Disruptive Innovations – Assessing Opportunities and Risks

Artificial Intelligence: Where do we see the main opportunities and risks?

Macro Outlook:

- The expectations for $1T in annual AI revenue by 2028 appear optimistic given the reliance on digital advertising revenue, the likely commoditisation of large language models (LLMs) and structural problems associated with the rollout of agentic AI.
- The sources of AI capex funding are shifting from free cash flow to borrowing, increasing the risk profile.
  - Hyperscalers are increasingly favouring off-balance sheet credit or the use of neoclouds, instead of funding investment directly from their cashflow. Over the last three years, c. 80% of AI capex was funded from hyperscaler cash flow, this is expected to drop to 50% over the next three years.
  - The entry of less profitable players, such as OpenAI and Oracle, who will be heavily reliant on private and public credit markets as well as vendor financing for their investment, also raises the risk profile of AI capex.
- Data centre power demand will increase 2-3x out to 2030.
- There are however significant challenges, both from supply side constraints (grid, personnel, key materials, land and components), as well as the maturation of AI models (the move to inference) which will require ultra-low latency/proximity to end users.
- Renewables and associated technology will be a key source of energy longer-term, but their rollout is heavily dependent on the buildout of the grid and transmission infrastructure.

Investment Implications:

- Adopt a moderately defensive posture in overall equity risk levels.
- Minimise direct lending to AI infrastructure. We believe the depreciation risk and likely limited useful life of the underlying semiconductor technology is underappreciated.
- Selectively capture AI upside potential via specialist public equities managers.
- Also position in equities likely to benefit from infrastructure build, such as utilities, energy, industrials and technology. Focus on 'picks and shovels' companies that will benefit from the rising price of key minerals, as well as the demand for production and recycling technology.
- Focus on vertical software applications through specialist PE/VC managers. The increasing commoditisation of LLMs should create attractive opportunities for application developers to build upon these foundational models.
- Target specialist digital infrastructure developers. Focus on underlying tenant quality, exposure to development sites for cash-rich hyperscalers. Aim to capture excess returns from data centre development as opposed to just management, targeting returns in excess of public market cap rates.

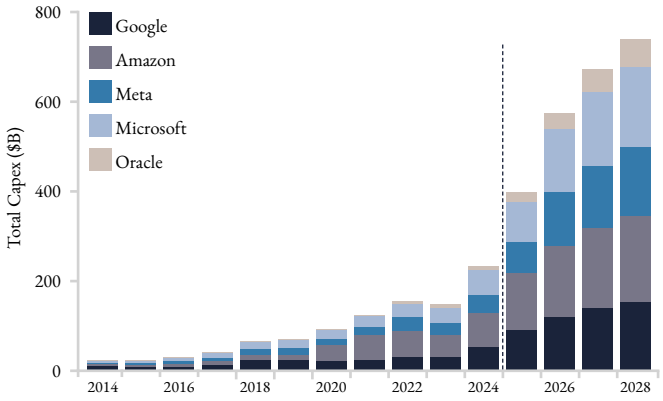
The quantum of capex will prove difficult to justify

In total, analysts estimate that c. $3T will be invested in AI between Q4 2025 and 2028, a figure that could reach $5-7T by 2030.[1] Total capex for hyperscalers is forecast to reach roughly $700B/annum by 2028, c. 70% of their operating cash flow, with $400-500B of this directly related to AI (Exhibit 1).[2] Recently, Oracle and OpenAI, which had previously relied solely upon Microsoft for their access to GPUs, have joined their ranks as large investors in this space.

1 Morgan Stanley, Goldman Sachs, Bloomberg Intelligence ($3T by 2028) J.P. Morgan ($5T), McKinsey ($7T) by 2030
2 Microsoft, Meta, Google and Amazon

Exhibit 1

Hyperscaler capex will continue to rise in the coming years

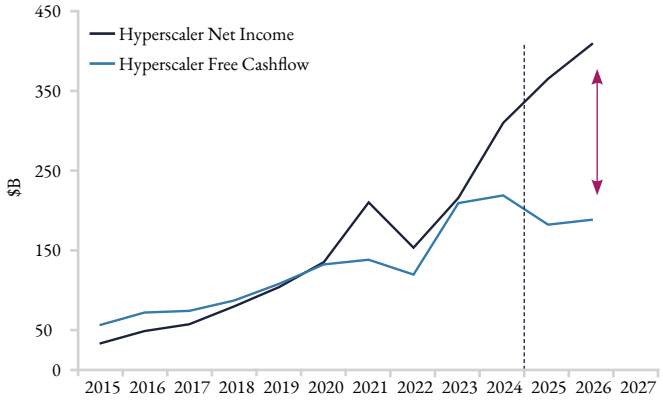


Source: *I/B/E/S*

For the last three years, the hyperscalers have financed c. 80% of total AI investment from cash flows. A decline in free cash flow relative to earnings, as per Exhibit 2, has prompted a shift in strategy. Microsoft and Meta have pivoted towards increased use of debt financing and off-balance sheet solutions like the neocloud[3] providers. Google and Amazon have sought to deploy their own custom silicon chips (ASICs[4]) as a lower-cost alternative to Nvidia's GPUs. **The proportion of total AI capex backed by hyperscaler cash flow will fall to c. 50% over the next three years.** Hyperscalers' (incl. Oracle) debt issuance has already reached $130B in 2025, up from an average of c. $33B/annum since 2015.[5]

Exhibit 2

The divergence between cashflow and net income has prompted a shift in strategy from the hyperscalers



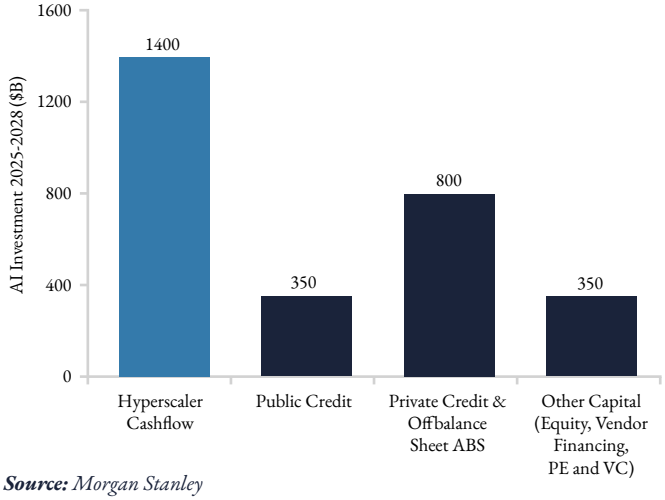
Source: *I/B/E/S*

Exhibit 3 shows that of the $3T total investment, $1.4T is expected to be financed directly from the operating cash flow of the hyperscalers. The remainder is expected to come from private credit and/or off-balance sheet financing ($800B), public credit ($350B) and other sources such as equity, PE, VC and vendor financing ($350B).

3 Neocloud: Coreweave and Nebius have business models that are solely dedicated to renting out GPU capacity, primarily sourced from Nvidia
4 Application Specific Integrated Circuits (Google TPUs, Amazon Trainium)

Exhibit 3

AI capex financing will be increasingly dependent on credit and vendor financing

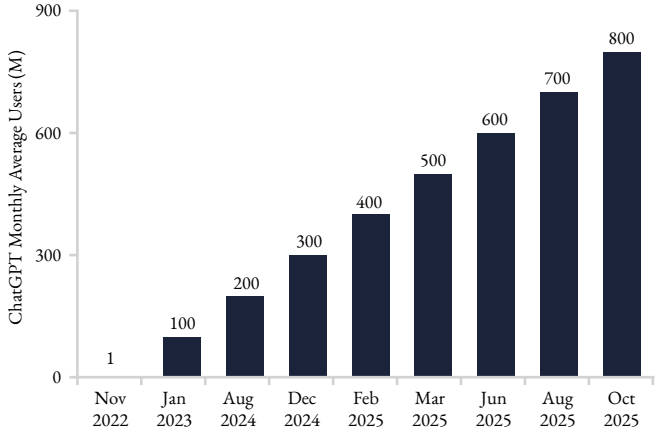


Source: *Morgan Stanley*

OpenAI, the largest private company in the world, with a market capitalisation of c. $500B, will be absorbing a significant proportion of the AI investment risk.[6] They are currently the market leader in Generative AI via ChatGPT with an estimated 76% share of AI-related traffic, down from 87% one year ago. ChatGPT currently has 800M users (see Exhibit 4), of which 5M are paid enterprise users.[7]

Exhibit 4

OpenAI has over 800M users



Source: *Nomura*

OpenAI's revenue for 2025 is estimated to be $13B, with internal company forecasts targeting $200B in revenue by 2030.[8] Microsoft, the largest investor in OpenAI[9], reportedly receives 20% of OpenAI's revenue. **However, the economics for AI queries are currently loss-making**, as illustrated in Exhibit 5. Company documents suggest that **OpenAI will post an operating loss of c. $13B in 2025.**[10]

5 Bank of America
6 The Economist
7 Nomura
8 The Information
9 27% shareholder following re-structure of OpenAI as a Public Benefit Corporation
10 The Information

Exhibit 5

OpenAI is currently loss-making, losing $4 for every million tokens processed

Source: *Goldman Sachs*

The balance sheet of OpenAI will face further strain from increasing data centre commitments. OpenAI had, until 2024, relied solely upon Microsoft for its GPU capacity. Between September and November 2025, **OpenAI announced a series of deals, totalling c. $1.4T,**[11] **to source GPU capacity directly from GPU** producers, neocloud providers and Oracle. Analysts estimate that this $1.4T equates to between 20-30GW of GPU capacity, as shown in Exhibit 6.[12] The sheer magnitude of these commitments, in light of OpenAI's current financial position, has raised concern amongst investors.

