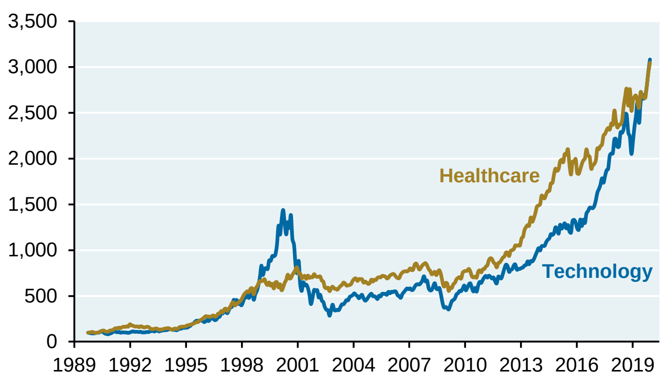
Q&A from the Eye on the Market client mailbag

Every summer I write an Eye on the Market that answers questions from the client mailbag. Here we go:

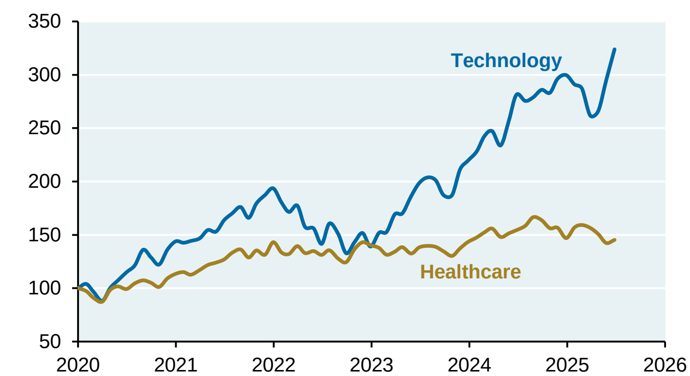
Before starting, here's a preview of the August Eye on the Market on Healthcare. For the 30-year period from 1989 to 2019, the US healthcare sector closely tracked technology returns, and with considerably lower volatility (15% vs 24%). Things have changed markedly since then, as shown on the right. The current large cap pharma forward P/E of 15x doesn't sound that distressed, but Eli Lilly is 40% of the S&P 500 Pharma Index and trades at a forward multiple of 31x. Remaining pharma stalwarts like Merck, Pfizer and Bristol Myers trade at forward P/E ratios of just 8x-9x; biotech trades at one the largest RoE discounts in the entire market; managed care sector returns have collapsed; and life sciences and medical device companies have been hurt by cuts to the NIH, CDC and other scientific research organizations.

S&P 500 healthcare vs technology total return, 1989-2019
Index (100 = September 1989)



Source: Bloomberg, JPMAM, June 2025

S&P 500 healthcare vs technology total return, 2019-2025
Index (100 = December 2019)



Source: Bloomberg, JPMAM, June 2025

In the August Eye on the Market, we will review what's going on under the hood: bipartisan proposals to lower drug prices, including Most Favored Nation approaches; competition from China; pending Section 232 tariffs on the pharma sector; the slowing pace of FDA drug approvals and the impact of RFK Jr at HHS; the decline in healthcare earnings growth relative to the tech sector; the impact of Trump policies to cut NIH/CDC funding by ~40%; the large cap pharma patent/revenue cliff; the rising rate of legal judgments favoring healthcare providers over insurers; and the challenges facing GLP manufacturers seeking to broaden adoption rates.

In case you missed it, there's also a link at the top of the page to the Eye on the Market 20th Anniversary Piece which we released in early July. Ask your coverage team for a bound version if you find that easier to read.

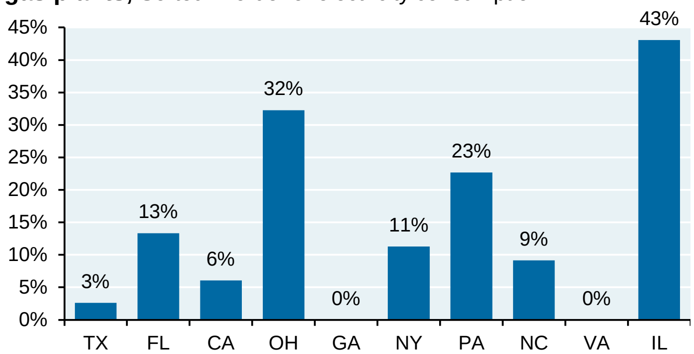
Michael Cembalest
JP Morgan Asset Management

Why is there such a long backlog for natural gas turbines, and do their higher prices make solar+storage comparable economically as a form of baseload power?

In July, a group of companies including Google, CoreWeave, Blackstone, Westinghouse and Energy Capital Partners announced $90 bn in data center and power infrastructure investment at the Pennsylvania Energy and Innovation Summit, much of which is intended to be powered by gas turbines. But supplies are tight: combined cycle turbine delivery times can reach 3-7 years, their costs have risen from $1,200 per kW in 2023 to $2,500 per kW, and NextEra's CEO also cites shortages in skilled labor pools for gas turbine projects.

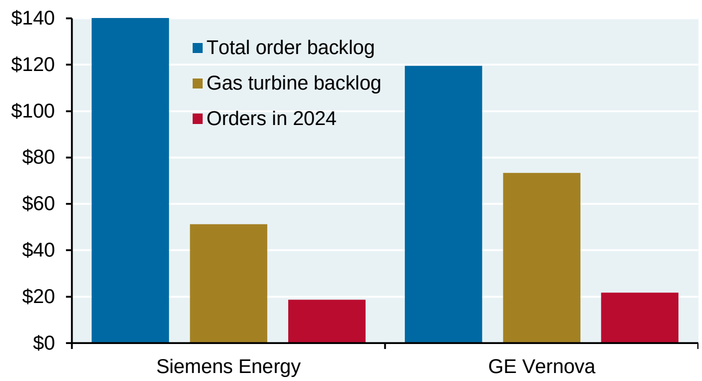
Most countries have given grid preference to renewables for over a decade, which slowed deployment of new turbines. The first chart shows the MW of gas turbines installed since 2019 as a share of gas capacity in ten US states with the most electricity consumption. Texas for example only installed 3% of its gas capacity in the last 6 years; in California, 6%. Given renewable grid preferences and a drumbeat of stranded asset warnings on fossil fuels, most turbine manufacturers have not materially expanded production capacity. Investors appear to like their capital discipline: turbine manufacturers GE Vernova (+57% ytd), Siemens Energy (+83% ytd) and Mitsubishi Electric (+16% ytd) have all outperformed their respective country equity benchmarks this year.

