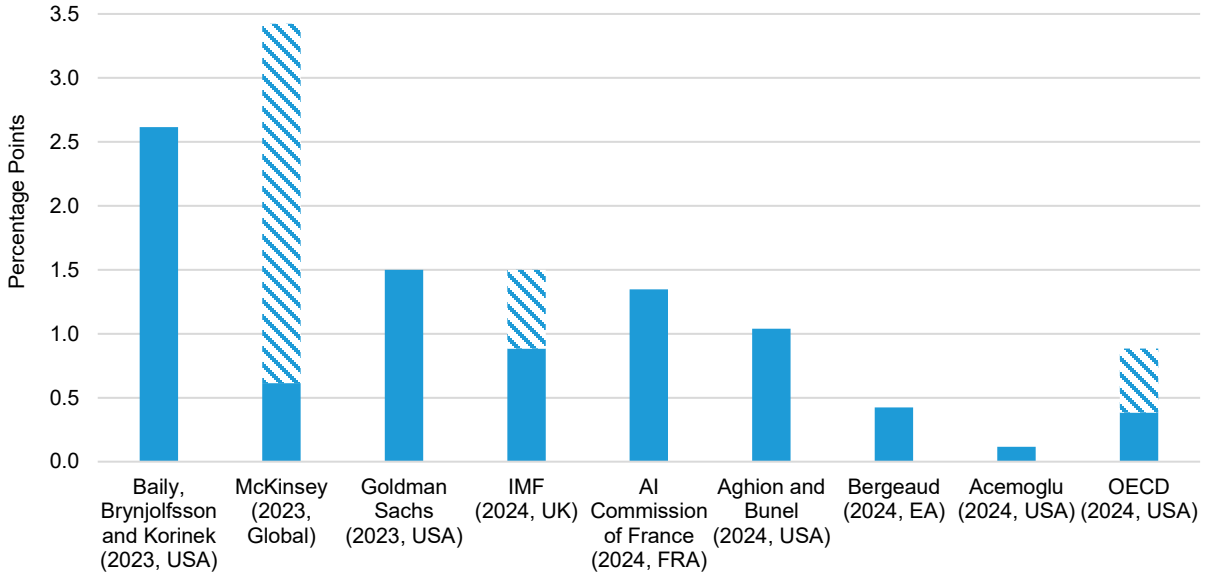
Taking a high-level macro view, which is the point of this note, we can skip over the exact mechanism of the revenue collection and defer to the great promise of AI as a path to productivity growth.

Scenarios for Productivity, Profit Growth and Valuation

How can one think about grounding the outlook for the possible revenue of AI companies and whether this can justify the capex? The framework that we use for this is grounded in our prior work on the range of aggregate productivity outcomes that are plausible.[3] The overwhelming message from that prior work is that one has to be humble in forecasting productivity growth, but given the need to have some kind of quantitative grounding for a framework, we use the range of the key academic (and academic-adjacent) studies that attempt to forecast productivity growth.

[3] AI vs. Demographics: Or might shrinking populations not be so bad if robots are taking jobs, anyway?

DISPLAY 4: COMPARING PREDICTED AI IMPACT FROM DIFFERENT ACADEMIC STUDIES



Current analysis does not guarantee future results.

When the source presents a range of estimates as the main result, the lower and upper bounds are indicated by striped areas. In cases where predictions are made for total factor productivity, predicted labor productivity gains are obtained by assuming a standard long-run multiplier of 1.5 regarding the adjustment of the capital stock (Acemoglu 2024, Aghion and Bunel 2024, Bergeaud 2024 and OECD). The estimates refer to the countries shown in brackets.

As of December 8, 2024

Source: https://cepr.org/voxeu/columns/miracle-or-myth-assessing-macroeconomic-productivity-gains-artificial-intelligence and AB

Note that most estimates leave out the problem that there are downward forces on growth (demographics, climate and deglobalization) that are of comparable scale, so AI's productivity gain would not necessarily be extra growth, just making up for lost growth elsewhere. This means that AI doesn't plausibly solve things like the build-up of public-sector debt. Nevertheless, it does offer a view on how plausible it is that the valuations for AI-related companies can be justified, which is our focus here.

The average productivity growth assumed in the studies shown above is an increase of 0.9 percentage points per annum (pppa) over the next decade. We note that this is close to the level of extra growth needed to offset the other downward forces on growth; it's also similar to the long-term sustained uptick in growth that was delivered by the steam engine. Thus, this forms the middle forecast for the analysis that follows. The low-growth case is essentially the one outlined by Daron Acemoglu in *A Simple Macroeconomics of AI*.[4] This case is that AI delivers an uplift to growth on the order of 0.1pppa, and that there is a constraint on the application of AI, in part from the lag of development in robotics, which means that approximately 20% of tasks are exposed to AI and that it is economical to automate about 5% of them. The techno-optimist view maps most closely onto the view expressed in Baily, Brynjolfsson and Korinek (2023),[5] which accords an extra growth rate of 2.5pppa, in part predicated on things like scientific breakthroughs enabled by AI. This is a huge range of forecasts for changes to annual growth rates and really underpins the idea that we just don't know what the impact of AI will be. But we can use them as forming a basis for a range of scenarios.

We assume global developed market gross domestic product (GDP) of $70 trillion that, in a base case, grows at 4% nominal pa (2% real + 2% inflation). We assume three scenarios for an incremental per-annum uplift to growth of 0.1, 0.9 and 2.5% based on the range of recent academic studies. We assume that the AI mega-cap names manage to capture 10% of any incremental productivity uplift, i.e., this represents the total accessible market (TAM). We further assume that these firms can earn 20% margin on this (down from the current net-income margin for these names of 28%, but above the long-run tech margin of 10%).

[4] Acemoglu, Daron (2024) *The Simple Macroeconomics of AI,* NBER Working Paper 32487

[5] Baily, Martin Neil, Erik Brynjolfsson and Anton Korinek. 2023 https://www.brookings.edu/articles/machines-of-mind-the-case-for-an-ai-powered-productivity-boom/

In other words, the earnings uplift for the AI names is 2% of any incremental GDP growth. A standout feature of today's AI companies that sets them apart from the TMT bubble of 1999–2000 is that they are profitable already. So, let's assume that their 2024 net income is a base that continues to grow at 7% pa (the average growth rate of US tech earnings since 1995), regardless of additional AI revenue. The three scenarios then imply a range of earnings uplift over this base. Our long-term equity-return forecast is 7% in nominal terms, so we assume that the AI-related names yield returns from here until 2030 that are in line with this broad market forecast. On this basis, this yields the range of price/earnings (PE) multiples in 2030 for the group shown at the bottom of *Display 5*.

DISPLAY 5: THREE SCENARIOS FOR AI PRODUCTIVITY AND AI COMPANY VALUATION

	Low (+0.1%)	Mid (+0.9%)	Techno-Optimist (+2.5%)
Baseline Developed-Market GDP (2024)	70,000	70,000	70,000
Starting Earnings for AI Companies (2024)	368	368	368
Baseline Nominal GDP 2030 (4%/yr)	88,572	88,572	88,572
Incremental gain from AI, ppa	0.1	0.9	2.5
Scenario-Specific 2030 GDP	89,085	93,272	102,140
Incremental GDP from AI (2030)	512	4,700	13,568
AI TAM (10% of Increment, $B)	51	470	1,357
AI Earnings (Assume 20% Margin), $B)	**10.24**	**93.99**	**271.35**
Baseline Sector Earnings from Non-AI Business (2030, $B)	**552**	**552**	**552**
Total Sector Earnings AI + Legacy Business (2030, $B)	**563**	**646**	**824**
Market Cap 2030 (Price +7%/yr for 5 years, $B)	**16,690**	**16,690**	**16,690**
Implied Scenario-Specific P/E (2030)	**29.7**	**25.8**	**20.3**
Market PE Multiple	**21.8**		
Tech Relative PE	**1.36**	**1.18**	**0.93**

Current analysis does not guarantee future results.

The model shows potential 2030 multiples for hyperscalers (Microsoft, Alphabet, Amazon, Meta and Oracle) based on three productivity growth scenarios: Low, Mid and Optimistic, with 0.1%, 0.9% and 2.5% additional productivity growth, respectively. It assumes that hyperscalers capture 10% of incremental GDP growth and that they earn 20% margins on the incremental income. Their legacy business earnings are assumed to grow by 7% per year. Finally, they are assumed to return 7% pa through 2030.