Exhibit 6

OpenAI have struck a series of agreements to invest up to $1.4T in GPU capacity

Company	Date Announced	Service	Financing	GW of capacity	Time line (Years)	Reported ($B)
Amazon	03/11/2025	GPU capacity	Combination: Equity, Credit, future revenue	Not Specified	7	38
Broadcom	13/10/2025	Custom GPUs (ASICs)	Combination: Equity, Credit, future revenue	10	3	Not Specified
AMD	06/10/2025	GPUs	Vendor Finance (via equity participation option)	6	5	Not Specified
Coreweave	25/09/2025	GPU capacity	Combination: Equity, Credit, future revenue	Not Specified	Not Specified	22
Nvidia	22/09/2025	GPUs	Vendor Finance (via equity)	10	Not Specified	100-350
Oracle	10/09/2025	GPU capacity	Combination: Equity, Credit, future revenue	4.5	5	300
Total				**30.5**		**Est. $1.4T**

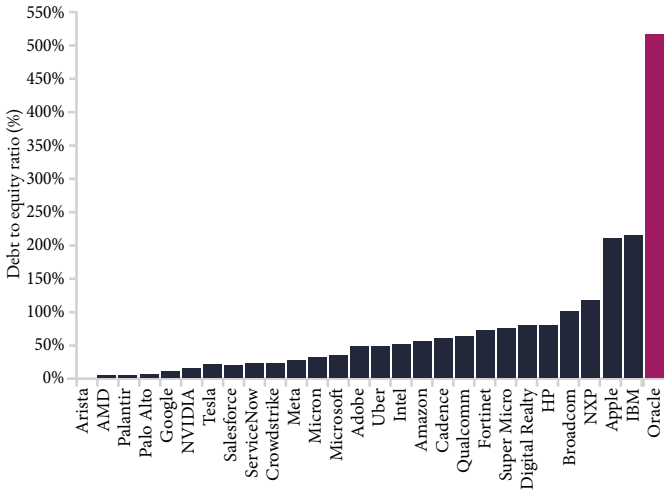
Source: *Corporate Press Releases*

Consider the case of Oracle, the 14th largest company in the S&P 500.[13] OpenAI has committed to purchase $300B worth of GPU capacity over the next five years from Oracle. To provide this, Oracle will need to commit to a combination of data centre leases as well as building data centre capacity itself in advance. Analysts expect Oracle, which is already highly leveraged relative to other technology firms (Exhibit 7), reflected in their BBB credit rating, to rely heavily on public and private debt markets.

11 Financial Times
12 Nvidia estimate that 1GW of GPU capacity = $50B
13 As at November 2025

Exhibit 7

Oracle is highly leveraged, relative to other tech companies

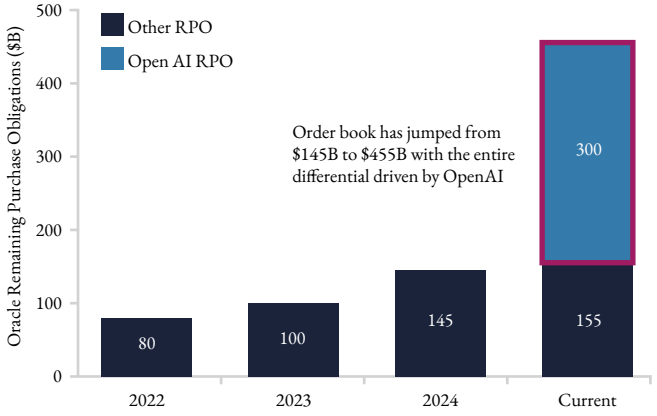


Source: *J.P. Morgan*

OpenAI, which is not expected to become profitable until 2030, **is now responsible for more than 65% of Oracle's future book of orders** (RPO[14]) as illustrated in Exhibit 8.

Exhibit 8

Oracle is now heavily dependent on the success of OpenAI

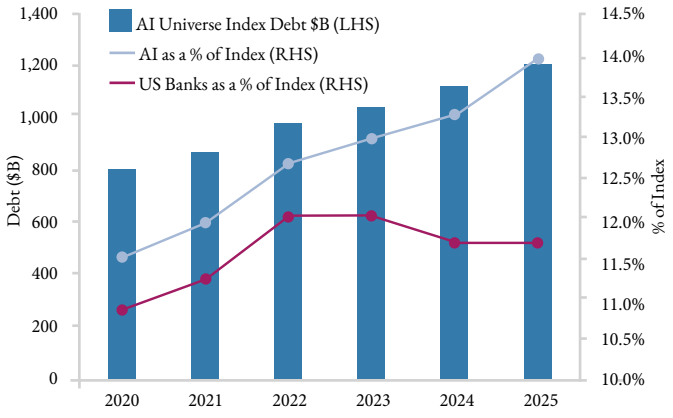


Source: *Morgan Stanley*

Investor focus will increasingly turn to potential strains on credit markets. Analysis from J.P. Morgan shows that outstanding **AI-related debt is already the largest segment of the investment grade credit universe**, c. 14% ($1.2T), Exhibit 9. In October 2025, a $27B bond issued via an SPV[15] (Beignet LLC[16]), to finance the development of Meta's Hyperion data centre, became the largest ever corporate bond issued in the US.

Exhibit 9

AI-linked debt is now the largest sector of the investment grade credit universe

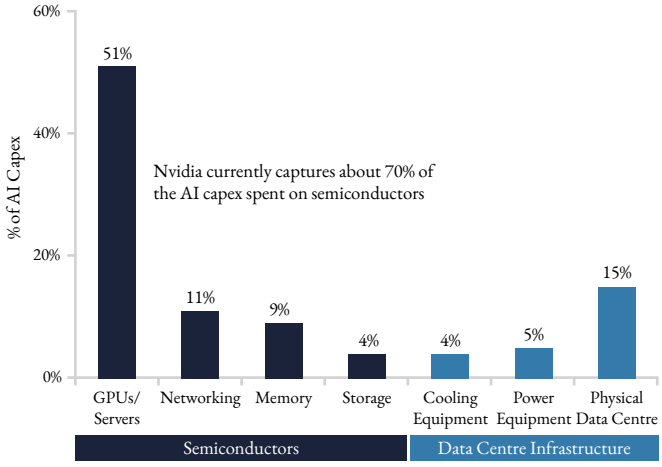


Source: *J.P. Morgan*

Roughly 75% of AI-related capex goes to the semiconductor industry: GPUs, CPUs, servers, memory and storage, with the remaining 25% going to the data centre physical infrastructure, as illustrated in Exhibit 10.