Gas plants added since Jan 2019 as a share of operating gas plants, Sorted in order of electricity consumption in MWh



Source: EIA Form 860, JPMAM. Includes gas-powered combined cycle combustion/steam turbines, 2024

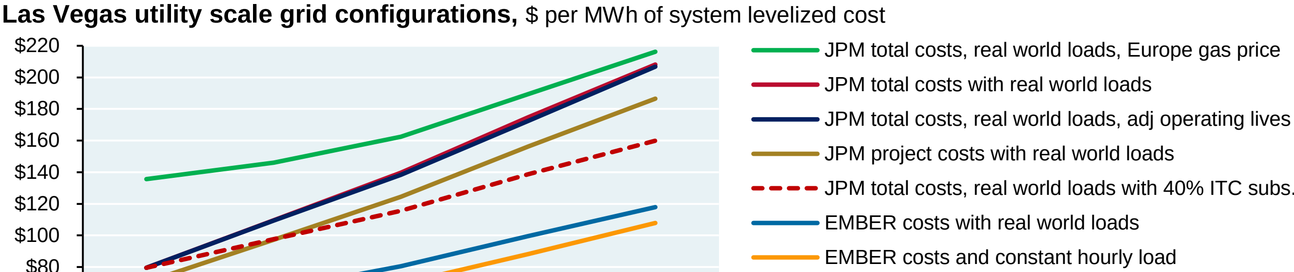
Gas turbine backlog and new orders 2024
US$, billions



Source: GasTurbineHub, 2024

Despite higher gas turbine prices, we're a long way from solar plus storage being cost-competitive baseload power vs natural gas. A recent paper from EMBER claimed that solar plus storage is getting closer to gas on unsubsidized levelized cost in places like Las Vegas[1], and could meet 97% of the load. They did a good job on some details: solar/battery degradation, DC->AC conversion losses, solar irradiance data, etc. However, their constant hourly load assumption makes little sense in the real world, we also disagree on capital costs for solar, batteries and gas in the US, and we assume lower battery round trip efficiency. We used our hourly grid model to create the cost curves shown below; our estimates for deeply decarbonized solar+storage systems are much higher than EMBER's. Plenty of details to follow in our next energy paper in 2026.

Las Vegas utility scale grid configurations, $ per MWh of system levelized cost



Utility scale 1-axis backtracking bifacial panels, 1.35 inverter loading ratio; US gas price $3.5, Europe $12.30 per MMbtu
Capital costs for solar, battery and natural gas CCGT:
EMBER: $388 per kW, $165 per kWh, $1400 per kW
JPM: $879 per kW, $228 per kWh, $2500 per kW
All solid line scenarios exclude ITC/other subsidies

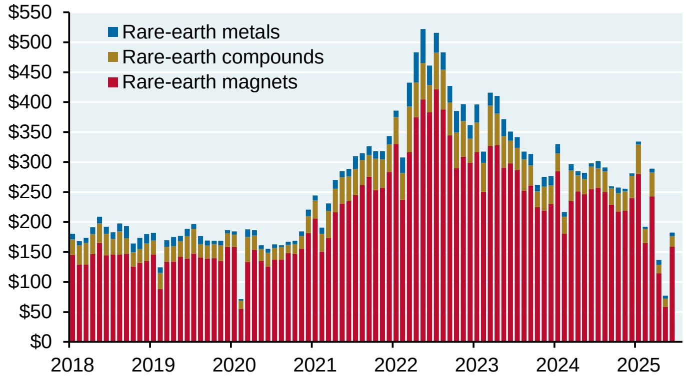
Source: NREL, EMBER, JPMAM, July 2025

[1] "*Solar electricity every hour of every day is here and it changes everything*", EMBER, June 21, 2025

Is China constraining exports of rare earths to the US and why did the DoD invest in MP Materials?

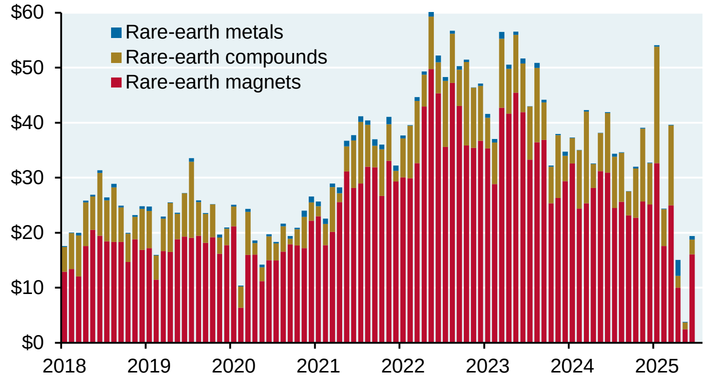
Yes. In May 2025, China's overall rare earth exports were 29% of the 2018-2024 monthly average, and 11% of the monthly average of such exports to the US. In June 2025 China agreed to approve more export licenses for these controlled items in exchange for relaxed US import/export restrictions, and they rose part of way back up. But the supply chain risks for the Western world remain. The Pentagon aims for a China-free magnet supply chain by 2027, but the US may struggle to meet this goal given Chinese subsidies, negligible Chinese environmental regulations, 39 Chinese universities with rare earth training programs (vs 0 in the US)[2] and a 90% share in global rare earth processing. Some new US processing capacity will come online in 2026-2028, but US-based MP Materials for example produces just 1,000 MT of neodymium vs 300,000 MT in China.

