Data Centres

The boom and bust of bits and bytes



EXECUTIVE SUMMARY

Over the past two years, Big Tech companies have more than *doubled* their capital expenditure to develop data centres supporting Artificial Intelligence (AI). These new data centres require substantial investments in real estate, infrastructure and semiconductors.

Despite a plethora of potentially enticing opportunities in industries that supply materials to data centres, such as HVAC, cabling and electrical equipment, Latitude has avoided making any investments in these areas. Our primary reason for this stems from our caution against investing in supply booms driven by speculative demand assumptions, borne out of repeated historical precedents which manifested in oversupply and poor returns in the long term.

Looking at past capital booms: railroads, automotives, telecoms and oil, the pattern of frenzied overinvestment followed by oversupply has been consistent. The current Al boom could repeat this pattern, raising concerns over whether the high spending by Big Tech will manage to generate sufficient returns to cover their cost of capital, let alone those implied by current lofty share prices. Significant 'known unknowns' about the technology's future and potential market commoditisation make it difficult to predict long-term outcomes.

We remain cautious, preferring investments in companies with more predictable, proven, probable returns and earnings growth. While Alphabet presents unique advantages, including its control over technology and low valuation, the fund is wary of overexposure to sectors characterised by rapid innovation where history reminds us that sustaining market leadership is particularly challenging.

WHY WE'RE NOT ALL IN ON AI

2025 | Data Centres

One of the dominant themes of the global stock market over the past two years has been the surge in capital expenditure (capex) by Big Tech companies such as Alphabet, Microsoft, Meta, Oracle and Amazon. This expenditure has been invested in building the next generation of data centres to support the Artificial Intelligence (AI) revolution. These data centres distinctly differ from the original cloud-focused versions, requiring a substantial increase in investment in land, equipment (electrical systems, heating, ventilation and air conditioning (HVAC)) and semiconductors.

Latitude rarely invests in new and nascent technologies, especially in fields where it is difficult to identify a clear winner. Although undeniably exciting, rapid innovation causes profit pools to shift quickly, often creating more victims than victors. We have, however, considered investing in some of the "pick and shovel" industrials, which are involved in supplying the materials and products used to construct and fit out data centres. In this letter we hope to explain why we have ultimately decided against investing in these fields in the past, and why we are unlikely to do so in the future.

Our reasons for not investing in the most obvious short-term beneficiary of AI, NVIDIA, are hopefully clear, our rationale for not investing in other adjacent companies in the sphere requires some further explanation. Several industrials that sell their products into data centres align with our investment strategy and sit patiently on our 'shelf' of stock ideas. These companies generally exhibit strong competitive advantages, high returns and are often exceptionally well-managed, despite having some degree of cyclicality. Examples include HVAC providers like Carrier and Daikin (which supply cooling liquids and equipment to data centres), low and medium voltage cable original equipment manufacturers (OEMs) like Legrand and Prysmian, and high voltage companies like Schneider Electric.

Before proceeding further, we need to explore the history of demanddriven capital booms to understand the perils of participating in them.

A HISTORY OF CAPITAL CYCLE BOOMS

Investing is a game of probabilities and when we encounter a scenario that contradicts historical trends, we prefer to remain on the sidelines, seeking alternative, simpler ways to generate total returns. Technological innovation carries positive creative connotations, but can

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be equally destructive, shifting profit pools between players, or upending them altogether. History demonstrates how difficult it has been to identify the long-term winners from the outset amidst booming investment in supply. There has never been a supply-side boom in a commodity asset, underwritten by anticipated demand, which has not ultimately resulted in significant oversupply, often taking years to resolve.

Some recent, notable examples include:

The railroad boom in the United States in the 1870s: The length of railroad tracks expanded more than threefold from 45,000 miles to c.215,000¹ miles, with the number of railroads (including government-sponsored ones) increasing by a factor of 50x². Railroads took nearly a century to recover from the overcapacity and resultant weak pricing power.

The automotive boom of the 1900s-2000s: Approximately 3.3 million cars were sold in the 20 years following the invention of the automobile³. As the car became the new popular means of transportation, the number of car manufacturers ballooned. The Great Depression aided the reset of the ensuing overcapacity with the bankruptcy of numerous car brands; to this day, the only two US car brands that haven't gone bankrupt (yet) are Ford and Tesla, both of which are currently suffering from weak returns and depressed profitability.