Exhibit 10

The majority of AI capex goes to semiconductor companies



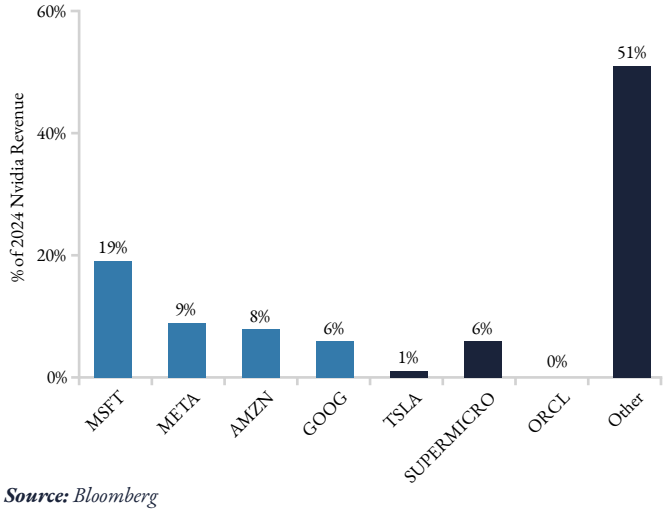
Source: *Morgan Stanley*

Nvidia has been the largest beneficiary of the AI boom. Its market cap has gone from $300B in November 2022 to c. $5T as of November 2025. It is expected to generate annual revenue of just over $280B in 2026, more than 10x the $26B it generated in 2021 prior to the launch of ChatGPT. It will reportedly ship 6M leading-edge GPUs in 2025. Its latest Blackwell GPUs retail at c. $40K with operating margins in excess of 70%.[17] **Its customer base is highly concentrated, with c. 40% of its revenues coming from the hyperscalers (Exhibit 11).**

14 Remaining Purchase Obligations – contracts that cannot be cancelled
15 Special Purpose Vehicle
16 SPV: Owned 80% by Blue Owl and 20% by Meta, allowing debt to remain off of Meta's balance sheet
17 Atreides

Exhibit 11

Nvidia is heavily reliant on the hyperscalers



Source: *Bloomberg*

Nvidia has invested $100B into OpenAI to fund data centre development and has established significant equity stakes in Coreweave and Nebius.[18] Coreweave and Nebius are "neoclouds", whose business models are exclusively focused on renting out GPU compute capacity, sourced almost exclusively from Nvidia. Microsoft and Meta, Nvidia's two largest customers, are also Coreweave's largest customers, comprising 80% of their 2025 revenue. OpenAI is widely reported to be Coreweave's third-largest customer. This has created a web of co-dependency, as illustrated in Exhibit 12.

Exhibit 12

The circularity of AI has created some significant vulnerabilities

A Relationship to B		B			
		Nvidia	OpenAI	Microsoft	Meta
A	Nvidia				
	OpenAI	Customer |Supplier | Received Investment ($100B)			
	Microsoft	Customer (19% Revenues)	Customer | Supplier | Investor (27% Equity)		
	Meta	Customer (9% Revenues)	-	-	
	Amazon	Customer (8% Revenues)	Supplier	-	-
	Google	Customer (6% Revenues)	-	-	Supplier (Gemini Model)
	Oracle	Customer	Supplier (65% Projected Oracle Revenues)	-	-
	Coreweave	Customer | Supplier | Received Investment (7% Equity)	Supplier (40% Projected Revenues)| Received Investment	Supplier (71% 2025 Revenues)	Supplier (10% 2025 Revenues)
	Nebius	Customer | Supplier|Received Investment	Supplier	Supplier	Supplier

Source: *Bloomberg*

18 7% stake in Coreweave, undisclosed in Nebius

Nvidia is forecast to grow its revenues to $320B by 2027 and analysts at Goldman Sachs estimate that Nvidia's **"vendor financing agreements"**[19] **will represent c. 15% of their 2027 revenue.** Nvidia's equity stakes in OpenAI and the neocloud companies can be seen through two lenses:

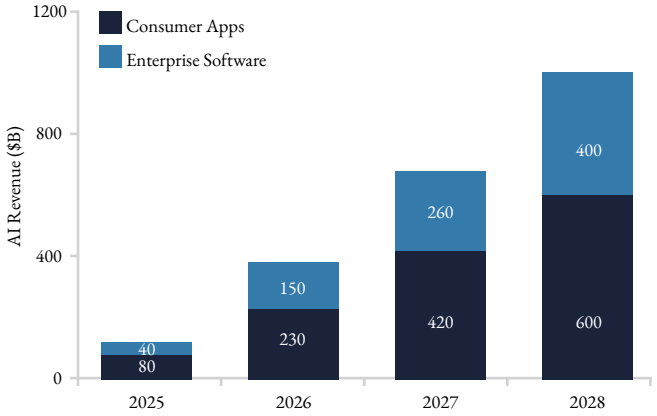
- On the one hand, they can be viewed as a way of assisting their largest customers - the hyperscalers - reduce balance-sheet risk by utilising data centre capacity from third-party providers who are now capable of scaling, with Nvidia absorbing part of that risk through its equity investments.
- A more sceptical assessment would suggest that Nvidia is financing these companies to ensure they continue to purchase their GPUs as opposed to competitor ASIC chips, drawing comparisons with the vendor financing in the telecoms space in late 1990s.

It will be a challenge to achieve a suitable return on this massive investment

Analysts forecast that annual AI revenue has the potential to reach $1T by 2028[20] (Exhibit 13), up from $120B in 2025. $1T in annual AI revenue would represent a 14% IRR on the projected investment over the coming three years.[21] 40% of forecast revenues are expected to come from enterprise IT spending, with the remaining 60% coming from consumer AI applications. **The assumptions behind these forecasts appear optimistic.**

Exhibit 13

Analysts expect AI revenue to reach $1T by 2028

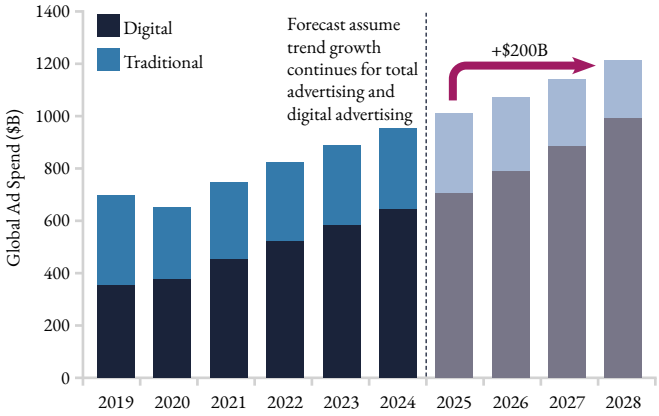


Source: *Morgan Stanley*

- **Consumer Applications:** Advertising is expected to be the single largest contributor to consumer AI revenue by 2028, at $190B. The global advertising market generates c. $1T in annual revenues as of 2025. Total expenditure on advertising has had a CAGR of +6.5% over the last 10 years (Exhibit 14). If this rate of growth continues, it will create another $200B in revenue per annum by 2028. **For the AI ad revenue forecast to be accurate, it would mean that either the entire growth in advertising revenue over the next three years accrues exclusively to AI** or that the growth in advertising expenditure meaningfully accelerates.

Exhibit 14

AI may have to capture 100% of the forecasted growth in ad spending to meet expectations



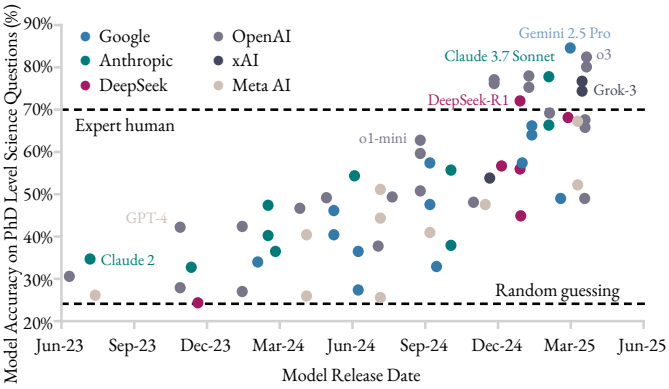
Source: *eMarketer*

- **Enterprise AI:** Enterprises will primarily utilise AI to enhance productivity, though recent studies from MIT and McKinsey have highlighted significant challenges still exist. There are two key issues related to the enterprise AI revenue assumptions. Firstly, LLMs[22] appear to be rapidly converging in quality (Exhibit 15), with analysts drawing the conclusion that **they may become commoditised, competing on cost as opposed to differentiation in quality, limiting any excess profits.**[23]

19 Classified as revenues linked to/associated with equity investments or provided on favourable financing terms
20 Morgan Stanley, Bloomberg Intelligence
21 J.P. Morgan
22 Large Language Models
23 Bloomberg Intelligence/J.P. Morgan

Exhibit 15

Dispersion in LLM performance has narrowed over time creating a risk of commoditisation



Source: *J.P. Morgan*

Secondly, there is the "lethal trifecta" or "jailbreaking". Experts suggest that for true productivity gains to be unlocked, AI needs agency – the ability to act independently and fully replace human employees. Agentic AI requires three things: 1) exposure to external data, 2) the ability to access internal, potentially sensitive, corporate data and 3) the ability to interact with external parties. The issue for LLMs is that they cannot easily distinguish reading data from reading instructions. This means that an AI model trained to read emails, with access to internal firm data and the ability to send information externally, **has the potential to be exploited**. Exhibit 16 shows some real-world examples of the lethal trifecta.