As of November 30, 2025

Source: Factset, Bloomberg, and AB

This bullish case also requires a hard form of US exceptionalism to hold. To be clear, we do have a view that the US equity market is exceptional, and we remain strategically overweight US equities. At the same time, it has to be recognized that the techno-optimist case outlined above assumes a continued ability for US tech companies to extract value from the rest of the developed world. This seems eminently likely in the near term, not least given the highly significant gap in data-center capacity between the US and the rest of the world and also the lower power prices in the US. There does not seem to be any ability to mount an opposition to this from the rest of the world, but in the long term we think this is moot. If some of this apparent US advantage is essentially a failure of antitrust in the US and a subsequent process of regulatory capture (e.g., via lower effective

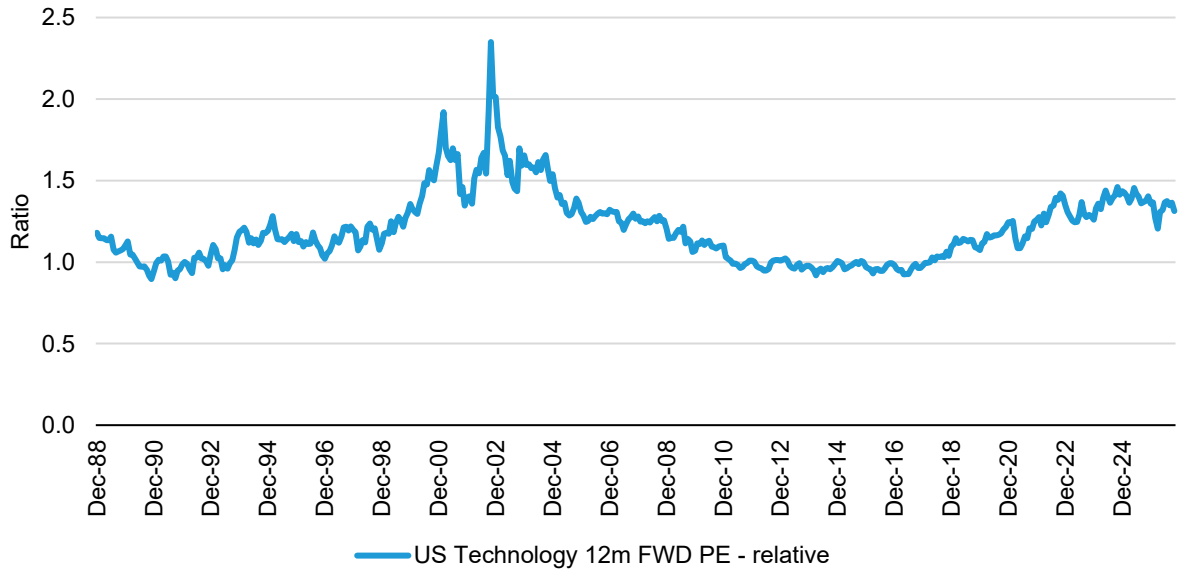
tax rates), it is not obvious why the rest of the world would accept an even more aggressive move in this direction; we think there would likely be a backlash.

Of course, it can be argued that any exercise that seeks to model a long-term PE is of limited utility, as one never knows over what time horizon any equilibrium multiple may be reached, nor indeed what might constitute an equilibrium multiple. However, we would argue they perform a useful basis, as over medium-term horizons there have been ranges of multiples that one can point to.

Over the last 37 years, US tech stocks have, on average, traded at a 20% premium to the market. This includes the TMT bubble of 1999–2000. Over time, the absolute multiple of the market has also risen. We have argued before that we do not need to see a reversion to long-term absolute market multiples. Fundamentally, the case for this lack of long-term mean-reversion is driven by: 1) the increased persistence of ROE over time for US companies; 2) our lack of belief that there needs to be a mean-reversion in the real cost of capital; 3) the fact that de-equitization will continue, as it requires a huge change in policy to reverse; and 4) that there is a good case that investor allocations over time must strategically re-weight toward equities away from nominal assets. This does not mean that valuation can be ignored, and we would reject any such claim. We can show that periods of high multiples, as is the case today, tend to beget periods of higher volatility, and we would also strongly reject any claim that there can be any sustained increase in the market multiple from today's level.

A 20% premium on, say, a market multiple of 20x (above the 37-year average of 17x) implies a tech multiple of 24x, i.e., this suggests that there is indeed a path to justifying current valuations from the macro-productivity and revenue assumptions outlined in this note. To the extent that there is a "problem," it seems to hinge more on how one can know what path of productivity one is on, a topic which we turn to next.

DISPLAY 6: TECHNOLOGY 12 MONTH-FORWARD PE RELATIVE TO MARKET (US)



Past performance does not guarantee future results.

As of October 31, 2025

Source: Factset and AB

The "Problem" of Depreciation

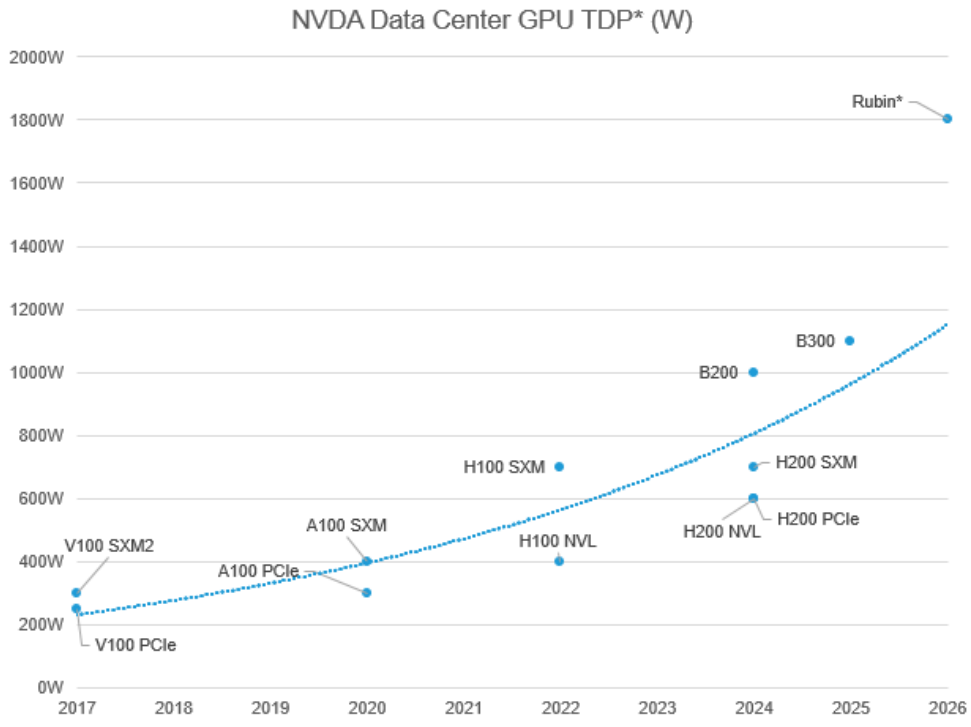
One can lay out these scenarios, but they describe possible paths rather than capturing the risks and the mechanism by which those risks may play on investors' willingness to see which of the above-described paths we are on.

It is often claimed that AI, or specifically the LLM, is one of the fastest-adopted new technologies ever in human history. The growth of ChatGPT from zero to 800 million weekly users (most of them not paying of course) within three years of being released being exhibit number one. However, the flipside of this observation is that the depreciation time of much of the underlying assets is also one of the shortest ever. Graphics processing units (GPUs) account for approximately 40% of new data-center capex, and their useful life is short.

Of course, there is an active debate about how short this useful life is. There appears to be a good case that a five-to-six-year deprecation time is achievable,[6] although there are risks to this view, and a case that the deprecation might not be linear.

As one extends the time horizon forward, though, there are potential downward risks to this useful life. The higher power usage of the latest generation of chips plausibly lessens their useful life even more than previous generations, and the latest generation of GPUs operates at a power level that has no historical precedent (*Display 7*).

DISPLAY 7: THE INCREASING POWER USAGE OF CHIPS IMPLIES FASTER DEPRECIATION CYCLES



*TDP – Thermal Design Power in watts (w)
*Rubin TDP is based on estimates

Current analysis and forecasts do not guarantee future results.