China rare earth exports to all countries
US$, millions



Source: General Administration of Customs of China, JPMAM, June 2025

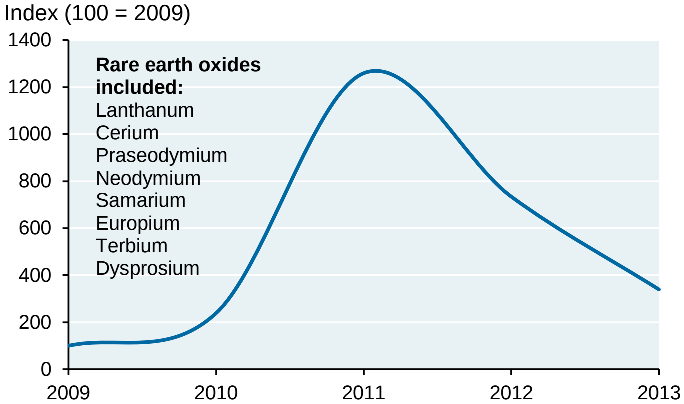
China rare earth exports to the US
US$, millions



Source: General Administration of Customs of China, JPMAM, June 2025

The risks to US auto, military and energy supply chains are substantial. The next chart shows what happened to rare earth prices in 2011, the last time China substantially restricted global supply. That may explain why the US Defense Department has become the largest shareholder in MP Materials, buying $400 mm of its convertible preferred stock and helping it build a new processing facility. The DoD entered into a ten-year agreement that establishes a price floor commitment of $110 per kg for MP's neodymium-praseodymium alloy, promising to purchase 100% of magnets produced at the facility. JP Morgan, Goldman and the DoD are providing project financing. At the end of 2024, MP Materials' largest shareholder and customer was the Chinese firm Shenghe Resources; that's who the DoD is replacing. The US is finally getting more serious about critical mineral supply chains, which is a very good thing if it can be done responsibly (see text box).

Rare earth oxide prices during Chinese export quotas
Index (100 = 2009)



Source: JPMAM, 2025

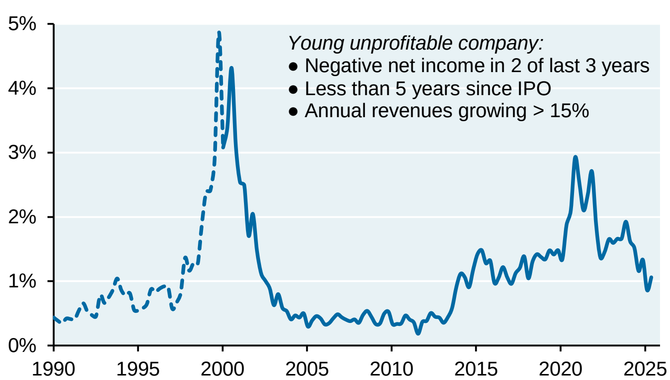
Be careful what you wish for. While some countries aim to build out rare earth supply chains, China's experience highlights the risks. Mining one tonne of rare earth minerals can create 2,000 tonnes of toxic waste. In northern China, toxic sludge from rare earth processing is dumped into artificial lakes while in south-central China, rare earth mines poisoned dozens of valleys and left hillsides stripped to barren red clay. During winter and spring the sludge dries out, after which dust contaminated with thorium, lead, cadmium and other heavy metals blows off the lake. Some reporters cite bubbling orange-colored creeks while passing by mining sites in Longnan. Discussions of rare earth industry pollution are highly censored in China. [BBC, NYT]

[2] "*The West's challenge in rare earths*", Tom Miller, Gavekal Research, July 2, 2025

What are you seeing these days regarding the YUCs, the MEGAs and US equity market valuations?

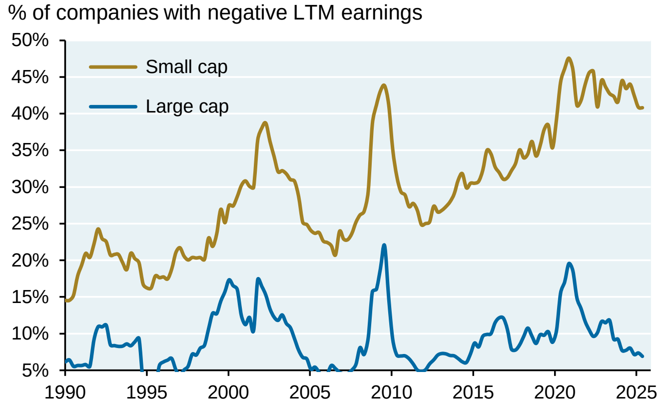
- Our YUC measure (the young unprofitable company share of total market cap) looks benign. This measure peaked in 2021/2022 with the SPAC boom and was an excellent leading indicator of the rout that was about to happen to low quality stocks. This risk index has fallen since, which is a positive sign for markets
- Small cap remains a barren profitability desert (40%+ of small cap companies with negative earnings!) while a falling share of large cap companies have negative earnings
- The 10 largest megacap stocks continue to hover at ~35% of market cap, which is an all-time high since 1990. But when looking at the megacap share of total market earnings, they're more or less keeping pace, particularly when measured based on forward earnings estimates
- Tech and TMT valuations are still hovering at the high end of the post-2020 range, ~30x forward earnings expectations. The rest of the market is less aggressively priced, and at 20x forward earnings is priced at the middle of the range since 1990. But these valuations have been creeping up steadily since early 2022

The YUCs: Young Unprofitable Companies
% of equity market capitalization



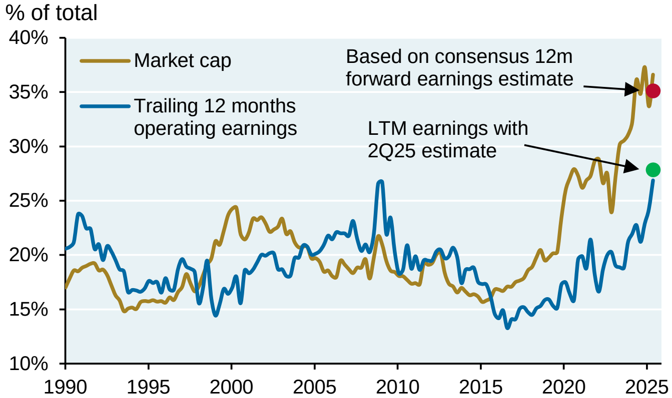
Source: Factset, JPMAM, June 30, 2025

Companies with negative earnings by size
% of companies with negative LTM earnings