Exhibit 16

There have been several real-world examples of the lethal trifecta

Company	Date	Issue
Notion	Sep-25	Data stolen via instructions embedded in PDF
Microsoft	Jun-25	Copilot coerced into emailing internal sensitive data
GitHub	Apr-25	Attacker created false malicious instructions disguised as a resolution in a public discussion forum - subsequently gaining access to sensitive information as GitHub Copilot referred users to solution code
Apple	Oct-24	Delayed release of Apple Intelligence due to vulnerabilities identified related to lethal trifecta
DPD	Jan-24	Manipulation of AI chatbot for information

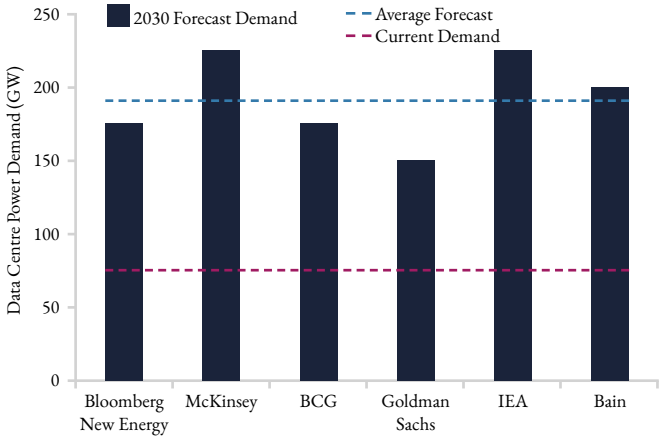
Source: *The Economist*

AI data centre buildout creates massive energy demand

Data centre power demand is expected to increase by 2-3x by 2030, moving from 75GW to 190GW[24], with OpenAI having secured 20-30GW alone. AI workloads are currently just 14% of total data centre workloads, but this share is expected to rise to 30% by 2027.[25] In the US, analysts forecast that **data centres will be responsible for 11% of total electricity demand by 2030**, up from just 4% today.[26]

Exhibit 17

Data centre demand is forecast to grow 2-3x out to 2030



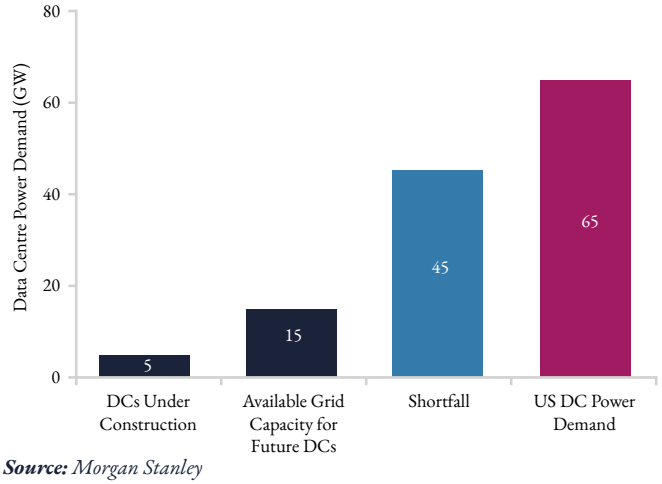
Source: *As shown*

A survey of the largest data centre constructors suggests that the three largest bottlenecks at present are: 1) securing power generation capacity, 2) the speed of access to power capacity and 3) the availability of chips (GPUs and high-bandwidth memory chips (HBM)).[27] The first two of these constraints primarily relate to grid capacity (transmission infrastructure) and regulation. Grid connection times in the US average four to five years versus just one to two years in China. **Morgan Stanley estimates that of the 65GW new power demand from data centres out to 2028, there will be a shortfall of 45GW,** as illustrated in Exhibit 18.

24 Average of expert forecasts
25 BNEF
26 Goldman Sachs
27 Morgan Stanley

Exhibit 18

Grid capacity constraints are likely to mean that data centre developers will have to find work-around solutions



Source: *Morgan Stanley*

Experts suggest that in the next five years, roughly 60% of planned US data centre projects will: 1) be built off the power grid (estimated 30%)[28], 2) repurpose existing sites (old nuclear/ gas plants, crypto mining data centres or commercial warehouses), or 3) be located outside of the US. **The maturation of AI models, moving from training to inference, adds further complications.** Data centres for inference, as opposed to training, have two key requirements:

1. Data sovereignty becomes a key issue. Consumer privacy rules mean that one cannot locate a data centre in the UAE, for example, for US/EU users.
2. Inference data centres require ultra-low latency, meaning that they must be located close to major urban centres where most of the end users are.

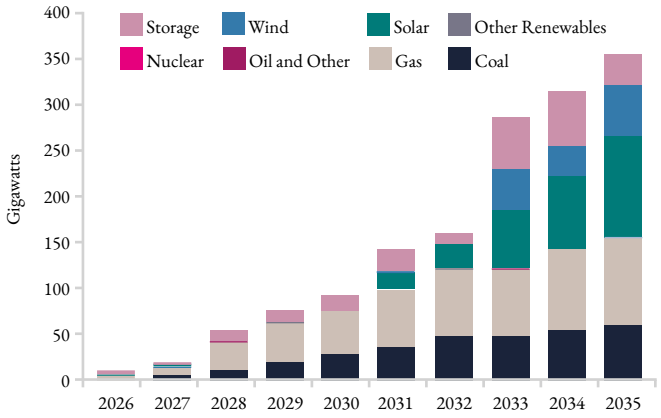
Locating close to major urban centres introduces problems. Firstly, there has been political backlash against rising power costs, which have already halted the development of data centres in many areas,[29] and secondly, proximity to large urban centres usually means a scarcity of available land. **This suggests that there could be a significant opportunity for specialist data centre developers who have the capacity and tacit knowledge to repurpose large commercial sites/power plants into data centres.**

Data centre developers face the risk of a potential asset-liability mismatch for their tenants. This arises from uncertainty regarding the life of their tenants assets (GPUs), relative to their fixed liability (the lease). Many experts argue that GPU useful life may be as short as just 12-24 months given Nvidia's current product cycle.[30] Others note that chips which are two generations old are still being utilised.[31] A GPU replacement cycle that is less than the lease length would necessitate tenants committing to further capital expenditure, stressing their cash flow. With this in mind, tenant quality becomes paramount.

Experts agree that in the short-term, fossil fuels, in particular natural gas, will be the primary fuel source used for data centre electricity generation (Exhibit 19). They note that reliability and scalability will be the most important factors for data centres,[32] two characteristics that are not associated with renewable energy. One issue that is emerging is a shortage of natural gas turbines, which currently have a lead time of c. four years.[33]

Exhibit 19

Natural gas will be the primarily fuel source for data centres in the coming years



Source: *Bloomberg New Energy Finance*

28 Bloom Energy
29 Atlanta, Dublin, Amsterdam, West London
30 Jim Chanos, Michael Bury
31 Atreides
32 Morgan Stanley survey
33 BNEF

Investment Implications of the AI Capex Boom

- ***Credit:***
  - **Minimise direct lending to AI infrastructure.** We believe the depreciation risk and likely limited useful life of the underlying semiconductor technology is underappreciated.
- ***Public Equities:***
  - **Adopt a moderately defensive posture in overall equity risk levels**. Since late 2022, AI-related stocks have been responsible for 75% of equity market returns, 90% of capital investment and 80% of earnings growth.[34] We believe this level of concentration, in light of the optimistic assumptions around the return on investment, poses a risk to equity markets overall.
  - **Selectively capture AI upside potential via specialist public equities managers** with a proven and deep understanding of the key components of the AI technology stack, including compute, storage and others.
  - **Prepare an 'Offense Playbook' ahead of any potential drawdown.** We assume we cannot perfectly time an AI-driven equity market derating but can prepare for it. This requires maintaining a sufficient cash/liquidity cushion to fund rebalancing, and continuing to identify attractive high-growth sectors as potential longer-term investment targets. **Selectively position in equities likely to benefit from infrastructure build**, such as utilities, energy, industrials and technology.
- ***PE/VC:***
  - **Focus on vertical software applications through specialist PE/VC managers.** The increasing commoditisation of LLMs should create attractive opportunities for application developers to build upon these foundational models.
  - **Focus on 'picks and shovels' companies that will benefit from the rising price of key minerals, as well as the demand for production and recycling technology.**
- ***Real Estate:***
  - **Focus on specialist digital infrastructure developers.** Focus on underlying tenant quality, exposure to development sites for cash-rich hyperscalers. Aim to capture excess returns from data centre development as opposed to just management, targeting returns in excess of public market cap rates.
- ***Commodities/AR:***
  - **Avoid outright commodity bets but use specialists to capture dislocations.** Use Absolute Return commodity managers that can dynamically position in commodity markets across short and long-term time horizons.