As of November 14, 2025

Source: https://resources.nvidia.com/en-us-gpu-resources/datasheet and AB

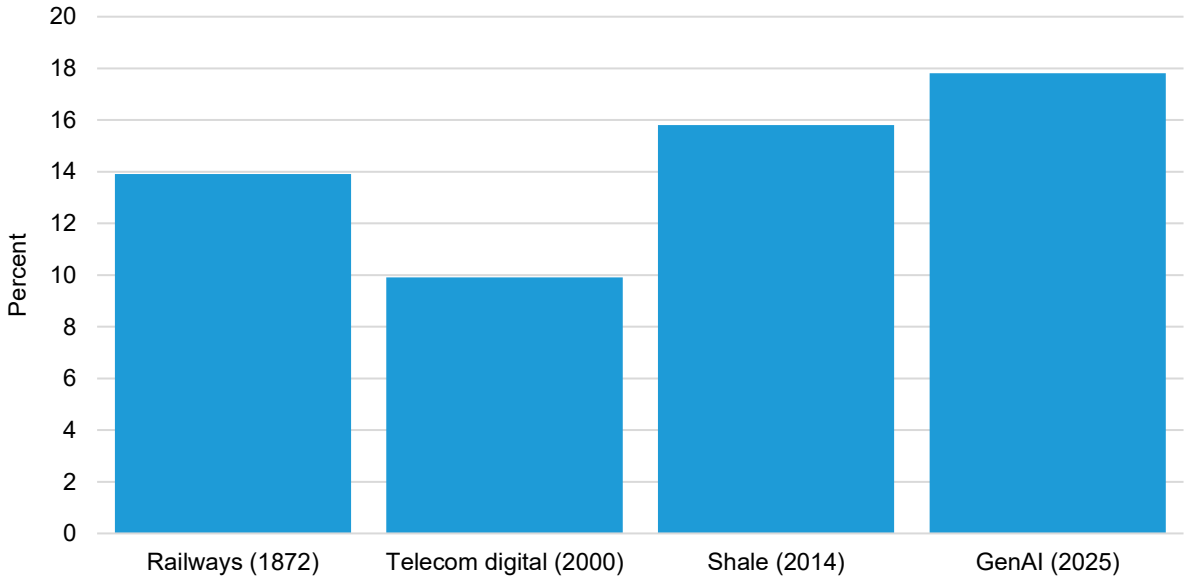
One can think about the implications of this situation in several ways. It means that the current high capex numbers have to be maintained on an ongoing basis. It also means that it is imperative to have data on the realized revenue growth path for AI on a

[6] Please see: Stacy A. Rasgon, Ph.D., *AI Value Chain: Can you really run a GPU for 6 years?*, Bernstein Research, November 17, 2025

time frame that is significantly shorter than this depreciation cycle. It is in this that we see one of the key risks emerging—the idea that there could be an "air pocket" where we simply do not have fast-enough information on the rate and breadth of revenue growth. It is this that, we think, will be a driver of volatility and almost inevitable drawdowns over the next year, even if the path of AI revenue is ultimately upwards.

Of course, we have seen past waves of capex, but unlike previous huge capex cycles (railways, the US interstate system, electricity and even fiber) the short depreciation time of the current wave stands out as unusual.

DISPLAY 8: ON A DEPRECIATION -ADJUSTED BASIS, THIS COULD BE THE MOST INTENSE CAPEX WAVE



Past performance does not guarantee future results.

Depreciation assumed as follows: railways 30 years, telecom 12 years, shale 7 years, GenAI infrastructure 5 years.

Note: The chart is adapted from Exponential View Substack (www.exponentialview.co)

As of September 17,2025

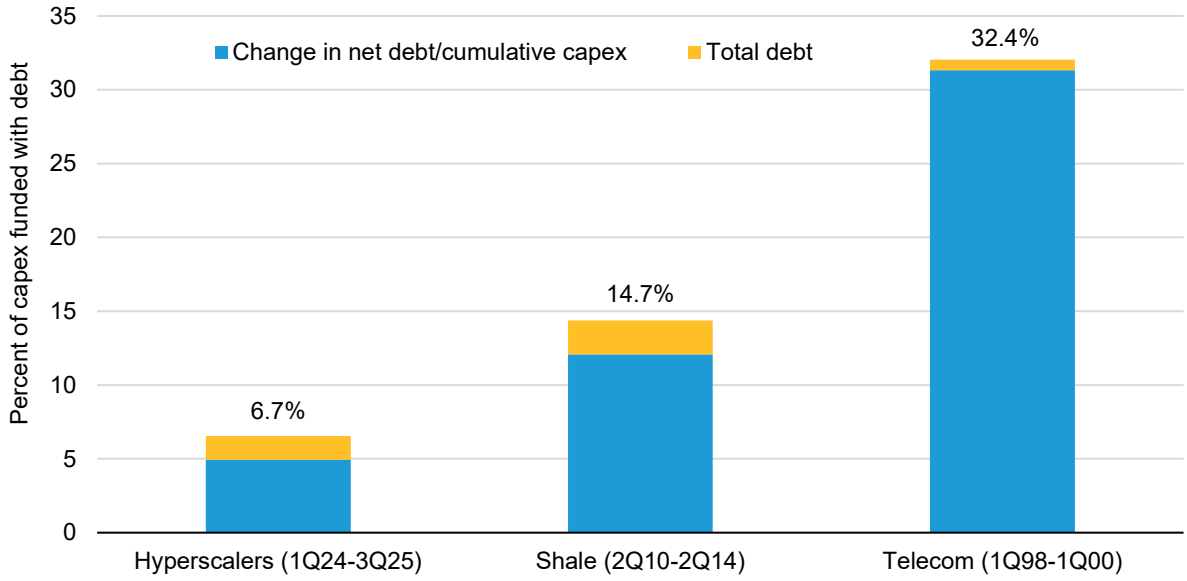
Source: Exponential View, FRBSF, FRED, JSTOR, Publicly Traded, Synergy Research, Wired and AB

This increase in power usage also contributes to worries about aggregate power demand from AI data centers emerging as a bottleneck, a point we discuss below.

Funding Quality

The other caveat that raises risks is funding quality. Until 2025, the capex needs of AI were met from free cash flow. This has now changed with debt being raised and the emergence of vendor-financing arrangements. The fact that debt is involved should not be surprising; the insatiable shift back to a form of capitalism that requires capital implies that debt will be a significant part of the mix. As is often noted, a distinguishing feature of bubbles is that they tend to be levered. Thus, the emergence of debt financing, while not unsurprising, raises an alarm bell that if things don't go to plan, this might not just be a misallocation of capital but a bubble.

DISPLAY 9: LEVERAGE PORTION OF CAPEX FOR AI IS WELL BELOW PRIOR INVESTMENT CYCLES



Current analysis does not guarantee future results.

As of November 1, 2025

Source: LLC, Wells Fargo Securities and AB

The credit market has seen **a wave of $200 billion of AI-related issuance since the start of 2025 from the likes of Meta, Alphabet and Oracle,**[7] though this also is matched by a large amount of capital seeking such exposure, hence keeping spreads tight.

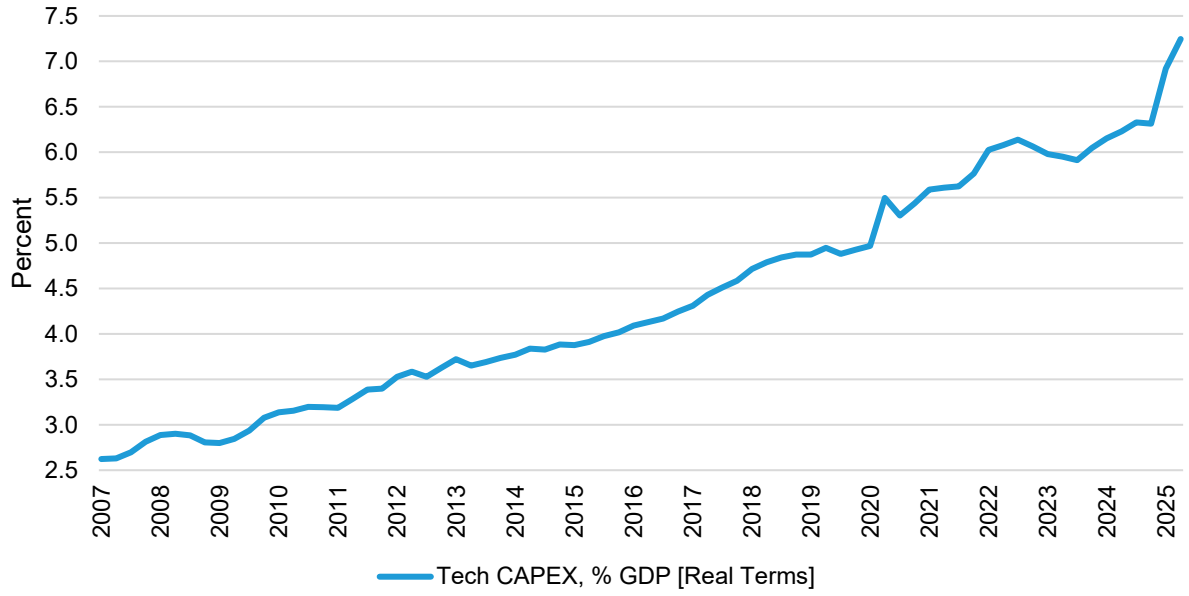
Having said that, debt financing has only emerged this year. If we are early in a debt-raising cycle, then this cycle could go a long way further. If we measure leverage as debt securities and loans of the non-financial corporate sector as a percentage of GDP, then the recent increase in leverage does not look significant compared with previous cycles, such as the buildup of leverage in 1997–2001 and 2005–2009. Having said that, this time has seen a transfer of where debt has built up, from the corporate sector to the government sector, and also a significant build up of private debt in parallel.