The telecom boom of the 1990s: Optimistic demand assumptions about data consumption drove companies to invest billions in broadband, fibre optic cables and spectrum to accommodate the growth of the internet. Oversupplied and overbuilt networks, combined with waves of regulation, rapidly commoditised the service across the developed world; even today, the telecom sector doesn't earn its cost of capital, attracting some of the lowest valuations in the stock market as operators continue to struggle with weak pricing power.

The Chinese real estate boom of the 1990s-2000s: As China developed during the period, a significant portion of its growth was invested to accommodate its urbanisation. No level of leverage or construction seemed sufficient, with the world flooding China's economy with cheap capital. Residential construction became approximately 25% of GDP⁴. It is fair to say that this experiment has now come to an end, with almost all of the large developers filing for bankruptcy. A similar bubble ended, if not more dramatically, in Japan during the 1990s.

"There has never been a supplyside boom in a commodity asset, underwritten by anticipated demand, which has not ultimately resulted in significant oversupply"

¹ Railroads in the Late 19th Century | Rise of Industrial America, 1876-1900 | U.S. History Primary Source Timeline | Classroom Materials at the Library of Congress | Library of Congress

² The Railway Mania of the 1860s and Financial Innovation

³ <u>Automobile Registrations, Passenger Cars, Total for United States</u> (A01108USA258NNBR) | FRED | St. Louis Fed

⁴ China's Property Market: Explaining the Boom and Bust – The Diplomat

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Capital assets are often seen as an **intrinsic competitive advantage**, although this is very case dependent.

Specifically, this is only true if capital assets have long lives, and future replacement costs far exceed the cost to build today.

It's clear to us that the opposite is true for AI data centres, where servers need replacing roughly every five years and semiconductor prices are highly deflationary in nature.

The oil boom (shale and non-shale) of the 2000s-2010s: It was a widely held view that there would never be enough oil to satisfy the insatiable demand from booming growth in emerging markets (notably China). Companies in the sector routinely spent all their operating cash flow and accumulated balance sheet debt to explore, drill and develop more expensive fields to meet demand. A decade later, oversupplied markets devastated oil services companies (which still haven't recovered) and forced oil companies to focus on free cash flow generation, deleveraging and capital returns to shareholders. A similar situation played out in the mining sector over the same period.

The developed world real estate boom of the mid-2000s: In the US, and much of the Western world, a supply boom of homes fuelled by low interest rates and lax credit standards led to a property bubble. This resulted in an oversupply of real estate that persisted for 10-15 years. The suppliers of capital in this case were banks, many of which required government bailouts, emergency equity injections or were liquidated. Most homebuilder stock prices fell by over 80% and didn't recover to previous highs for a decade. The cost of the bailouts remains a component of national debt still contributing to fiscal deficits today.

The electric vehicles of the 2010s-2020s: Driven by technological improvements in batteries and storage, and the rise of Tesla, automakers around the world rushed to develop their own electric vehicles (EVs), spurred on by the push and pull of regulatory encouragement and (uneven) government subsidies. Today we have an oversupply of EVs, weak adoption rates and low-cost Chinese competition. Prices of new and older EVs have yet to find a floor. Latitude's recent note on EVs⁵ explores the topic further.

Renewable energy generation of the 2020s: In a similar vein to EVs, a combination of government legislation and subsidies stimulated a rush by oil companies and specialists to make investments in offshore wind, solar, biodiesel and sustainable aviation fuel. High costs, higher government deficits and less favourable subsidies have seen capex and returns targets slashed, and many of these early investments written down by 80-90%.⁶

A common theme in many of the examples listed above were new technological innovations, which were anticipated to drive booming demand and required capital investments in capacity – "build it and they will come".

We believe that booms driven by fixed assets are inherently reflexive in nature. As valuations rise in the stock market for companies in a hot sector, the market places more value on future growth rather than current returns. This incentivises risk-taking and additional capital capex, making return on invested capital (ROIC) a secondary concern to further

⁵ Latitude Q3 2024 Comment Piece: EVs

⁶ <u>Equinor 2025 Capital Markets Update</u> – Equinor cut its renewables capex 50% and reduced its expected returns from 12-16% to 10%.