Can China become a world leader in AI?

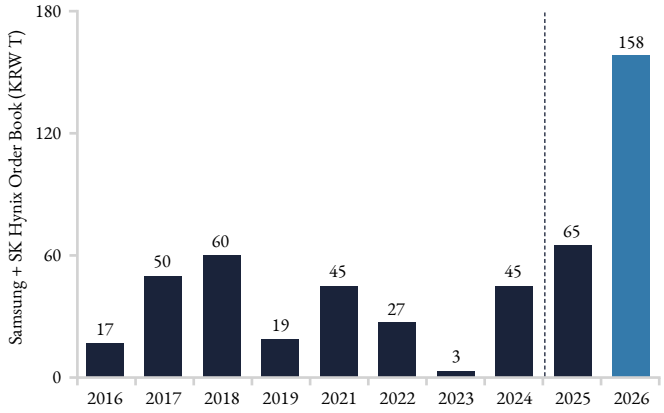
- In the near term, China is likely to lag the US in frontier AI computing power, given ongoing limitations in accessing the most advanced chips and semiconductor manufacturing equipment.
- Longer-term, China is taking a differentiated path, one that puts greater emphasis on its relative strengths in energy, manufacturing and large-scale deployment.
- This could generate more productivity benefits when applying AI gains across the real economy.

China is still reliant on US-sourced semiconductor technology but it is adapting around this constraint

China's primary disadvantage in AI development remains accessing advanced semiconductor technologies, which impacts both the quality and quantity of chips it can produce. Analysts estimate that Nvidia's Blackwell chips are about 6x more powerful and efficient than the latest Huawei Ascend chips.[35] Nvidia, via its access to TSMC, can produce over 6M leading-edge GPUs/annum.[36] Chinese companies can theoretically produce 1M GPUs/annum via capacity at SMIC, Cambricon and TSMC, but a structural shortage of HBM chips, which are essential for producing GPUs, means that actual production capacity is closer to 700K.[37] HBM chips are primarily the domain of just two providers: SK Hynix and Samsung. Recent agreements with Oracle, OpenAI and Broadcom mean that orders for 2026 are more than twice their previous peak, restricting the capacity available to Chinese businesses (Exhibit 20).

Exhibit 20

Orders for high-bandwidth memory chips are double their previous peak, limiting the potential for China to access supply



Note: 2020 is excluded due to COVID

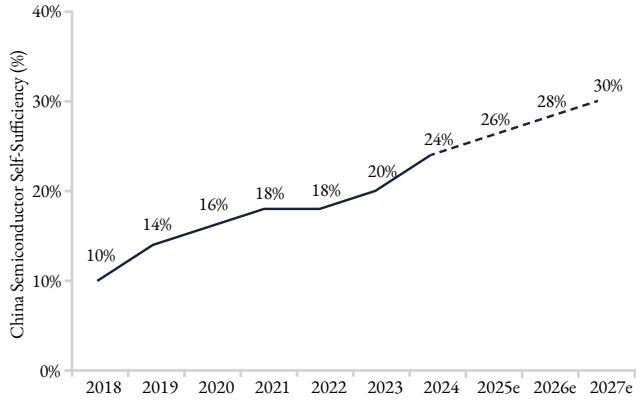
Source: *SemiAnalysis*

34 J.P. Morgan
35 UBS
36 The Economist
37 Semi Analysis

Domestic chip production in China currently covers only c. 20% of total domestic demand. China has an explicit goal of reaching 70% self-sufficiency by 2027. One of the primary constraints in achieving this is lithography technology, where Europe's largest technology company, ASML, has a monopoly. US and European export controls mean that ASML is effectively blocked from selling its most advanced lithography devices to China. ASML estimates that utilising previous generations of its technology, DUV instead of EUV,[38] results in chips that cost 12% more, take six months longer to produce, with an output yield of usable chips that is 9% lower. As a result, analysts are sceptical of China hitting these targets and estimate they will reach just 30% self-sufficiency by 2027 (Exhibit 21).

Exhibit 21

China is expected to fall short of its 70% domestic chip self-sufficiency target by 2027



Source: *Morgan Stanley*

China takes a differentiated approach

China's approach to AI has been notably different from that of the US, partially due to choice and partially due to technological necessity. The current focus for US companies has been on developing proprietary LLMs that they believe will serve as one-stop shops for all queries, or "digital gods" as some, including Atreides CIO, Gavin Baker, refer to them. Chinese companies, by contrast, have focused on open-source, smaller and task-optimised language models, designed to be "good enough" for widespread industrial use rather than perfect across all benchmarks.

This has two important implications. First, it reduces dependencies on leading-edge hardware by allowing more efficient training and inference on less advanced chips. Second, it accelerates diffusion across the economy, since open-source models have lower barriers for adoption across manufacturing, mobility, logistics and energy systems.

The are, of course, drawbacks. Without access to leading-edge external semiconductor technology, or until China fully develops homegrown capabilities, many experts believe Chinese AI models will lag the performance of US models.[39] Moreover, differences in chip architecture and software may limit their use in other regions.

One clear indication of Chinese ingenuity in getting around known issues of inferior hardware is the surge in intellectual property creation. China now accounts for approximately 60%[40] of global AI patent filings, many of which are focused on high-impact workarounds and architectural innovations. So far, there has been some progress in architectural efficiencies, model compression and better software optimisation to reduce compute intensity. There has also been greater deployment of horizontal scaling, using a larger volume of lower-end chips to achieve similar results.

Ultimately, China's goal may not necessarily be to "beat" the US in fundamental computations, but to "not lose" on intelligence while winning on application.

From compute to application: where China's AI value is likely to accrue

A critical difference between the US and China is where AI value is captured. In the US, much of the value currently accrues at the infrastructure and foundation model layers – GPUs, cloud platforms and proprietary LLM providers. In China, by contrast, the value is more likely to be captured through application and productivity gains across the real economy.

This reflects several structural features. Chinese models tend to be open-source and hence provide limited scope for direct monetisation at the model layer. Moreover, consumer willingness to pay for standalone AI services remains limited, requiring monetisation across platform ecosystems rather than directly. In this context, AI applications are being rapidly integrated into sectors like logistics, autonomous vehicles and automated factories.

As such, AI in China should be viewed by investors less as a narrow technology sector play and more as a broad economic boost, with value diffused across industrials, platforms, energy and advanced manufacturing.

38 DUV = Deep Ultraviolet, EUV= Extreme Ultraviolet
39 Goldman Sachs, Morgan Stanley, Atreides
40 The World Intellectual Property Organization

Physical AI and China's industrial advantage

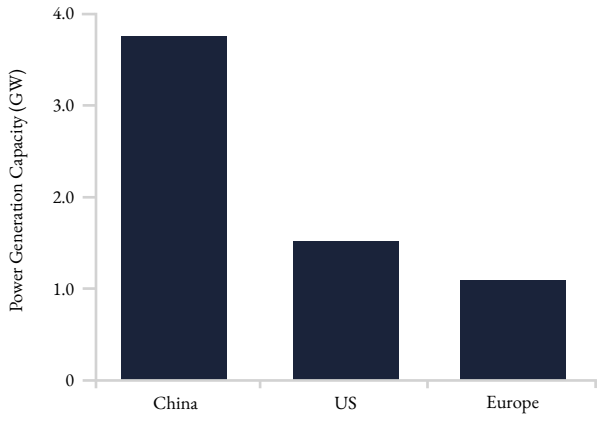
One area where China's strength is especially pronounced is physical AI - the integration of AI into real-world systems such as robotics, autonomous driving and smart manufacturing. China controls nearly 30% of global manufacturing output, and in areas like robotics, component localisation is already extremely high. Many Chinese humanoid robot and industrial automation companies source over 90% of components domestically, enabling rapid iteration, cost reduction and shorter deployment cycles.

Powering ahead

In addition, China holds one significant medium-term structural advantage that is difficult to replicate: energy. China already has nearly triple the electricity generation capacity of the US (Exhibit 22) and is forecast to add triple the amount of capacity that the US will add over the next 25 years. This has resulted in substantially lower industrial electricity costs in China; roughly half of the level in the US ($0.09/kWh vs 0.16/kWh), which materially lowers the marginal cost of AI infrastructure buildout and ongoing model inference.