Macro Growth

What does this mean for the economy overall? In the short term, the demand for capex has been the key element contributing positively to US GDP growth in a period when there has been slowing activity elsewhere. But this is not the key point. The bigger issue is that tech is consuming a larger share of capex (*Display 10*). On one level, this might not matter. The distinction between sectors in the economy, in a similar way to the distinction of sectors within the listed stock market, is most definitely not written in stone. As tech or AI takes on a growing share of activities that used to be considered different sectors, then it is natural that this capex share will rise. The more important point is whether this capex leads to a trend improvement in growth via productivity.

[7] https://www.ft.com/content/82f63f23-db20-4f6c-84f1-e7b45ca09f46

DISPLAY 10: TECH CAPEX IS ACCOUNTING FOR A RAPIDLY GROWING SHARE OF US GDP



Past performance does not guarantee future results.

Note: Tech CAPEX includes Information Processing Equipment & Software and Computers & Peripheral Equipment.

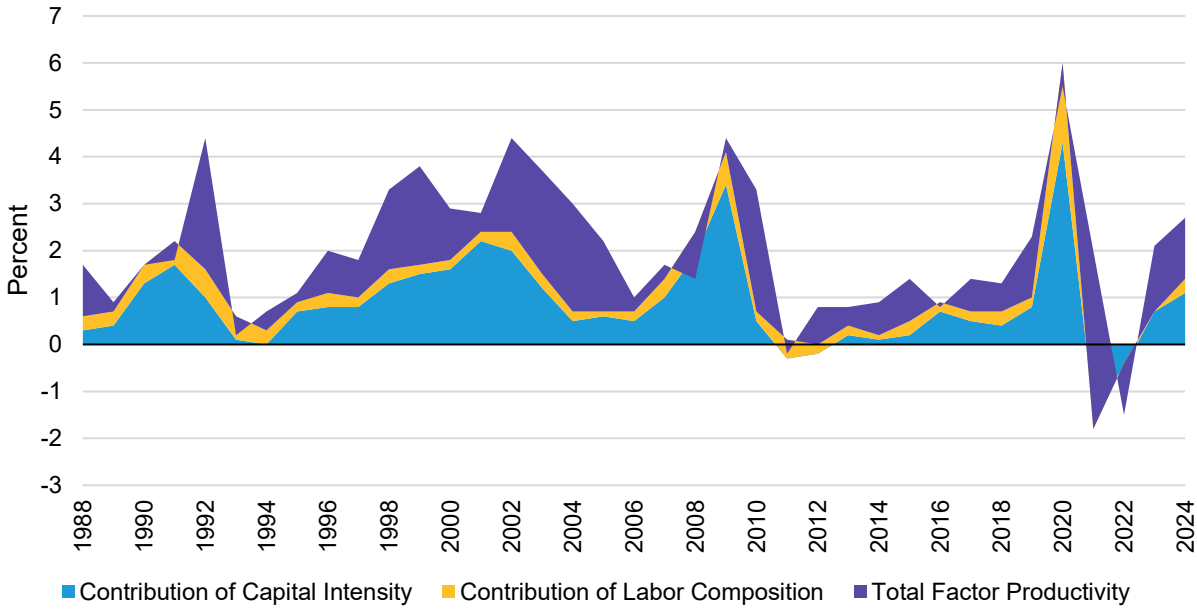
Data as of December 4, 2025

Source: BEA, Macrobond and AB

Previous periods of capital deepening have led to productivity growth, at least for a while. The most recent example is the late 1990s (*Display 11*). The TMT bubble did lead to an increase in productivity; the problem was that it was transient and did not stick. There were two stages to this episode: The second half of the 1990s saw a process of capital deepening. Then from 2000–2004, the main contribution was a pickup in total factor productivity.

Applying this experience to today's circumstances, the contribution of the capex surge to growth this year and next via an increase in capital intensity is real enough, and likely has kept the US out of a recession in 2025. The hope is that this leads to a sustained increase in the growth rate of overall productivity in a way that did not happen after 2000.

DISPLAY 11: CONTRIBUTIONS TO US LABOR PRODUCTIVITY GROWTH



Current analysis does not guarantee future results.

As of December 31, 2024

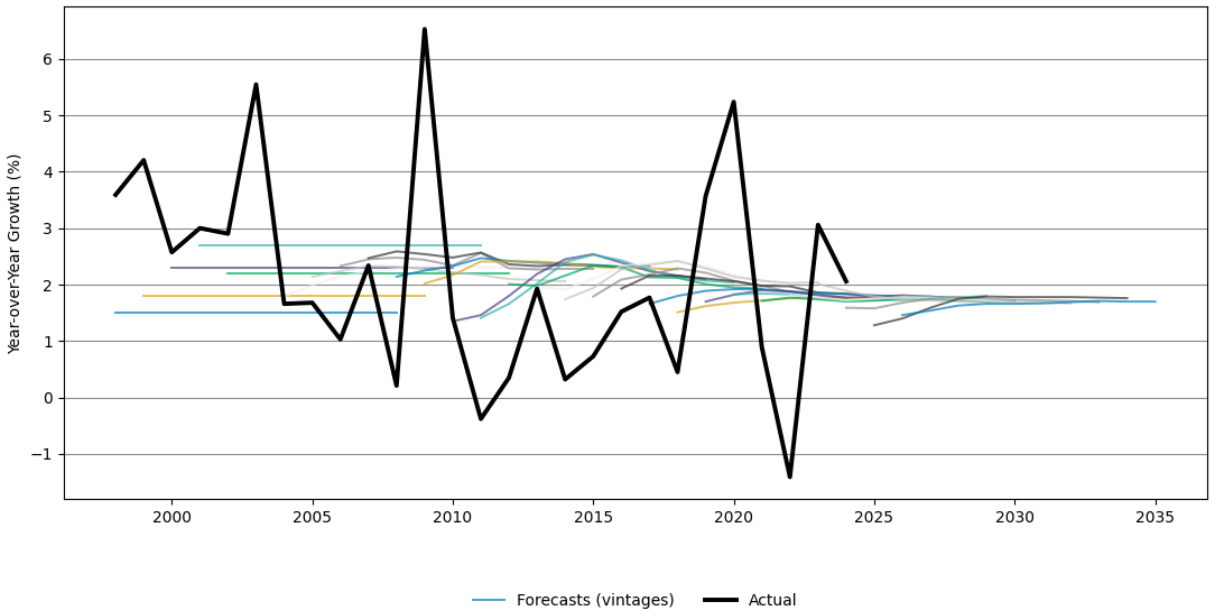
Source: BLS, Macrobond and AB

A sustained increase in productivity is the great hope of AI, but it is also something that we have to be very humble about attempting to forecast. It is not obvious at all that sustained increases in productivity are amenable to being forecast. We discussed this at length in our recent note.[8] As an example of the perils of forecasting sustained increases in productivity, during the TMT bubble, the Congressional Budget Office raised its medium-term projections of labor productivity growth to 2.7 percent for the next decade. This constituted a huge shift in the forecast: in four years, from 1997 to 2001, the Congressional Budget Office more than doubled its 10-year projection of productivity growth from 1.2 to 2.7 percent, and then had to lower them again subsequently (*Display 12*). As is common with forecasts of productivity growth in other countries, the forecasts have had a pronounced downward trend for the past decade.[9] The point of bringing this up here is that one has to be very humble in making any forecast of productivity growth.

[8] AI vs. Demographics: Or might shrinking populations not be so bad if robots are taking jobs, anyway?

[9] https://scholar.harvard.edu/files/jorgenson/files/retrosprctivelookusprodgrowthresurg_journaleconperspectives.pdf?utm_source=chatgpt.com]

DISPLAY 12: CBO-PROJECTED VS. ACTUAL LABOR-PRODUCTIVITY GROWTH



Current analysis and forecasts do not guarantee future results.