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investment; Sundar Pichai (CEO of Google) recently stated in an earnings call that the spending is more defensive than offensive.

"the risk of under-investing is dramatically greater than the risk of over-investing for us here, even in scenarios where if it turns out that we are over-investing"

Sundar Pichai

Further, the success credited to early participants in supply-side investments through higher share prices has a procyclical behavioural effect on incremental investment decisions, well before anticipated real world returns on investment have materialised.

The challenge with significant fixed asset expenditures to drive growth is that they tend to have second and third order effects on the broader economy—effects that a boom in capital-light businesses usually does not create.

While we are certainly not forecasting a recession, we remain mindful that any shortfall in AI utilisation, or potential overcapacity in data centres, could whipsaw several adjacent sectors of the economy. It could also have a material negative impact on the stock market given the concentration of large-cap indices around this theme, a function of cyclically high earnings *and* high valuation multiples.

The latter is worth pausing on; when investors pay very high multiples for stocks, they are implicitly expressing a very high degree of confidence in both future growth *and* the economic returns it will generate. If there is a lesson to be learnt from the historical cases above, it would be caution about extrapolating such projections.

Many of these sectors (oil, construction, railroads, banks) produced market beating returns only when companies in the sector began to deploy capex rationally and excess capital was returned to shareholders instead of being spent on unbridled expansion, often decades after the initial boom.

INVESTMENTS BY BIG TECH IN NEW CAPEX

While AI was a focus for both Meta and Alphabet for some time, its consumer-facing prominence came when Microsoft invested \$10 billion⁸ in the startup OpenAI at the beginning of 2023⁹. This investment was intended to fuel the company's next phase of growth and develop ChatGPT into both a consumer product to improve internet search, and a corporate tool to deliver cost savings. Since then, Big Tech companies have raced to outspend each other annually, with 2025 potentially seeing over \$300 billion in AI annual spend, up over 50% on 2024 and 5x the combined capex bill of the Big Four¹⁰ (five, including OpenAI) in 2019 (Exhibit 1).

Any shortfall in AI utilisation could whipsaw several adjacent sectors of the economy

⁷ Alphabet Second Quarter 2024 Earnings Call

⁸ Microsoft to Invest \$10 Billion in ChatGPT Maker OpenAI (MSFT) - Bloomberg

⁹ Microsoft and OpenAl extend partnership - The Official Microsoft Blog

¹⁰ Amazon, Google, Meta and Microsoft

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Exhibit 1 | The rising capital intensity of Big Tech – capital expenditures have doubled as a proportion of revenues since 2019

CAPEX		2019	2023	2024	2025	Delta
MSFT (*)	-	14,000 -	28,000 -	44,000 -	80,000	5,600
G00G	-	23,548 -	32,248 -	52,345 -	91,903	6,450
AMZN	-	16,860 -	52,000 -	60,000 -	100,000	10,400
META	-	15,625 -	28,000 -	37,500 -	65,000	5,600
Total 4	-	70,033 -	140,248 -	193,845 -	336,903	28,050
Total 4 Incl. Open Al	-	70,033 -	150,248 -	206,345 -	366,903	30,050
% of sales		18.5%			37.2%	

Despite Sam Altman's confident prediction that "AGI" (Artificial General Intelligence) will be achieved in 2025 (though precisely what the means is a moving feat), there are several concerns this level of spending raises:

How will this advancement be monetised? In order to produce the historical returns that Big Tech has delivered—returns that are crucial to maintaining their high valuations—an additional \$300+ billion in revenues would be required from this capex (Exhibit 2). Given that we suspect most of these revenues would come from IT budgets across global companies, this would represent roughly 30% of total software IT spending worldwide¹¹. This calculation excludes capex spent by other tech companies like Oracle, XAI and the Chinese tech giants (more on that later). It's important to note that, after more than a decade, cloud computing still hasn't reached this level of penetration in worldwide IT budgets.