Exhibit 22

China has a significant power advantage over the US, with 2.8x the generation capacity



Source: *IEA*

Moreover, China's strategy links AI development directly with its renewable energy expansion, data centre clusters and grid infrastructure. This integrated approach is likely to support faster scaling of AI workloads in the years ahead.

Investment Implications of China's AI push

As noted above, China currently provides less of a pure-play AI opportunity for equity investors, given a lack of technology leadership and the high valuations of some Chinese-listed AI companies. However, China's differentiated approach to AI development may accelerate broader productivity gains, which can provide investment opportunities in the following areas:

- ***Public Equities:***
  - Allocate to China-focused managers who **have a deep understanding of the AI ecosystem and can identify the long-term winners** from China's strategic investment in AI.
- ***PE:***
  - Search for opportunities within Chinese private markets, but remain cognisant of the associated political and geopolitical risks and are therefore **adopt a very high bar for investment.**

Are we on the verge of a breakthrough in quantum computing?

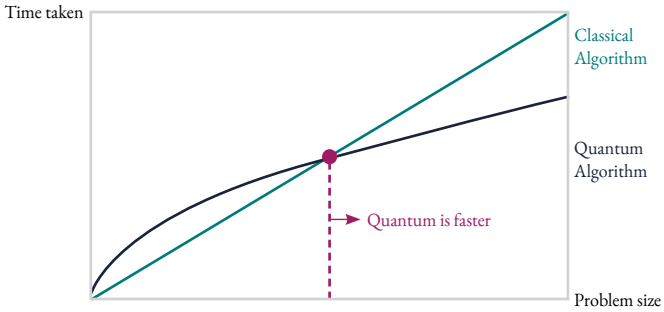
- Most experts believe that some form of commercial adoption of quantum computing is still at least a decade away and there are concerns amongst some investors about the breadth of actual long-term practical commercial applications of quantum computing.
- Despite this, the valuations of listed "pure play" quantum computing stocks have soared with price-to-sales ratios, on 2027 estimates, in the range of 55-210x.
- Quantum computing has the potential to make AI inference far more energy efficient.
- Quantum computing may be a threat to cryptocurrency and associated applications, with US government agencies suggesting that there is a 50% probability that a quantum system will be developed that can break today's cryptographic standards in the next decade.

The prospects and timeline for quantum computing

Quantum computing offers the potential to solve extremely complex problems exponentially faster than existing processor technology by using qubits[41] instead of bits, as illustrated in Exhibit 23. Scaling up the number of qubits is the key challenge because as the number of qubits increases, so does their propensity for errors due to the fragility of quantum processors.

Exhibit 23

Conceptual representation of the speed of quantum versus classical algorithms

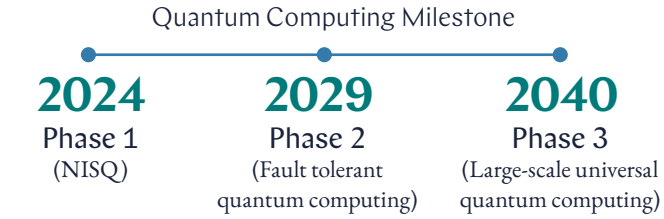


Source: *Morgan Stanley*

Google's Willow chip, one of the most advanced quantum chips in development, uses roughly 100 qubits and has shown evidence of reducing error rates as it scales, a crucial milestone for the industry. However, at this level of qubits, there are no commercial applications where quantum computers would be superior to classical machines.[42] A McKinsey survey of experts showed that 72% of the respondents expect a fault-tolerant[43] quantum computer with up to 100K qubits before 2035. This, in theory, could provide real-world applications, but experts caution that "truly powerful quantum computers could require millions of qubits".[44] **The roadmap for most quantum computing is error-tolerant computing before 2030 and commercial applications by 2040, as illustrated in Exhibit 24.**

Exhibit 24

Commercial applications for quantum computing may be 15 years away



Source: *Morgan Stanley*

41 In contrast to bits, which are either zero or one, qubits can represent any combination between 0 and 1 simultaneously
42 The Economist
43 Quantum computers that can continue to operate correctly even when some components fail
44 Professor of Quantum Tech at the University of Sussex
45 Financial Times
46 The RSA (Rivest-Shamir-Adleman) algorithm is utilised for encryption online
47 The Economist
48 BT and HSBC
49 As at end Nov 2025
50 I/B/E/S

The potential to impact AI and crypto

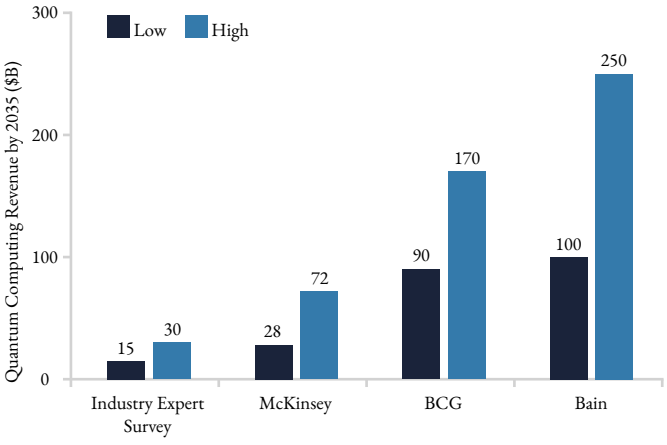
- **AI:** Across industries, quantum adoption is still very much at an experimental stage. Nvidia, Microsoft, and IBM are trialling quantum-classical hybrid systems, **which aim to enable more energy-efficient AI model inference, but Nvidia CEO Jensen Huang believes that practical quantum computing is still 20 years away.**[45]
- **Crypto:** Quantum computing's threat to cryptography has been well cited. However, for a quantum computer to break the RSA algorithm,[46] it is estimated that it could take up to 20M qubits.[47] US government agencies assume a c. 50% probability that this will occur within the next decade. In response, the US National Institute of Standards and Technology finalised its first post-quantum encryption standards in 2024, with the EU and China following suit. This has prompted the development of quantum-safe hardware, such as Quantum Key Distribution and quantum-safe networks, which are in the process of being developed and deployed.[48]

Total addressable market and investments

As Exhibit 25 shows, there is a considerable range of estimates amongst analysts of how large the market for quantum computing could become over the next 10 to 15 years. This reflects both the uncertainty around the potential to deliver usable commercial technology and the breadth of potential use cases.

Exhibit 25

There is little consensus about how large the quantum computing market could be

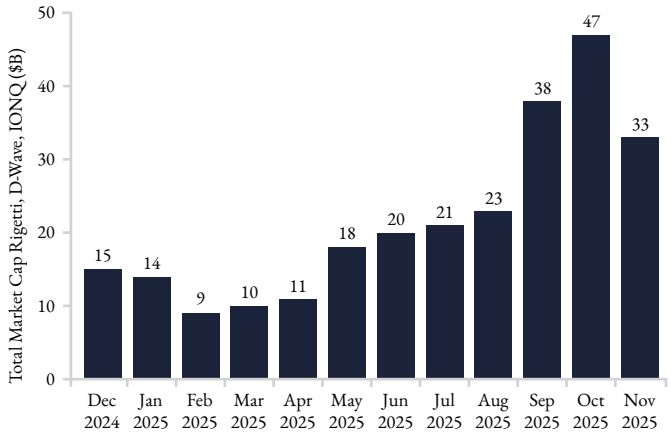


Source: *As indicated (expert survey from Morgan Stanley)*

Despite the degree of uncertainty on potential market size, single stocks such as Rigetti, D-Wave and ION-Q, widely viewed as "pure plays" on quantum computing, have seen their valuations soar in 2025. Exhibit 26 shows that the total market capitalisation of these companies has increased from $15B at the beginning of 2025 to $33B,[49] with forward price-to-sales ratios of 55-210x on 2027 revenue estimates.[50]

Exhibit 26

The market cap, and valuation, of quantum "pure plays" has expanded dramatically despite uncertainty on future market size



Source: *Bloomberg as of 25th November 2025.*

Investment Implications of Quantum Computing

- ***Public Equities:***
  - **Avoid publicly listed quantum computing "pure plays"**. Expert assessments of the near-term revenue potential suggest that many publicly listed quantum companies are likely overvalued.
  - **Focus on the likely beneficiaries of eventual advances in quantum computing.** For example, our allocations to the life sciences sector stand to benefit if quantum computing significantly accelerates the drug discovery process.
- ***Cryptocurrency/Commodities:***
  - Quantum's potential to impact cryptocurrency remains a concern and is one of several reasons that we have a **relative preference for gold over Bitcoin** as a hedge against debasement risk.