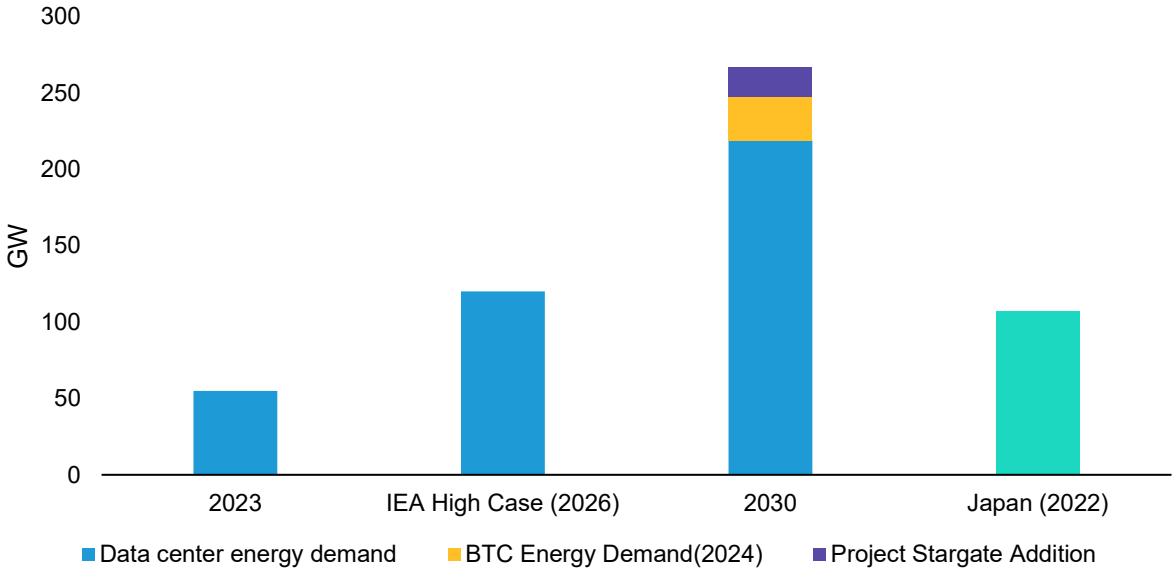
As of November 14, 2025

Source: CBO, Macrobond and AB

Power Implications

There is a real concern about the power demand of AI. There are a few specific worries, but we would really point to: (1) the possibility that insufficient power supply is a bottleneck to any hoped-for productivity improvement from AI; (2) tight power markets that push up power prices for consumers and businesses in the near term; and (3) the extra power demand from AI, which looks set to be equivalent to the total power demand of Japan by the end of 2026. This third item is an extra reason to assume that an energy transition cannot happen, or at least that it would be significantly delayed, thus there is a greater risk of a temperature increase of more than 2 degrees.

DISPLAY 13: GLOBAL DATA-CENTER POWER DEMAND IS EXPECTED TO EQUAL JAPAN'S TOTAL POWER DEMAND NEXT YEAR



Current analysis and forecasts do not guarantee future results.

The 2023 and 2030 data-center energy demand is based on McKinsey estimates and International Energy Agency (IEA) forecast. Japan energy-consumption estimate is based on IEA (2024), Electricity 2024, IEA, Paris https://www.iea.org/reports/electricity-2024 License, CC BY 4.0. BTC energy consumption is based on Cambridge Centre for Alternative Finance (CCAF) data, and project Stargate estimates are from Bernstein sell-side US machinery research team.

As of January 28, 2025

Source: Bernstein US Machinery research team, Cambridge Centre for Alternative Finance, Enerdata, IEA, McKinsey and AB

Using OpenAI as a case in point, the company has contracted for a total of approximately 20 gigawatts (GW) of power capacity through various partnerships as of October 2025 (*Display 14*). This total includes several major deals:

- **4.5 GW** from a five-year, $300 billion cloud-computing deal with Oracle, primarily for the Stargate project
- **10 GW** through an alliance with NVIDIA to build data centers using NVIDIA hardware
- **6 GW** from a strategic partnership with AMD for the deployment of AMD Instinct GPUs

OpenAI also has existing agreements with Microsoft Azure, having agreed to purchase an incremental $250 billion of Azure services, though a specific power capacity in GW for the total Microsoft deal was not specified in the snippets.

OpenAI's overall goal, as stated by CEO Sam Altman, is to build out 30 GW of "compute" infrastructure, valued at approximately $1.4 trillion, to support future AI models.[10]

It seems unclear at this stage where this extra power is to come from. 20GW is about the power output of 20 nuclear power stations. This statistic is thrown around a lot now, but one should pause and consider how staggering it is. Moreover, the average time to build a nuclear power station (>6 years) would make them highly unlikely to be able to meet this target, not to mention the lack of nuclear or grid development in the US over the last decade. Gas and renewables presumably have to provide the bulk of this draw. Our view is that the risks of supply constraint plus energy-price inflation remain high.

[10] https://openai.com/global-affairs/seizing-the-ai-opportunity/

Bernstein research has suggested that the share of total power from solar and wind needs to rise significantly as the most plausible way to meet this extra demand (*Display 14*).

DISPLAY 14: WORLD ENERGY SUPPLY FORECAST

	Power Generation (TWh)							
Source	2024	% Share	2050	% Share	2024	2050	Capacity Additions (GW/yr) 2024-50	Power Gen per Capacity (TWh per GW)
Fossil fuels	18,309	59%	10,800	35%	4,664	2,751	-74	3.9
Of Which Gas	*7,001*	*22%*	*7,000*	*10%*	2,007	2,007	0	3.5
Solar	2,112	7%	29,280	42%	1,865	25,865	923	1.1
Wind	2.511	8%	13,022	19%	1,135	5,885	183	2.2
Nuclear	2,817	9%	7,220	10%	416	1,066	25	6.8
Hydro	4,453	14%	6,978	10%	1,411	2,211	31	3.2
Other	1,054	3%	2,701	4%				
Total	**31,256**	**100%**	**70,000**	**224%**				

Current analysis and forecasts do not guarantee future results.

As of August 15, 2025

Source: EIS, IEA, Bernstein estimates (2050) and analysis and AB

This topic of power is most definitely not only an economic question; we think it is primarily a social question. The immediate question is, in this world of supply lagging demand, how will access to power be apportioned? One of the defining features of the US economy in recent decades has been the increasing power of corporations and the rise in the corporate profit share of GDP. If that is applied to power access as well, then it raises yet another inequality issue for AI. We suspect this will become a point of political focus in coming years.

Strategically, there are the climate implications and the difficulty of effecting an energy transition. We wrote about this at length,[11] but aside from this also being a question of growing inequality, it also plausibly implies a downward force on economic growth rates that offsets any productivity gains from AI. Hence, the question that is raised in some client meetings is about whether, in the round, it is indeed right to assume that AI increases growth rates at all.

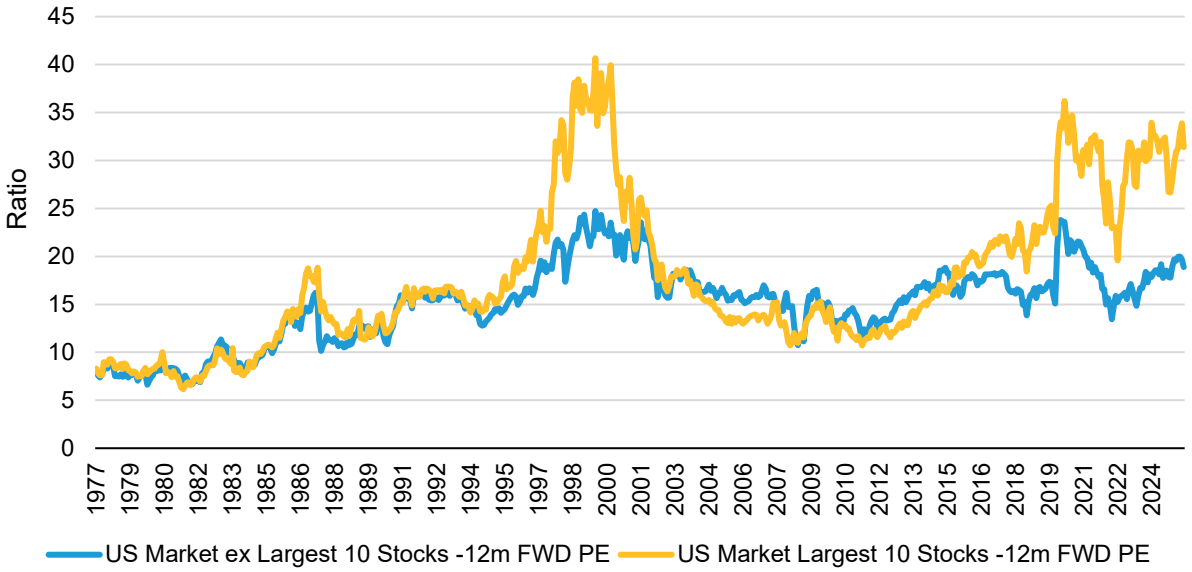
Implications for the Market and What Is a Defensive Trade?