Exhibit 2 | Big Tech requires \$340bn of incremental revenues to generate returns consistent with history

		Comments
Incremental capex spent since 2022 (m USD)	236,903	i
Required return on capital post tax	30.0%	Average big tech returns
Additional net income required by '26E	71,071	
Implied revenues at 20% net income margins	355,355	
IT / enterprise software spend in '24	1,091,000	
% of total spend	32.6%	

Which technology will prevail, if any? We're not even two years into this boom and the market has already alternated between declaring Alphabet and Google Search both losers and winners. More recently, Chinese companies have made technological advances with spending that appears to be significantly lower than their US counterparts. The question then becomes: what happens if the technology ends up being a pure (deflationary) commodity, with the bottlenecks being data for training and potentially chips (whose power is increasing exponentially)?

We are neither technologists nor scientists, so we don't express a strong opinion on this matter. As investors, we form views on the expected returns embedded in equity prices and can say that we strongly doubt

Can Big Tech generate
sufficient incremental
revenues to earn returns
consistent with those implied
by their valuations?

¹¹ IT spending worldwide by segment 2025 | Statista

While peak optimism was

coincident with peak

valuations, Amazon's best

returns were earned after the

competitive landscape in e-

commerce was well

established

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the large-cap stocks making these investments are priced for such an outcome today.

The key point is that, when a technology becomes widely adopted, there's often time for market participants to be patient and determine who the winner will be. It took 15 years in online retail to figure out that Amazon was the market leader; the stock returned 5% p.a. in the decade from 2000-10, even as e-commerce penetration steadily grew from 0-5% (Exhibit 3). The stock returned 30% p.a. in the decade after, once the competitive landscape had been established and Amazon's share of e-commerce tripled (Exhibit 4). This did not require the patient investors to participate in the extreme valuations coincident with the extreme optimism that preceded a lost decade where multiples contracted, even in the face of investors being directionally right about the growth of e-commerce (Exhibit 6).

Apple's stock had a 7x PE ratio just 10 years ago, despite the company being the uncontested leader in the premium smartphone segment. In our opinion, those were the optimal times to buy the stock—not in the middle of the S-curve adoption.

Exhibit 3 | US e-commerce penetration and Amazon market share of e-commerce



Exhibit 4 | Amazon took 15 years to establish a dominant position in US e-commerce, but tripled its share in the decade that followed

Amazon market share of US e-commerce sales (%)

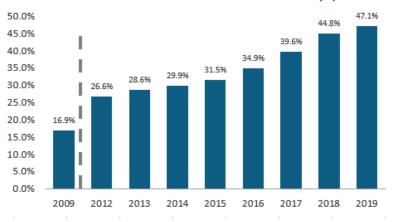
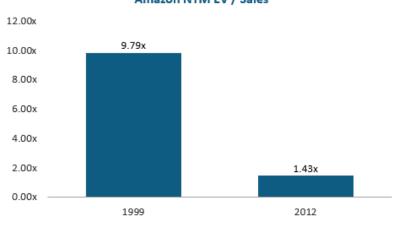


Exhibit 5 | Amazon – high expectations and high valuation meant a decade of lost returns

Amazon NTM EV / Sales



Are valuations sustainable in the face of rising capital intensity? While the market has historically valued Big Tech companies at very high multiples due to their low capital intensity, it would be absurd to describe these businesses as capital-light today, given that their total capex accounts for approximately 37% of revenues (Exhibit 1). For comparison, a capital-intensive company like BP currently spends only 6-7% of its turnover on capital expenditures, with a post-capex free cash flow (FCF) yield of around 14%. For the average Big Tech company, this number is c.1.7%, indicating a very high likelihood that either incremental revenues will materialise quickly, or that capex will be reduced (or both) in the near future (Exhibit 3).

Big Tech valuations reflect historic capital-light business models, despite rapidly increasing capital intensity

Exhibit 6 | Average FCF Yields of big tech companies post capex and stock-based compensation dilution in 2025

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FCF yields (%) at current prices(*)	2025E
GOOG	2.8%
AMZN	2.3%
ORCL	1.5%
MSFT	1.1%
META	0.9%
Average	1.7%
(*) including all capex and subtracting SBC	

There is comfort in company, and in Big Tech data centre capex it seems that everyone is spending big. Except that isn't the case. We believe that growth at **Apple** likely peaked some time ago, so we're not especially interested in the shares at current elevated valuations, however, we do find Apple's decision (once again) to *not* participate in another wave of capex overspending commendable. It highlights where their competitive moat still lies today—namely, in the device and software ecosystem itself. Their calculation is that they can forge partnerships with the best technology providers once it becomes clear which one is the leader.