What is the longer-term outlook for crypto/blockchain?

- Easing regulation should support wider investor adoption but for now Bitcoin's ownership remains heavily concentrated and, in many cases, is highly leveraged. For example, 82% of Bitcoin is controlled by just 0.27% of wallets.
- The consensus is that value of outstanding stablecoins will increase from c. $300B today to c. $2T by 2030. This may be overly optimistic.
  - After accounting for on/off ramp costs[51] and the likely costs associated with KYC/fraud prevention, the apparent cost advantage associated with stablecoin payments versus traditional payment rails largely evaporates.
  - Stablecoin's primary use case may be as a vehicle to access US dollars for emerging market residents, but this is likely to trigger a response from EM central bankers as stealth dollarisation would undermine domestic monetary policy.
- As crypto markets develop and mature, correlations should fall reflecting key differences in underlying drivers.

Regulatory changes to support adoption

The US administration has implemented a significant deregulation drive in an attempt to support wider adoption of cryptocurrencies. Industry analysts suggest that an average 2% increase in allocation by institutions could equate to c. $3T in additional demand for cryptocurrency assets,[52] equivalent to the total market capitalisation of all outstanding cryptocurrency.[53] Exhibit 27 shows that the US administration has provided clear support for the crypto industry including personnel changes at the SEC, the dropping of investigations against industry platforms, the establishment of a strategic reserve and a combination of legislation and executive orders to encourage institutional adoption.

51 FX conversion costs to stablecoins
52 Blackrock
53 As at 31 October 2025

Exhibit 27

US administration has been very crypto friendly

Date	Action	Impact
Dec-24	Appoints David Sacks as White House Crypto Czar and crypto advocate Paul Akins as the head of the SEC	The removal of crypto sceptic Gary Gensler and his replacement by pro crypto Paul Akins sends a clear signal to the industry that regulators will be giving the crypto industry much further room to innovate
Jan-25	Executive order revoking Biden era cryptocurrency policies	Looking to provide regulatory clarity
Mar-25	Creation of strategic Bitcoin reserve	Government will now maintain a stockpile of seized crypto assets
Jul-25	Clarity Act passed by the House but not the Senate	Act will establish a regulatory framework for digital assets but still requires passage in the Senate.
Jul-25	Genius Act passed by Congress	Provides regulatory clarity for the stablecoin industry
Aug-25	Trump signs executive order to potentially allow 401K accounts to invest in cryptocurrency.	$9T in US retirement assets which could in theory be deployed in cryptocurrency

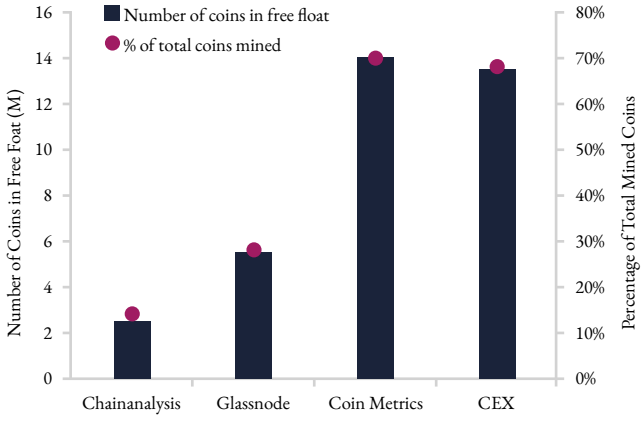
Source: *FT, Economist, Bloomberg*

Bitcoin ownership remains highly concentrated and, in many cases, leveraged

Just 0.27% of all Bitcoin wallets control 82% of the existing supply.[54] Chainanalysis, a cryptocurrency analytics company, estimates that the free float of Bitcoin is between 2.5-3M coins, roughly 14% of the total c. 20M mined to date. While other estimates suggest the free float is closer to 13-14M coins, as illustrated in Exhibit 28, Chainanalysis believe that one must exclude any coins that have been dormant for more than a year when calculating a free float estimate.

Exhibit 28

The actual free float of Bitcoin may be quite small



Source: *As indicated*

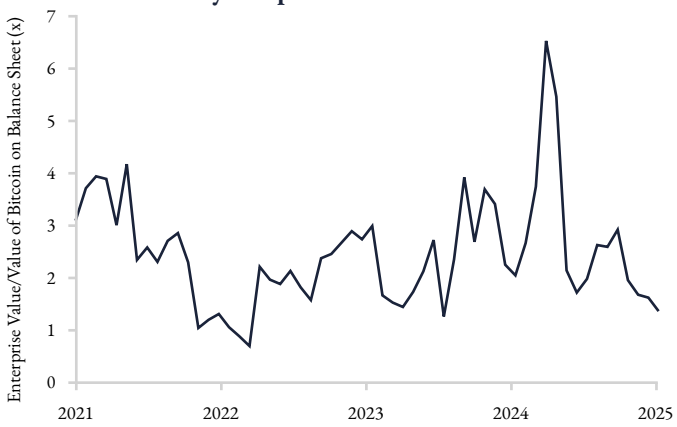
Many of the largest holders of Bitcoin are highly leveraged Bitcoin Treasury companies.[55] Strategy, formerly Microstrategy, which currently holds c. 650,000 Bitcoins (potentially up to 25% of the free float), is the most well-known. Strategy's approach entails issuing a combination of debt, equity, and preferred stock with the sole purpose of buying Bitcoin. Michael Saylor, Strategy's CEO, posits that as long as the company's enterprise value exceeds the value of the Bitcoin held on its balance sheet, it will be accretive to issue equity to purchase more Bitcoin.[56] There are two issues for Strategy:

- Firstly, its MNAV[57] premium has fallen to just below 1.2x from a peak of 6.5x in November 2024 (Exhibit 29) reflecting shareholders' increasing concerns that the company is relying on equity issuance to pay dividends and coupons as opposed to purely buying more Bitcoin. In late September 2025, Strategy raised c. $130M from the issuance of common stock, but just $22M was used to purchase Bitcoin, while the rest was required to service debt and preference share coupons/dividends.[58]

54 River.com
55 Financial Times estimates that are nearly 200 Bitcoin Treasury Companies
56 Strategy press releases
57 Premium of the Strategy's enterprise value over the value of the Bitcoin on its balance sheet
58 Strategy press releases

Exhibit 29

Strategy's falling premium may reflect broader concerns for Bitcoin treasury companies



Source: *Bloomberg, SEC Filings*

- Secondly, as things stand, Strategy has $5B out-of-the-money convertible bonds outstanding, which will begin to reach maturity in 2027.[59] The company generates no significant cash flow from its operations and in the event the bonds mature out of the money, Strategy would almost certainly have to resort to liquidating its Bitcoin holdings, potentially flooding the market with supply.

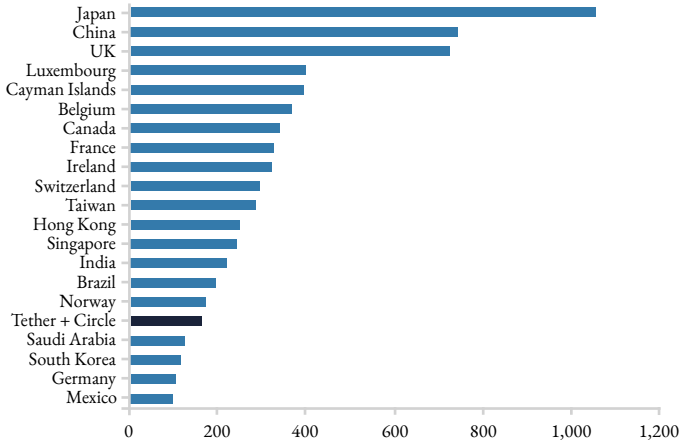
Stablecoin legitimacy and use cases

The passage of the Genius Act has given stablecoins legitimacy. The legislation defines stablecoins as a digital asset for payment/settlement, which must be backed 1:1 by eligible USD reserves (primarily USD T-Bills). It does, however, prohibit stablecoin issuers from paying interest. The two largest stablecoins, Tether ($182B) and Circle ($76B), represent c. 90% of stablecoin issuance.[60] Stablecoin issuers are now one of the largest holders of US Treasuries, Exhibit 30.