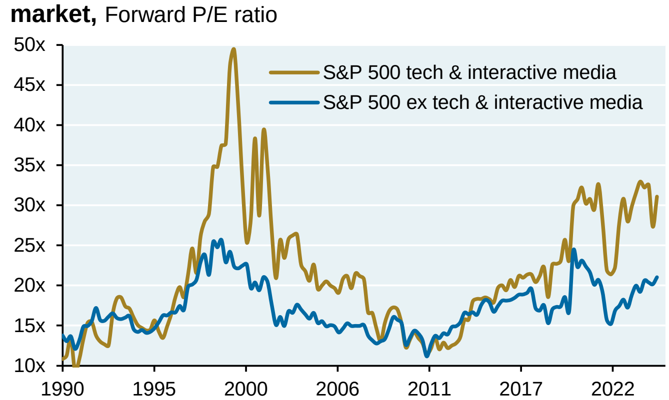
Source: Factset, JPMAM, June 30, 2025

Top 10 companies share of total earnings and market cap
% of total



Source: Factset, JPMAM, June 30, 2025

Tech & interactive media valuations vs the rest of the market, Forward P/E ratio

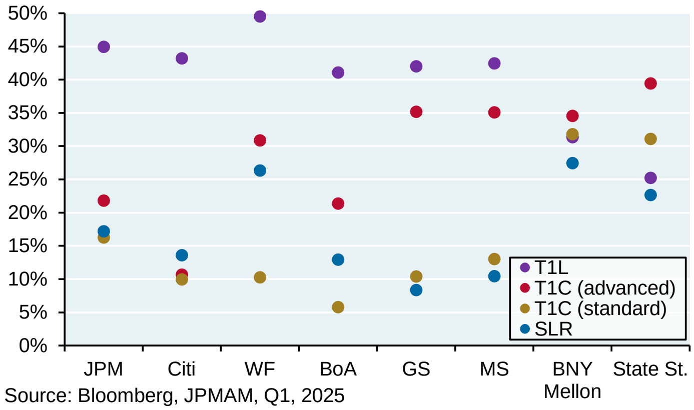


Source: Bloomberg, JPMAM, June 2025

What would be the real-world implications of a relaxation in certain US bank capital regulations?

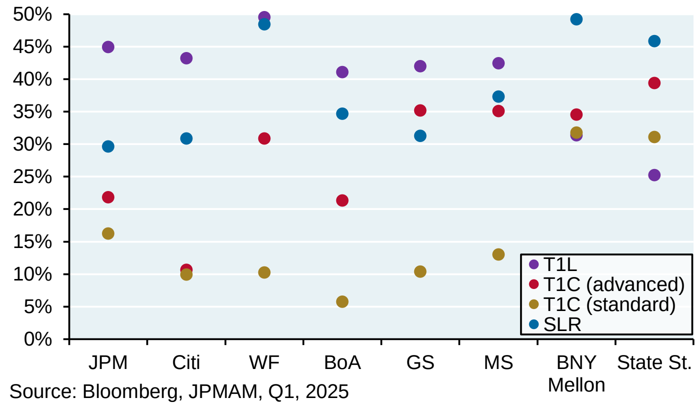
Not nearly as much as you would think. There are four primary ratios that govern bank capital requirements for the eight systemically important banks: Tier 1 Leverage, Tier 1 Capital-Advanced, Tier 1 Capital-Standard and Supplementary Leverage (SLR). The proposed relaxation of the SLR ratio would only reduce industry capital requirements by a meaningful amount if (a) the SLR ratio were the most binding ratio of the four, and (b) if the next highest ratio entailed a lot more excess capital. Unfortunately, this is not the case: as shown in the first chart, the SLR (blue dot) is only binding for GS, MS, BNY and State Street, and in each case, there's another capital ratio right behind it[3]. So even if the current Fed proposal to reduce the SLR ratio from 5% to 3.5% - 4.5% were adopted, excess bank capital would only increase from $124 bn to $130 bn, limiting the potential for stock buybacks or increased risky asset lending by these eight banks (second and third charts show the impact of proposed rule revisions).

Excess tier 1 capital by ratio under current SLR rules
Current capital - miniumum req. capital as a % of current capital



Source: Bloomberg, JPMAM, Q1, 2025

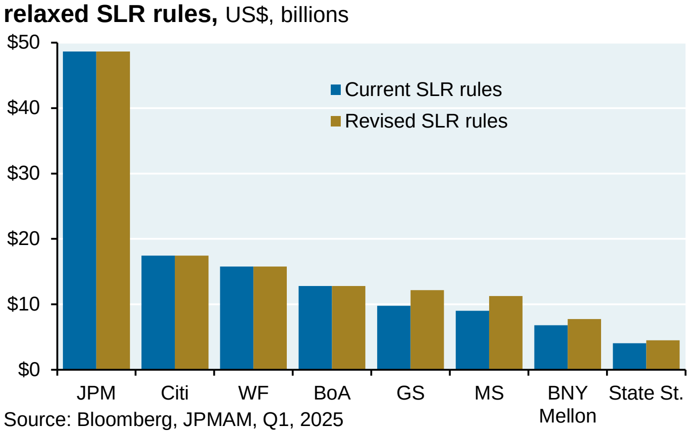
Excess tier 1 capital by ratio under revised rules
Current capital - miniumum req. capital as a % of current capital



Source: Bloomberg, JPMAM, Q1, 2025

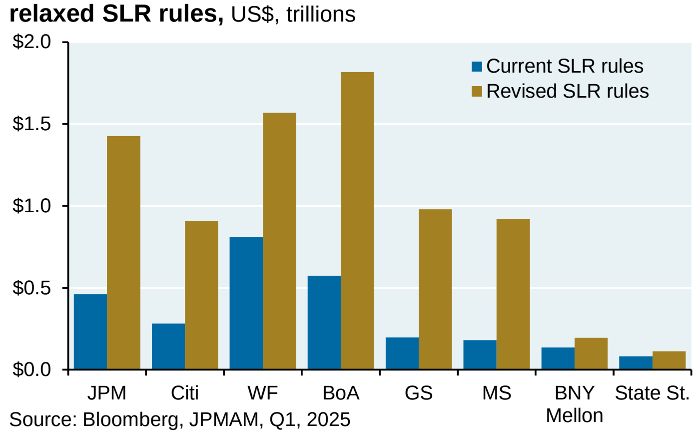
What would change, at least on paper: the ability of these eight banks to purchase Treasury bonds or other assets with zero risk weights. For example: under current rules, banks would have the ability to purchase $2.7 trillion of Treasury bonds before a combination of SLR, Tier 1 Leverage, Long Term Debt and Total Loss Absorbing Capital rules would kick in. The proposed change to the SLR ratio would increase this amount to ~$8 trillion. Could banks be relied upon to act as a safety valve in case of an unexpected collapse in demand for US Treasuries by onshore or offshore buyers? Unclear; banks have plenty of additional capacity right now to buy more Treasury bonds, either for income or duration purposes, and have not utilized it.