We end this note with the observation we made at the outset, that the flow of capital into AI represents a vertiginous dialectic. We simply do not have enough data yet to resolve the yawning gap between different projections of the gains from AI and to whom they will accrue. This situation points toward two wildly different views of aggregate growth, corporate profit growth and valuation.

The bifurcation of the US stock market is well known. As we show in *Display 15*, the valuation of the largest 10 stocks is 31x 12-month-forward earnings per share (EPS). The rest of the market, omitting those largest stocks, is 19x.

[11] Can the Energy Transition Happen?

DISPLAY 15: VALUATION OF THE LARGEST 10 STOCKS IN THE US MARKET AND THE REST



Past performance does not guarantee future results.

As of October 30, 2025

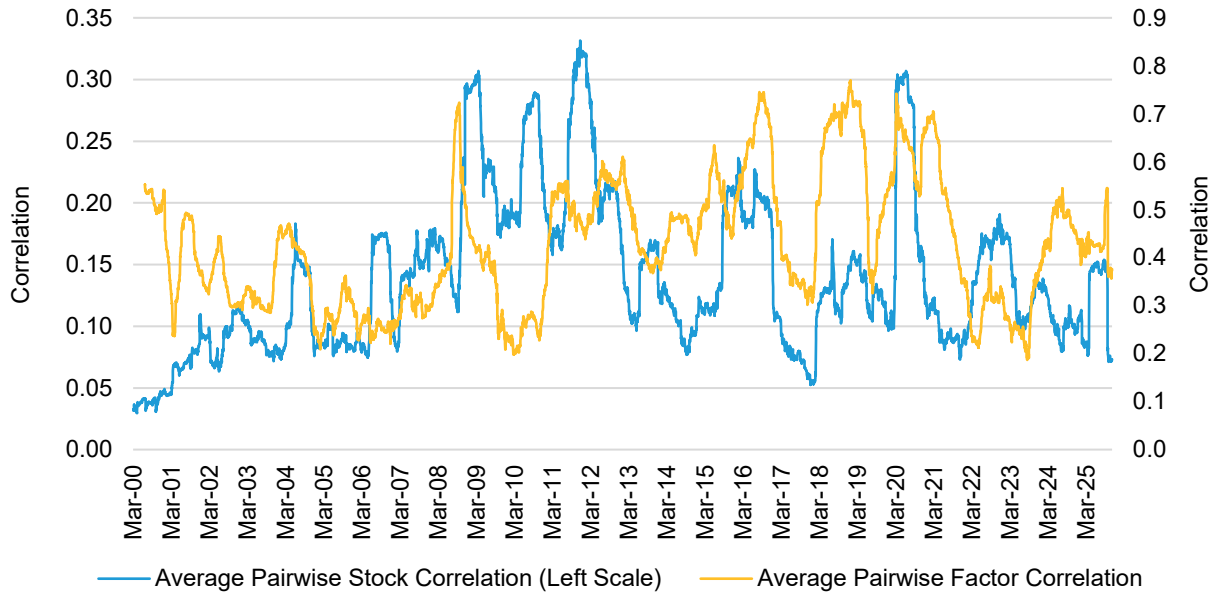
Source: Factset and AB

Given the high level of market concentration, the impact of any devaluation of the AI-linked names would be significant. As a broad framework to offer a guide, a decline in the multiple of the largest 10 stocks to 20x 12-month-forward EPS (a level above the 50-year average, but we have explained elsewhere that we do not think there has to be a full mean reversion in absolute multiples) would imply a drawdown of those names of –36% and a fall in the overall market of –14%.

It would clearly be naïve to assume that the rest of the market would not fall in such an environment, so any fall would be larger than this. Although retail investors have been participating in the direct purchasing of AI-related names in unprecedented size, there has also been a very elevated flow into passive capitalization-weighted indices that would presumably go rapidly into reverse in such a scenario.

Correlations among stocks and among factors have been “well behaved” and stable in recent times. So-called “Liberation Day” earlier this year caused correlations to rise for a period, but the effect of that appears to have now abated. But even abstracting from that very recent move down, correlations have been subdued. However, they tend to rise abruptly in times of sell-offs, not least because of the scale of the flow into “passive” cap-weighted indices that presumably reverses abruptly upon a sell-off.

DISPLAY 16: AVERAGE PAIRWISE FACTOR AND STOCK CORRELATION



Past performance does not guarantee future results.

The stock correlations are the average pairwise correlations of daily stock returns for the constituents of the MSCI AC World index over a rolling six-month window.

From March 7, 2000, through November 11, 2025

Source: FactSet, I/B/E/S, MSCI and AB

Just to be crystal clear, we are not calling for a downturn. There is not enough evidence for the current projections of AI, nor for the shift in funding quality, to determine a sell-off. However, we do think that the risk of a drawdown is elevated and that there is a high degree of complacency about volatility. This is in part to do with market structure and in in part AI-specific. We think that the risk of a draw-down is elevated because:

1) The confluence of high valuations and high concentration imply a greater risk of drawdown, as we have previously shown.[12]

2) Over the timeframe of the depreciation cycle of the GPUs being installed, there is an elevated risk of an "air pocket" with insufficient clarity on the ability to achieve challenging revenue targets that will lead to drawdowns.

This does not constitute a net bearish view, but it does mean that investors need to line up defensive trades, and in some cases start to allocate toward them. So, the big question is what constitutes a defensive trade in this environment? One problem is that the timing is highly uncertain, so any drawdown-mitigation strategy must be relatively cheap to carry. A few suggestions follow in the next sections.

Healthcare

Earlier this year, we outlined the strategic case for healthcare at length—see US Healthcare: Attractive Valuation for a Structural Growth Opportunity. We still retain that positive view. We suggest that there are several supporting factors for healthcare's role as a defensive trade, and we would be happy for investors to put the trade in place today and not wait for a sell-off to commence:

1) There is a good case for the sector to be an AI beneficiary (better care delivery, drug development and diagnosis).

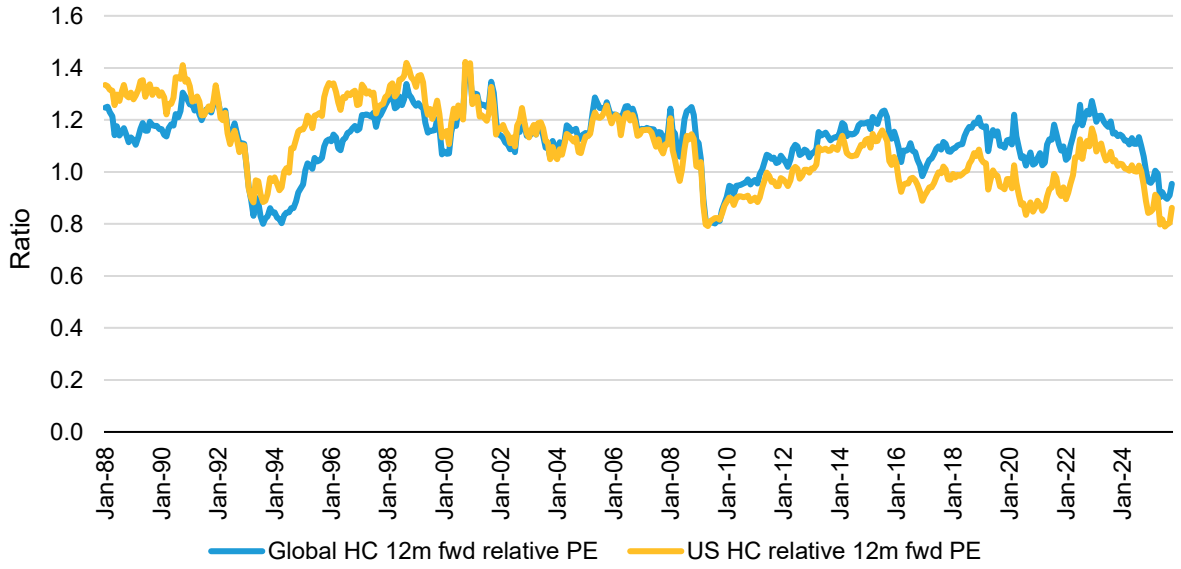
[12] US Healthcare: Attractive Valuation for a Structural Growth Opportunity

2) There is long-term demographic support, given aging populations.