Exhibit 30

Stablecoins are one the largest holders of US Treasuries

International holdings of US Treasuries ($B) as of January 2025

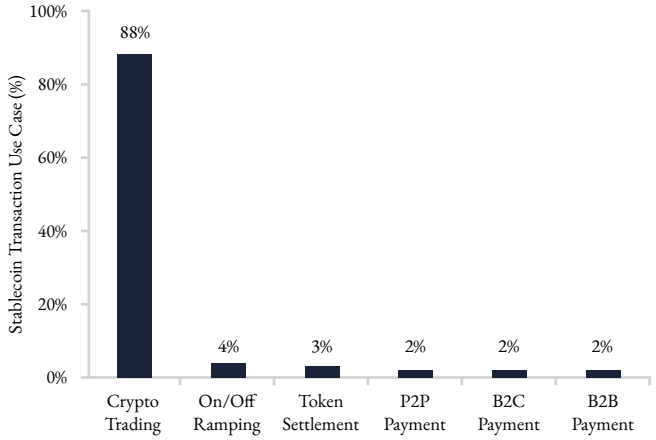


Source: *J.P. Morgan*

Stablecoins have a number of potential use cases: 1) they act as a type of "digital cash" for cryptocurrency trading, 2) they have the potential to serve as a lower-cost, decentralised, instant payment settlement system and finally 3) they provide a potential access point to US dollars for emerging market investors. As Exhibit 31 shows, facilitating crypto trading remains their overwhelming use case at present.

Exhibit 31

Payments are still only a marginal use case for stablecoins



Source: *BCG*

59 Financial Times
60 Coinmarketcap.com

Much has been made of the potential for stablecoins to replace traditional payment rails. Settlement on traditional payment rails usually takes between 0 to 5 business days, and costs will usually range from $0.20 up to $50.[61] Stablecoins could offer instant settlement and lower costs, potentially less than $0.10/transaction. For peer-to-peer transactions in developed markets, one of the fastest-growing segments of the payments market, this isn't a revolutionary offering. Revolut, PayPal, Venmo, CashApp and several banks offer instantaneous, free (within limits) peer-to-peer payments. For domestic business-to-business transactions, experts highlight that the market is highly efficient and unlikely to be replaced.[62]

For cross-border transactions, including remittances, there is the potential for disruption. However, experts note that the problem for stablecoins is that once on/off ramp costs[63] (conversion fees) and KYC/AML costs (still in the process of being regulated)[64] are factored in, the overall cost advantage for stablecoins rapidly evaporates[65] (Exhibit 32). Another issue is that stablecoin payments and all smart contracts are immutable, meaning they cannot be reversed in the event of an error.

Exhibit 32

Once platform and verification costs are factored in, stablecoins' cost advantage shrinks

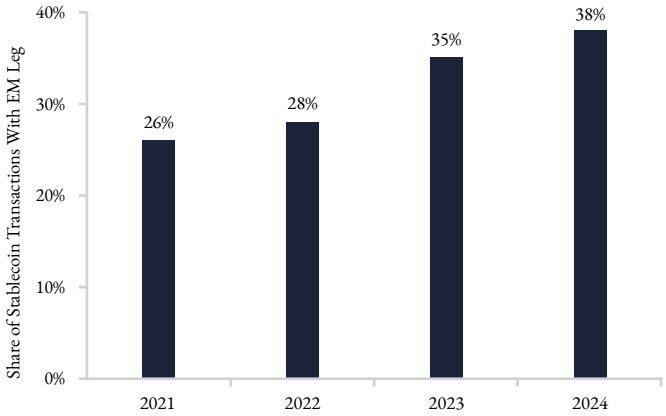
	Traditional Payment	Stablecoin (Tether)
Rail Cost	$0.2 - 50	$0.1
FX Spread	0.35% - 3%	
Platform On/Off Ramp	-	0.2% - 3.5%
Fraud/Verification	-	$150

Source: *J.P. Morgan, Tether*

Experts conclude that, for now, the primary use case for stablecoins, outside of crypto trading, could be to serve as a vehicle for residents in emerging markets to access US dollars. Data from the Cambridge centre shows that emerging markets' share of stablecoin flows has risen from 26% in 2021 to 38% as of December 2024 (Exhibit 33). Chainanalysis' crypto adoption index shows that 17 of the top 20 nations are emerging markets. This could be a significant problem for policy makers in emerging markets, as this "stealth dollarisation" could undermine the impact of domestic monetary policy and capital controls.

Exhibit 33

Emerging markets are becoming an increasingly important driver of stablecoin adoption



Source: *IMF*

The value in other blockchain rails

The vast majority of stablecoin payments and other forms of smart contracts are settled across one of three networks: Ethereum, TRON and Solana. The Ethereum network settles between 40-50% of stablecoin transactions.[66] In contrast to the Bitcoin blockchain, which is used almost exclusively to record and validate Bitcoin ownership, the Ethereum network is primarily utilised to validate and process smart contracts and digital tokens such as stablecoins.

61 McKinsey
62 Goldman Sachs, J.P. Morgan
63 The cost of converting fiat currency to stablecoin and back to fiat
64 Regulators must publish guidance by July 2026
65 J.P. Morgan
66 CoinGecko

To utilise the Ethereum network, one must pay fees, denominated in Ether. Some of the fee will accrue to network validators, but most of it will be "burned", that is, permanently removed from supply. This, in essence, means that as network activity increases, the amount of Ether outstanding decreases, increasing its scarcity value. This should, in theory, fundamentally link the price of Ether to the network's utility value and stablecoin adoption. In practice, however, the price of Ether has been highly correlated to Bitcoin, offering little in the way of diversification, as illustrated in Exhibit 34.

Exhibit 34

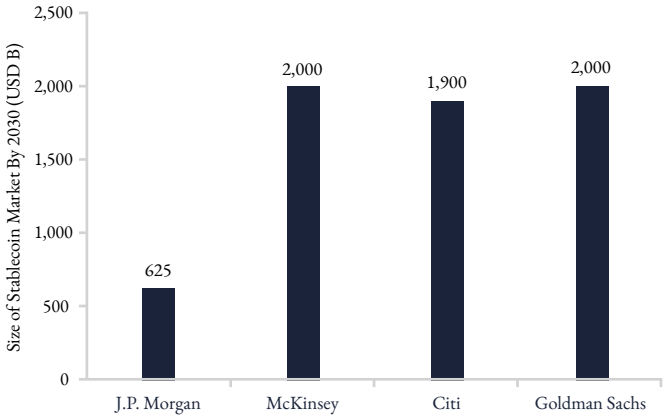
Ether remains highly correlated with Bitcoin despite a theoretical difference in underlying drivers

Source: *Bloomberg*

Experts believe that as cryptocurrency markets develop and mature, correlations will adjust reflecting the different underlying fundamental drivers. For Ethereum, Solana and Tron stablecoin adoption trends are expected to be crucial. Exhibit 35 shows that most experts believe the stablecoin market will reach c. $2T by 2030. J.P. Morgan is the exception, highlighting that regulation and costs associated with KYC/fraud and the stance that policy makers adopt in emerging markets will be important factors in determining the eventual size of the market.

Exhibit 35

Most experts believe the stablecoin market will reach c. 2T



Source: *As indicated*

How are we reflecting this in our investments?

- Cryptocurrency/Commodities:
  - **At present, direct Bitcoin holdings are not part of our model portfolio allocations.**
  - For those wishing to hedge against the risk of monetary debasement, we believe that **gold is a superior alternative** given its 1) longer track record, 2) higher Sharpe ratio, 3) recourse to a physical asset, 4) sustained support from global central banks and 5) less concentrated/leveraged ownership structure.
- PE/VC:
  - We do, however, have exposure to other blockchain technologies through our PE and VC programmes which **invest selectively in native coins and network facilitators.**
- Public Equities:
  - We have identified several ways in which clients can take exposure to native coins, blockchain rails and facilitators via listed equity markets.

What are the implications of rising defence budgets?

- Geopolitical uncertainty coupled with explicit demands from the US administration will lead to a sharp increase in defence spending across NATO members and Japan. NATO members are targeting defence budgets at 5% of GDP by 2035, which represents a +90% increase in spending.
- Rising demand and an inelastic supply chain have the potential to fuel higher prices for key defence infrastructure and input materials (including copper and rare earth metals).
- Drones, cybertechnology and energy infrastructure are expected to receive significant investment.

How are we reflecting this in our investments?

- Public Equities:
  - Selectively allocate t**o regional specialists** in Europe and Japan who are investing in key beneficiaries with structural moats in the industrial, utility and technology space.
- PE/VC:
  - Allocate to Private Equity managers with an **explicit lens on defence technology as well as selective exposure to key producers/refiners of critical minerals which will be needed as inputs.**

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