**Excess Tier 1 capital only increase by $6bn under new relaxed SLR rules,** US$, billions



Source: Bloomberg, JPMAM, Q1, 2025

Treasury buying capacity increases sharply under new relaxed SLR rules, US$, trillions



Source: Bloomberg, JPMAM, Q1, 2025

[3] Each dot shows the surplus of a given ratio vs its minimum required level. In other words, a 0% value would mean that the bank holds an amount of capital exactly equal to the minimum required amount.

What do you make of Apple's paper citing the problems that reasoning models currently face?

Apple's "Illusion of Thinking" paper outlined what they see as severe limitations of reasoning models. In May we wrote about some of them, including a table from OpenAI regarding reasoning model hallucination rates. But according to Maxime Labonne (a former colleague now at LiquidAI), Apple's analysis suffered from the following: its analysis reflected token limits rather than reasoning limits; some puzzles may have been impossible to solve; in some cases reasoning models understood solutions but chose not to write out thousands of moves due to practical constraints; and the paper confused solution length with reasoning difficulty.

From an investor's perspective, I'm not sure I care that much about Apple's paper or rebuttals to it[4]. I'm much more interested in how AI is being used in the real world and whether it improves productivity, particularly **since 50%-60% of equity market returns have been generated by AI-related stocks since 2023**. And on this front the news is more good than bad, although the Salesforce paper is a reality check:

- **2025 Gallup/Walton Foundation Poll**[5]: 60% of K-12 teachers used AI this school year to plan lessons, create assignments and complete administrative work. Teachers who use AI every week save 6 hours per week, which translates to 6 weeks per school year. Weekly AI users save twice as much time as monthly users. Over half of teachers using AI report that it improves the quality of their work
- **June 2025 paper on AI used for creating systematic medical research reviews**[6]**:** Using a combination of language models, researchers created Otto-SR, an automated workflow to conduct systematic reviews. This refers to the process of synthesizing all available research pertaining to a given medical subject. Otto-SR was able to reproduce an entire issue of Cochrane systematic reviews in just two days, a task that would take humans 12 work-years. While Otto-SR requires some human supervision, when compared to its human counterparts Otto-SR more accurately identified relevant research (97% vs 82% accuracy) and more accurately extracted data from research sources (93% vs 80% accuracy)
- **May 2025 Stanford paper on AI in the workforce**[7]: From December 2024 to April 2025, the share of US adults using LLMs at work rose from 30% to 43% (however only 1/3 of these adopters use the tool every workday). For tasks where LLMs were used, average completion times fell from 90 minutes to 30 minutes. LLM usage is most prominent in customer service, marketing and tech
- **May 2025 Salesforce AI Research paper on business applications**[8]**:** LLM agents achieved a disappointing 58% task success rate in single-turn (simple Q&A) scenarios and an even worse 35% success rate in multi-turn interactions. These agents also exhibited a near-zero confidentiality awareness that can be improved with prompting, though this often compromises performance. The study also found that LLMs struggled to effectively request necessary additional information when not initially provided with sufficient details

Broad conclusions: AI in the workplace is increasingly used for efficiently summarizing existing materials and automating routine tasks, while it still struggles with agent-user interactions and maintaining confidentiality without compromising performance. AI-generated outputs still require human double-checking, but this revision process is significantly less time-consuming than creating the work from scratch. **Importantly, we do not need AGI to see real productivity gains.**

---

[4] *"The Illusion of Thinking: Understanding the Strengths and Limitations of Reasoning Models via the Lens of Problem Complexity"*, Apple, Shojaee et al, June 7, 2025. A rebuttal example: *"The Illusion of the Illusion of Thinking"*, Lawsen (Open Philanthropy), June 10, 2025. Another possible rebuttal: one of OpenAI's reasoning models scored a **gold medal** at the International Math Olympiad on a completely new problem set, something no AI model has been able to do before.

[5] "*Teaching for Tomorrow: Unlocking Six Weeks a Year with AI",* Gallup/Walton Family Foundation, June 2025

[6] *"Automation of Systematic Reviews with Large Language Models"*, Cao, Arora and Cento, June 13, 2025

[7] *"The Labor Market Effects of Generative Artificial Intelligence"*, Hartley (Stanford) et al, May 2025

[8] *"CRM Arena-Pro: Holistic Assessment of LLM Agents Across Diverse Business Scenarios and Interactions"*, Salesforce AI Research, Huang et al, May 24, 2025

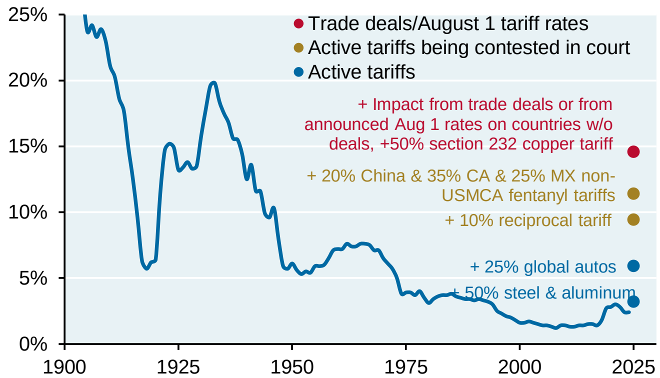
What's the latest on tariffs and unforeseen consequences?