3) The sector has touched a valuation low point that is in line with the lowest relative multiples for the sector in 40 years. It is back at low points associated with previous attempts to fundamentally reform US healthcare.

4) Despite recent positive performance, healthcare remains a hated sector that has seen significant outflows since 2023. The only near-equivalent is the outflow from the energy sector. This gives a low bar for the sector to clear in terms of confidence.

DISPLAY 17: GLOBAL AND US HEALTHCARE RELATIVE VALUATION IS ON PAR WITH 30-YEAR LOWS

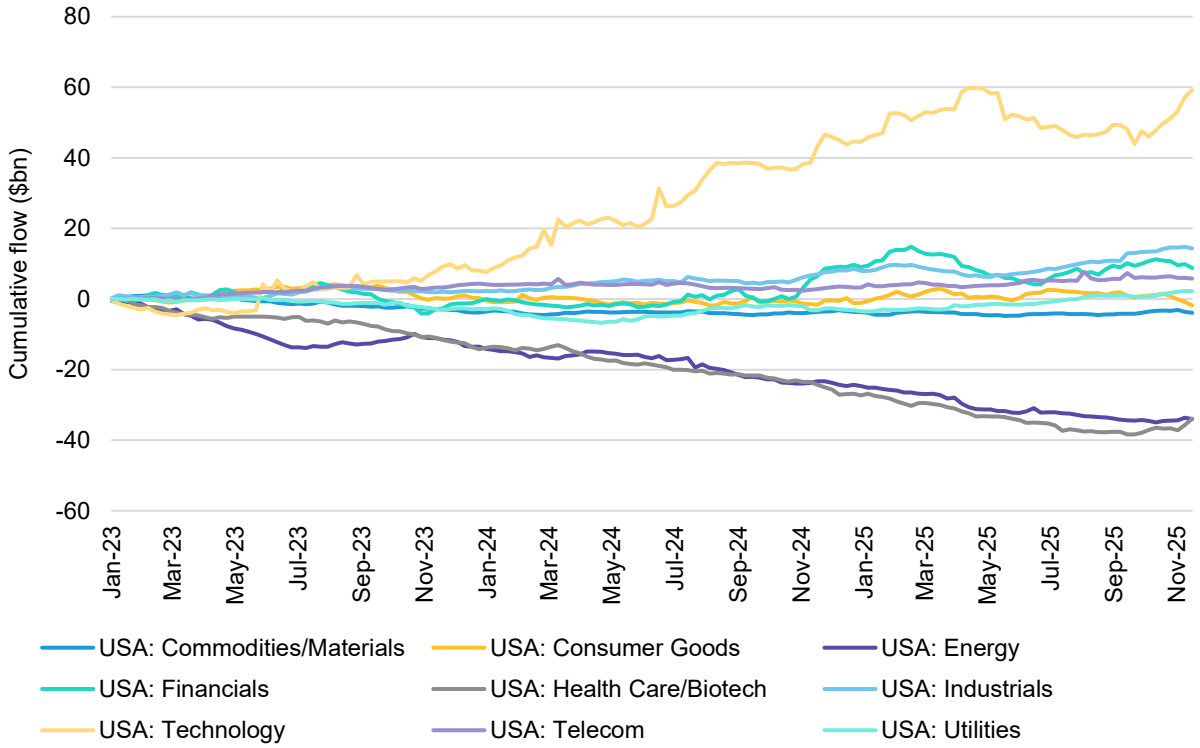


Past performance does not guarantee future results.

As of October 31, 2025

Source: Factset and AB

DISPLAY 18: HEALTHCARE IS STILL A HATED SECTOR



Current analysis does not guarantee future results.

As of November 19, 2025

Source: EPFR Global and AB

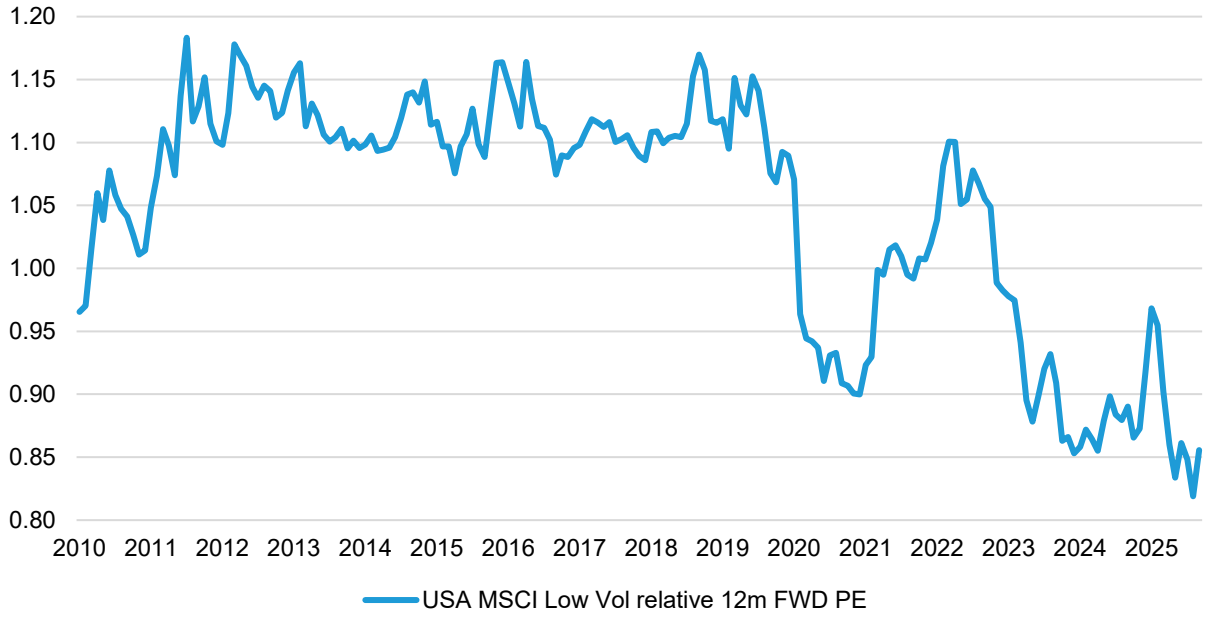
Low volatility

A second candidate for a defensive trade is exposure to the low-volatility factor, for these key reasons:

1) We think there is complacency about volatility, so low-volatility stocks should outperform. The caveat is the need for an extra focus on forward-looking expectations of volatility, not just stocks that have been low volatility in a period of smooth inflows into a rising market.

2) Low volatility, as a factor, is attractively valued (*Display 19*).

DISPLAY 19: THE LOW-VOLATILITY FACTOR TRADES AT ITS LARGEST DISCOUNT TO THE BROAD US MARKET IN 15 YEARS



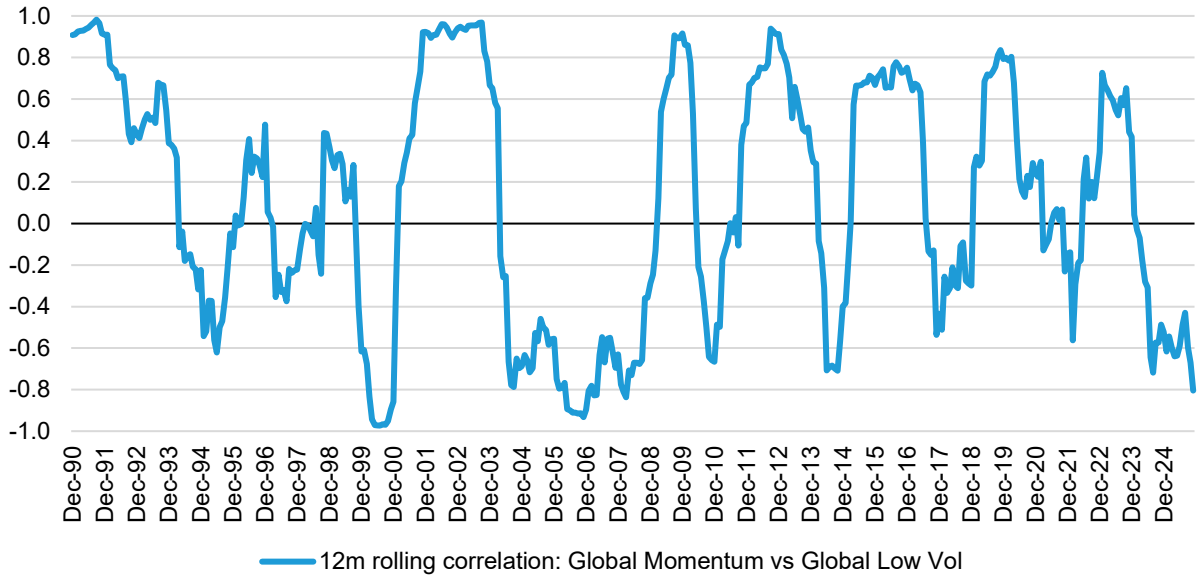
Past performance does not guarantee future results.