DATA CENTRE SEMICONDUCTORS – CASHING IN ON THE CHIPS?

While we do follow the **semiconductor industry**, we will not focus on our findings in this piece; semiconductors follow the ebb and flow of big tech capex. We are not inclined to invest in these stocks, as we believe a reduction in Big Tech spending would immediately lead to a reduction in revenues for Al-exposed chip companies - a risk we are not willing to take at current valuations.

Technology risks are also prevalent in the semiconductor industry, where companies that were dominant only a decade ago (like Intel) are now on the brink of bankruptcy, while others (like AMD) have risen to prominence, particularly those at the cutting edge of innovation. Again, this is the nature of investing in high innovation industries where profit pools can rapidly shift from established companies to new ones.

DATA CENTRES – WILL WE CONSUME MORE ELECTRICITY OR NOT?

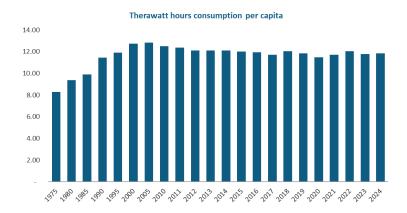
One step further downstream are the industrials that supply data centres. The key question to address here is: **are we at an inflection point in electricity consumption?** This is a particularly difficult question to answer. Despite increases in GDP and the proliferation of computer and internet applications, the past 20 years have seen a decline in electricity consumption per capita. Recent market studies from McKinsey forecast approximately $3\%^{12}$ growth in electricity consumption per capita over the next seven years, driven by both EV adoption and data centre development.

The dominant companies of a decade ago are now on the brink of bankruptcy

¹² Global Energy Perspective 2024 | McKinsey

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Exhibit 7 | There has historically not been growth in electricity consumption per capita (in the past 25y) – are estimates baking in improvements in technology?



	2023	2030	CAGR
MCK impl Power demand	3,973	5,179	3.9%
Per Capita	11.69	14.51	3.1%

Whether this step change in trend growth manifests or not will depend on:

What the future adoption of AI will look like and how widespread it will become. What if AI adoption falls short by 2027? Are we still confident that power demand will increase by 4% annually?

How significant the improvements in technology will be. For example, it appears that new innovations by NVIDIA could make their systems up to 30 times more efficient per query. What if the rate of improvement is such that the required footprint of data centres is smaller than anticipated?

What if the forecasts are correct but utilities fail to ramp up investments quickly enough to deliver the necessary grid connections to support the projected growth? What would happen if power prices were to rise significantly, effecting both the economics for data centre developers and the capital expenditure plans of Big Tech companies?

What if the energy intensity in AI compute differs from current assumptions? As we alluded to earlier, DeepSeek, a Chinese company that few had heard of before January 2025, revealed itself as capable of achieving breakthroughs in model development at seemingly a fraction of the costs required to operate the large language models of their American counterparts. This should give investors pause for thought when projecting forecast ranges for the next five years.

The reality is that the situation is still in flux and the answers to these questions are complex. In investment terms, such uncertainties warrant humility and the recognition that there should be simpler solutions to generating excess returns in the stock market.

Power consumption per capita has not grown in the past 25 years, can we be confident power demand will inflect to deliver trend grow of 4% p.a.?

DATA CENTRES – WHICH COMPONENTS ARE MOST IMPORTANT?

While we don't wish to become preoccupied with technical details in this letter, it's worth noting that data centres are made up of several components. Their connections to the grid, which are on the outside of the centre, are what experts classify as "high voltage" electrical equipment. Inside the walls, you'll find low and medium voltage equipment, as well as cooling machines. The "white space" (above ground) houses the servers, switches and racks, while the underground "grey space" contains busways and transformers.

Exhibit 8 | Illustrative data centre schematic



When considering the industrial component providers, the short-term outlook is reasonably assured owing to full backlogs awaiting execution. In the medium to long term, there are more reasons for caution:

Will the current electrical and HVAC installations still be relevant in five years' time, or will technological advancements require different solutions? Initially it seemed that Power Distribution Unit (PDU) equipment was a viable solution for Legrand, but the favoured technological approach has shifted over the past 12 months so that Busways have been deemed superior and are now being installed in the latest generation of data centres. In a niche with such rapid innovation, how can we be sure that current trends will be durable?