Our latest estimates appear below, including the somewhat murky terms of the US-EU trade deal. Better than it looked a month ago, but still the highest tariff rates since before WWII. Some important questions:

- How much US trade with Mexico and Canada will be designated as MCA compliant now that there's an incentive to fill out all the paperwork? Official statistics from 2024 on MCA compliance by Canadian and Mexican exporters range from 30%-50%, but possible MCA compliance levels could be as high as 90%
- How much substitution will take place in which US imports from China are replaced by other foreign and US domestic substitutes? After all, US imports from China have already fallen by ~40% this year. For goods that are excluded from reciprocal tariffs, there's still an incentive to substitute away from China since all imports from China are subject to fentanyl tariffs
- What tariff rates will be applied in pending Section 232 investigations on pharma and semiconductors?
- What would happen if the Administration lost in the DC Circuit (where the US District Court for DC case is being appealed) OR in the Court of Appeals for the Federal Circuit (where the Court of International Trade case is being appealed)? Since appellate rulings are binding nationally, if the Administration loses either case they would need to come up with a new tariff plan, possibly based on Section 122 or Section 301

Average tariff rate on all US imports

Assuming 20% US domestic and 20% foreign substitution from China



Source: Tax Foundation, USITC, White House, JPMAM, 2025

Estimated final destination tariff rates as of July 2025

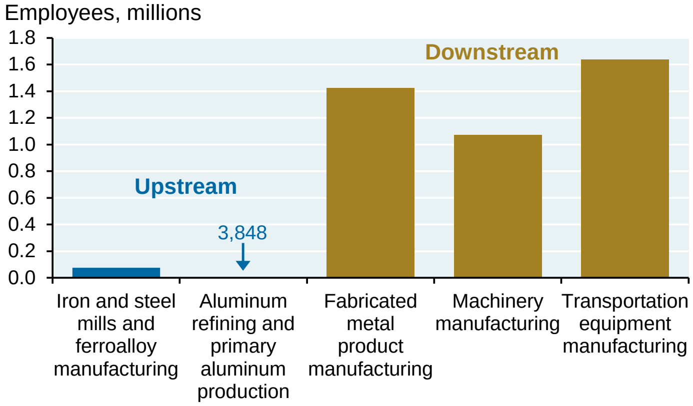
Exporting country	2024 imports (US$, bn)	2024 tariff rate (duties collected)	Est. 2025 tariff rate
Mexico	$506	0.2%	7.7%
China	$439	10.7%	43.2%
Canada	$413	0.1%	2.5%
Germany	$160	1.4%	16.0%
Japan	$148	1.5%	15.9%
Vietnam	$137	3.9%	18.6%
South Korea	$132	0.2%	21.1%
Taiwan	$116	0.9%	7.5%
Ireland	$103	0.2%	11.4%
India	$87	2.4%	11.6%
Italy	$76	2.2%	16.3%
United Kingdom	$68	1.0%	10.9%
Switzerland	$63	0.6%	7.2%
Thailand	$63	1.6%	24.4%
France	$60	1.2%	15.9%

Source: USITC, JPMAM, 2025. The 2025 tariff rates include pre-existing stacked tariffs, 50% steel/aluminum tariffs, 25% auto tariffs, reciprocal tariffs, 20% China fentanyl tariffs & 35% CA / 30% MX non-USMCA fentanyl tariffs, 50% copper tariff, all other country and product specific exceptions and 20% US domestic and 20% foreign substitution from China

Tariffs to-date could raise as much as $230 bn per year in revenues according to Yale's Budget Lab, even after negative dynamic revenues effects. But there could be unforeseen consequences: protecting a small number of upstream US steel and aluminum workers via 50% tariffs may negatively impact ~50x more workers in downstream industries that use these same materials. Second, at a time when the US aims to build out large amounts of AI and energy infrastructure, the rising cost of required raw materials and intermediate capital goods may create some challenges as well (see chart on right). Firms like Piper Sandler anticipate a US capital spending boom as a result of onshoring, product substitution to US firms and OBBBA corporate tax provisions; we'll be tracking this as well.

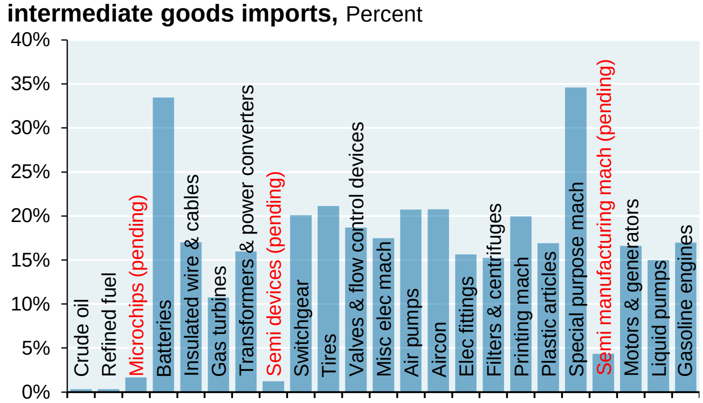
Steel and aluminum manufacturing employees, 2022

Employees, millions



Source: 2022 Economic Census, JPMAM, 2025

Effective tariff rate on largest categories of US capital and intermediate goods imports, Percent

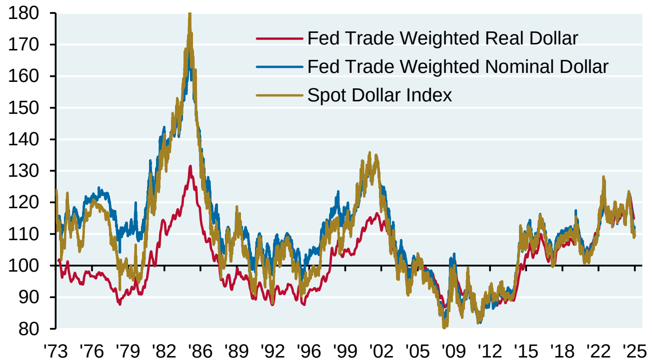


Source: USITC, White House, JPMAM, 2025

Charles Gave wrote that the US dollar is no longer the world's reserve currency[9]. What's your view?

I have a lot of respect for Charles and his team at Gavekal. But on this issue, our data sources do not indicate that much has changed. Yes, the dollar has declined by 5%-10% this year, but from elevated levels. And as shown on the right, our US$ reserve currency tracker shows no major deterioration; if anything, some dollar measures *improved* since 2022. The Trump budget bill is expected to increase debt/deficits, although Yale's Budget Lab projects that net incremental tariff revenues could reach $230 billion per year based on the latest rates/deals, in which case these fiscal measures wouldn't be far from the original CBO baseline. Either way, it seems premature to suggest that the dollar is no longer the world's reserve currency, and/or that the BRICs, the RMB or the Euro are substantially eroding its role.