As of November 19, 2025

Source: Macrobond, MSCI and AB

Moreover, as we show in *Display 20*, the 12-month correlation between the global momentum and low-vol factors is approaching historic lows, which reinforces our view that it should act as a hedge against a tech-driven market sell-off.

DISPLAY 20: CORRELATION OF LOW VOL AND MOMENTUM IS CLOSE TO HISTORIC LOWS



Past performance does not guarantee future results.

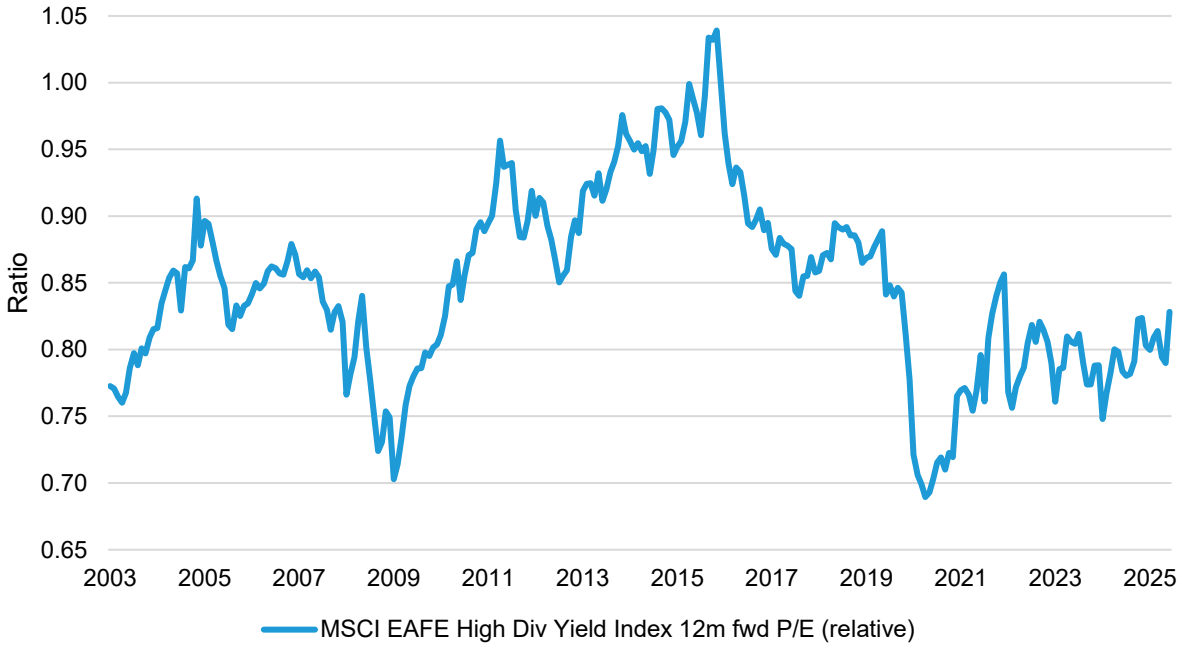
As of December 2, 2025

Source: Factset and AB

EAFE income

A third defensive trade that we would highlight is international income. The case for income being one of the more defensive possible permutations of value trades is well established. Focusing this trade on non-US markets makes sense in the context of defending against a sell-off in US tech names (this does not change our strategic view to overweight the US over longer horizons). Simple exposure to international income strategies in the equity market are overweight energy, financials, utilities and consumer staples. And, as *Display 21* shows, it is currently valued below its historical average relative multiple.

DISPLAY 21: RELATIVE VALUATION OF MSCI EAFE DIVIDEND YIELD FACTOR



Past performance does not guarantee future results.

As of December 1, 2025

Source: Macrobond, MSCI and AB

Short-duration fixed income

Almost inevitably, short-duration fixed income would be likely to see inflows in an AI sell-off. A few points are worth noting, however:

1) Given the uncertain timing of any AI-related drawdown and the need for some investors to lever such a position to have a meaningful impact on a portfolio, there is some limit to how attractive this can be. So, this is not a call we would make today.

2) We think the focus has to be on short duration, not long. We remain strategically underweight long-duration nominal debt, given public debt levels, an expectation of higher inflation, capricious US policymaking and a geopolitical imperative to de-dollarize. An extra incentive would come from the likelihood of rate cuts to offset the negative wealth effect of any sell-off.

Is gold a defensive trade?

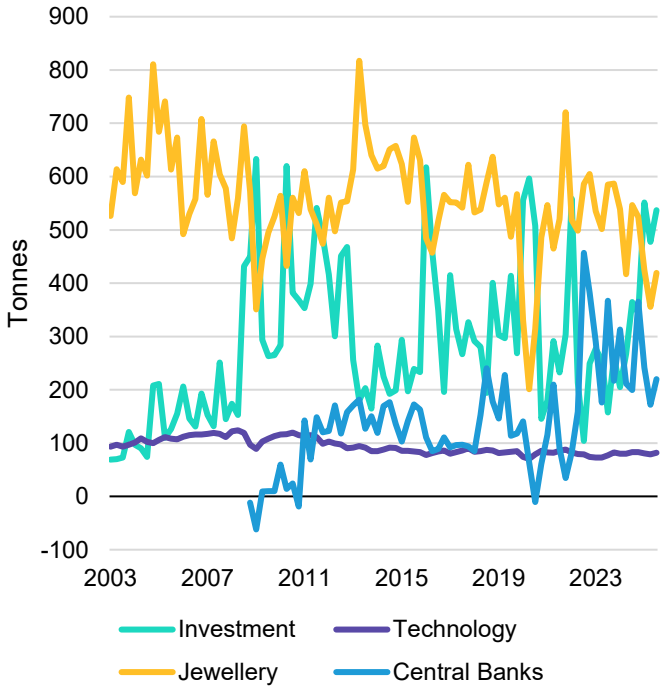
We have been long-term bullish on gold since upgrading it in 2019.[13] We retain our strategically bullish view, even after its rapid ascent, as we think that allocations to gold will continue growing in response to the new structural investment paradigm that we think investors face.

But aside from that strategic view, is gold a defensive trade in a short-term tactical context? We take the view that it is not realistically possible to value gold, a point we have made in other notes. Without valuation as a guide, it is not really possible to place gold's recent move in context. With this in mind, a specific tactical worry is that the extraordinary performance of gold, having outperformed global equities for 10 years on an annualized basis, has now drawn in an unusually large number of

[13] Inigo Fraser Jenkins, Paul Gait et al., *Global Quantitative Strategy: A strong case for holding gold*, Bernstein Research, 11 February 2019.

investment buyers. There are always caveats about data on who is buying gold, as both the public and private sector want to be secretive about it. But the most likely state of affairs is that investors have constituted the largest source of gold demand for three quarters, exceeding the demand even from the jewelry industry. This has not happened before in the 25 years for which we have data (*Display 22*). We suspect that this hasn't happened in 50 years, since the 1970s inflation scare. The problem is that investment buyers will inevitably be fickler, especially the subset that has bought gold by virtue of the fact that it has become part of a cross-asset pro-momentum trade.

DISPLAY 22: GOLD DEMAND BY CATEGORY



Current analysis does not guarantee future results.

As of November 13, 2025

Source: Macrobond, World Gold Council and AB

We would mention a significant mitigating factor. Recent surveys of investors' positioning[14] show that the modal allocation of investors to gold is still zero! We can attest to this in our own client meetings as well. While gold comes up in nearly 100% of meetings, whether or not investors have done anything about it in terms of allocation is highly dependent on where they sit in the investment industry. Pension funds still struggle to own gold in the majority of cases; we suspect they will eventually have to change their minds, but this could take a long time.

So, yes, gold allocations should rise and we are happy to continue to recommend it and we are happy for investors to be buying gold today. However, on tactical horizons we think there is likely complacency about the volatility of gold, just as we think there is complacency about the volatility of equities. One possible answer is to buy gold and buy gold volatility at the same time.

[14] BoFA September 2025 Global Fund Manager Survey

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