2025: 5%-10% decline in the US dollar from elevated levels
Index (100 = January 31, 2006)



Source: Bloomberg, JPMAM, July 25, 2025

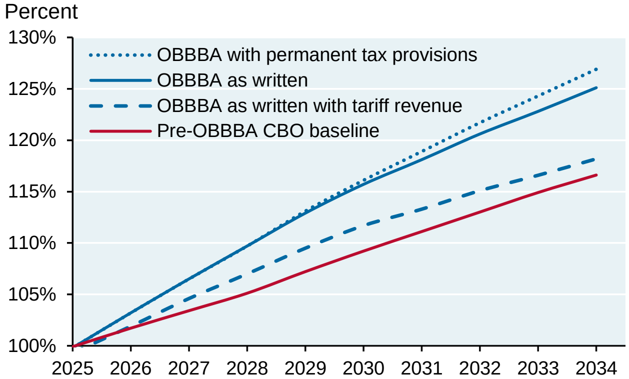
US$ share of global markets

	2022	Latest	Latest as of date
Cross-border loans	50%	52%	Q4 2024
Intl. debt securities	49%	53%	Q4 2024
FX transaction volume	88%	88%	April 2022
Official FX reserves	60%	58%	Q4 2024
Trade invoicing	50%	42%	June 2025
SWIFT payments	42%	49%	October 2024

Source: BIS Quarterly Review, ECB, IMF, Gavekal Research, JPMAM

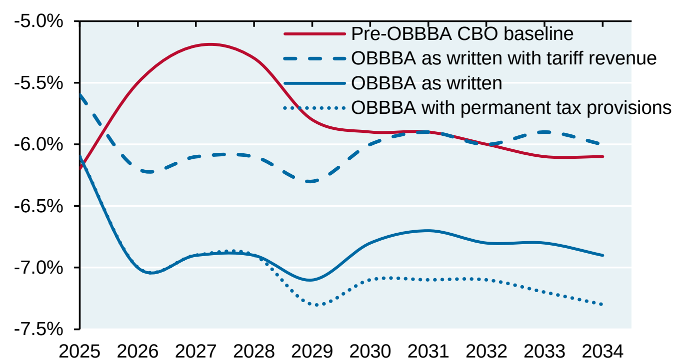
Projected impact of the of the OBBA, with/without permanence of certain tax provisions and tariff revenue:

Federal debt to GDP
Percent



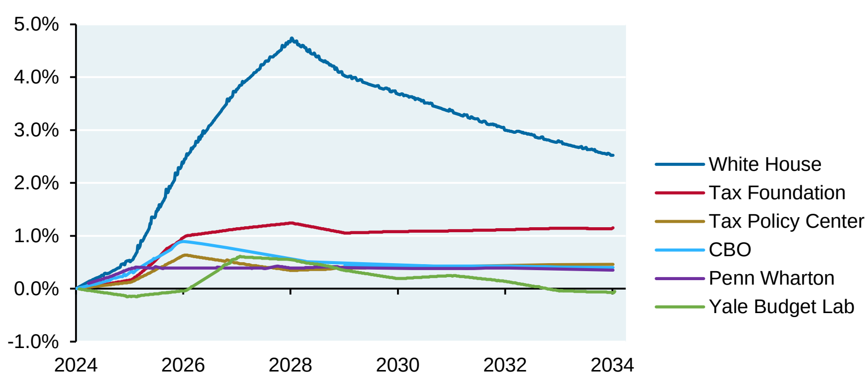
Source: Yale Budget Lab, JPMAM, July 1, 2025

Total budget deficit to GDP
Percent



Source: Yale Budget Lab, JPMAM, July 1, 2025

Projected GDP growth impact of OBBBA
Percent



Source: Center for a Responsible Federal Budget, July 2025

One of these things is not like the other. The last chart explains why the White House has a very different view on the reconciliation bill's growth impact. They also have a different view of numbers: last I looked, drug prices cannot fall by more than 100% as the President claimed; and gas prices are not $1.99 anywhere in the US.

[9] Gavekal Daily Research, July 8, 2025

Do JP Morgan's blockchain projects argue for building positions in Ethereum?

Not really, at least not yet. The infrastructure for JP Morgan's Kinexys product (a new intraday blockchain-based repo settlement system) was built on a "fork" of Ethereum. As a result, there is no direct connection back to Ethereum in any way that would create tolling revenues for the network and any gains for ETH holders. Daily volumes are just $2 billion compared to $10 trillion in traditional payments the firm handles daily; it remains to be seen just how much demand there will be for a blockchain-based B2B payments system.

That said, if JP Morgan or other firms created products on the public blockchain in the future, they might be built on Ethereum and Layer 2 chains connected to Ethereum, or other Layer 1 blockchains like Solana. JP Morgan has also developed a proof-of-concept permissioned deposit token called JPMD (a stablecoin alternative) which initially will be exclusively for the firm's institutional clients to facilitate on-chain money transfers. JPMD is currently offered on Base, a Layer 2 product developed by Coinbase on top of Ethereum, and may accrue some incidental benefits to ETH holders over time.

What do you make of Sam Altman's comments on fraud risk from voice authentication cloning?

At a Federal Reserve conference last week, Sam Altman referred to a "significant impending fraud crisis" resulting from AI voice cloning technology that can fool traditional voice authentication methods, often used by banks. Some cloning tools only require three seconds of recorded audio to create convincing impersonations.

Here are some of the tools that banks often use to protect clients from this kind of cloning fraud. Certain options require clients to sign up for them, rather than being used by default.

- Deepfake detection tools that use AI to detect synthetic/AI voice generation. One example of a deepfake detector: Reality Defender (which is itself an AI program) which analyzes voice patterns for unnatural pitch, rhythm, articulation and other irregularities
- In-App Authentication: push notifications to trusted devices to authenticate callers. Example: allows client service to require callers to confirm their identity on their phones (identity only, not payment authorization)
- Digital Payment Verification: enrolled clients digitally approve payments through a mobile app notification that requires clients to sign into their online account
- Phone porting/SIM Swap/Call Forwarding: a vendor service available in the US to detect if the caller is on a line subject to the aforementioned conditions
- Payment characteristic pattern recognition: is the requested payment out of character for the person given their historical transaction history (amount, country, beneficiary). After client service receives instructions and the payment is authorized by the client, the final step would be a fraud agent that could still prevent the transaction from taking place until additional verification steps are taken

Where are your next fishing trips?

I will be fishing out of my Hobie Mirage Outback kayak for sturgeon in British Columbia in late August, and for tarpon at Bocas del Dragon in Trinidad sometime in November. Here are some pictures from prior trips.


IMPORTANT INFORMATION

2536325. In the **Netherlands**, this material is distributed by **J.P. Morgan SE – Amsterdam Branch**, with registered office at World Trade Centre, Tower B, Strawinskylaan 1135, 1077 XX, Amsterdam, The Netherlands, authorized by the Bundesanstalt für Finanzdienstleistungsaufsicht (BaFin) and jointly supervised by the BaFin, the German Central Bank (Deutsche Bundesbank) and the European Central Bank (ECB); J.P. Morgan SE – Amsterdam Branch is also supervised by De Nederlandsche Bank (DNB) and the Autoriteit Financiële Markten (AFM) in the Netherlands. Registered with the Kamer van Koophandel as a branch of J.P. Morgan SE under registration number 72610220. In **Denmark**, this material is distributed by **J.P. Morgan SE – Copenhagen Branch, filial af J.P. Morgan SE, Tyskland**, with registered office at Kalvebod Brygge 39-41, 1560 København V, Denmark, authorized by the Bundesanstalt für Finanzdienstleistungsaufsicht (BaFin) and jointly supervised by the BaFin, the German Central Bank (Deutsche Bundesbank) and the European Central Bank (ECB); J.P. Morgan SE – Copenhagen Branch, filial af J.P. Morgan SE, Tyskland is also supervised by Finanstilsynet (Danish FSA) and is registered with Finanstilsynet as a branch of J.P. Morgan SE under code 29010. In **Sweden**, this material is distributed by **J.P. Morgan SE – Stockholm Bankfilial**, with registered office at Hamngatan 15, Stockholm, 11147, Sweden, authorized by the Bundesanstalt für Finanzdienstleistungsaufsicht (BaFin) and jointly supervised by the BaFin, the German Central Bank (Deutsche Bundesbank) and the European Central Bank (ECB); J.P. Morgan SE – Stockholm Bankfilial is also supervised by Finansinspektionen (Swedish FSA); registered with Finansinspektionen as a branch of J.P. Morgan SE. In **Belgium**, this material is distributed by **J.P. Morgan SE – Brussels Branch** with registered office at 35 Boulevard du Régent, 1000, Brussels, Belgium, authorized by the Bundesanstalt für Finanzdienstleistungsaufsicht (BaFin) and jointly supervised by the BaFin, the German Central Bank (Deutsche Bundesbank) and the European Central Bank (ECB); J.P. Morgan SE Brussels Branch is also supervised by the National Bank of Belgium (NBB) and the Financial Services and Markets Authority (FSMA) in Belgium; registered with the NBB under registration number 0715.622.844. In **Greece**, this material is distributed by **J.P. Morgan SE – Athens Branch**, with its registered office at 3 Haritos Street, Athens, 10675, Greece, authorized by the Bundesanstalt für Finanzdienstleistungsaufsicht (BaFin) and jointly supervised by the BaFin, the German Central Bank (Deutsche Bundesbank) and the European Central Bank (ECB); J.P. Morgan SE – Athens Branch is also supervised by Bank of Greece; registered with Bank of Greece as a branch of J.P. Morgan SE under code 124; Athens Chamber of Commerce Registered Number 158683760001; VAT Number 99676577. In **France**, this material is distributed by **J.P. Morgan SE – Paris Branch**, with its registered office at 14, Place Vendôme 75001 Paris, France, authorized by the Bundesanstaltfür Finanzdienstleistungsaufsicht(BaFin) and jointly supervised by the BaFin, the German Central Bank (Deutsche Bundesbank) and the European Central Bank (ECB) under code 842 422 972; J.P. Morgan SE – Paris Branch is also supervised by the French banking authorities the Autorité de Contrôle Prudentiel et de Résolution (ACPR) and the Autorité des Marchés Financiers (AMF). In **Switzerland**, this material is distributed by **J.P. Morgan (Suisse) SA**, with registered address at rue du Rhône, 35, 1204, Geneva, Switzerland, which is authorised and supervised by the Swiss Financial Market Supervisory Authority (FINMA) as a bank and a securities dealer in Switzerland.

In **Hong Kong**, this material is distributed by **JPMCB, Hong Kong branch**. JPMCB, Hong Kong branch is regulated by the Hong Kong Monetary Authority and the Securities and Futures Commission of Hong Kong. In Hong Ko.ng, we will cease to use your personal data for our marketing purposes without charge if you so request. In **Singapore**, this material is distributed by **JPMCB, Singapore branch**. JPMCB, Singapore branch is regulated by the Monetary Authority of Singapore. Dealing and advisory services and discretionary investment management services are provided to you by JPMCB, Hong Kong/Singapore branch (as notified to you). Banking and custody services are provided to you by JPMCB Singapore Branch. The contents of this document have not been reviewed by any regulatory authority in Hong Kong, Singapore or any other jurisdictions. You are advised to exercise caution in relation to this document. If you are in any doubt about any of the contents of this document, you should obtain independent professional advice. For materials which constitute product advertisement under the Securities and Futures Act and the Financial Advisers Act, this advertisement has not been reviewed by the Monetary Authority of Singapore. JPMorgan Chase Bank, N.A., a national banking association chartered under the laws of the United States, and as a body corporate, its shareholder's liability is limited.

With respect to countries in **Latin America**, the distribution of this material may be restricted in certain jurisdictions.

*Issued in **Australia** by JPMorgan Chase Bank, N.A. (ABN 43 074 112 011/AFS Licence No: 238367) and J.P. Morgan Securities LLC (ARBN 109293610)*.

References to "J.P. Morgan" are to JPM, its subsidiaries and affiliates worldwide. "J.P. Morgan Private Bank" is the brand name for the private banking business conducted by JPM. This material is intended for your personal use and should not be circulated to or used by any other person, or duplicated for non-personal use, without our permission. If you have any questions or no longer wish to receive these communications, please contact your J.P. Morgan team.