What is the level of recurring revenue associated with these sales? Based on our experience with capital goods companies, we've found that the best time to invest is not when revenues are skewed to original equipment relative to aftermarket sales. If original equipment sales are high and the cycle corrects, revenues can decline dramatically, while the cycle for spare parts or replacements can be extended beyond initial expectations. Several of the Big Tech companies have already extended the depreciation periods for their data centres over the past five years—starting at around five years, each additional year cuts demand by around 20%, all else being equal. This was also the case during the

Global Financial Crisis, when capital goods companies involved in construction (e.g. Assa Abloy) saw their revenues caught in a spending

In a niche with such rapid innovation, how can we be sure that current trends will be durable?

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bubble correction and proved to be less defensive than originally anticipated.

We do not have confidence in the estimates and believe the sensitivity of revenues to these assumptions creates a wide range of potential outcomes.

It's also entirely possible that, in a scenario of growing capex for Big Tech companies, spending on data centres could decline as resources are reallocated towards improving efficiency in whichever technology domain these opportunities arise from.

In summary, the industrials exposed to data centre spending are at multiyear highs in terms of valuation and at peak backlog/earnings, leaving little room for long-term disappointment.

CONCLUSION

We have explored through historic examples, the perils of investing in high innovation industries – particularly where expectations of pending demand are used to underwrite large, fixed cost capital investments. Al is the nascent high innovation industry of today, bringing with it a bow wave of data centre capital investment which has caused Big Tech capex to quintuple since 2019.

While we admire many of the companies exposed to this theme, they present a risk which we do not need to expose our investors to, in order to generate attractive returns. The stock market offers plenty of opportunities today for active managers to generate returns in a more knowable way. Students of history have many examples where seemingly inexorable demand hits the proverbial air pocket, taking years to be resolved. We prefer situations where valuation, earnings growth and capital returns (the three key drivers of long-term total returns) are aligned in favour of shareholders. We will continue to focus on these idiosyncratic opportunities, where our edge and differentiation are more likely to lead to better outcomes, rather than being drawn in to risky bets resting on unanswered questions about the future shape of demand for new technologies.

APPENDIX: ALPHABET – A CONTRADICTION TO THESE PRINCIPLES?

Some of our investors might wonder why we have owned Alphabet in the funds since inception. There are several reasons why we believe Alphabet is better positioned than most companies in the industry supply chain and other Big Tech firms, but we must caveat this by saying: we do not believe the company's current level of capex will produce adequate returns on invested capital and would not be surprised if this spending is cut within the next 18-24 months.

In our opinion, Alphabet has:

We prefer situations where valuation, earnings growth and capital returns (the three key drivers of long-term total returns) are aligned in favour of shareholders

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The best combination of in-house computing power, data and hardware. Large supercomputers, a top 3 cloud division and its own hardware and TPU chip business, as well as data on which to train its AI (YouTube and Google Search). In fact, no other company possesses these components at such a scale. Unlike other Big Tech companies that are at higher valuations, Alphabet also has full control over its technologies.

A highly diversified and underperforming business franchise. Margins in YouTube (ads and subscriptions), Search and Cloud are too low and have been over-costed for years. This is now being reengineered to accommodate new AI investments. This is clearly reflected in the operating margin expansion of the last quarter, which increased by c.500bps, despite the AI investments. Alongside Meta, Alphabet has the most significant cost opportunity; the company has also significantly under-monetized applications used by billions of consumers, including Maps and Gmail.

A new business line showing promising signs of dominance: Waymo. The autonomous taxi-hailing service Alphabet launched over a decade ago is now a revenue-generating engine and seems technologically a decade ahead of the competition. While we don't know how large the opportunity will be, if this turns out to be the next trillion-dollar market capitalization opportunity, Alphabet is perfectly positioned to capture it.

The lowest valuation among all companies in the sector. At 20x cashadjusted price-to-earnings ratio, and with mid-teens growth, we believe the company is not priced for Al success. We also believe that Alphabet shares would be a major beneficiary of a capex reduction plan, should Al fail to become prevalent in the next 2-3 years. The market would likely respond positively to improved cash conversion as the earnings and free-cash-flow yield converge. Finally, we see room for multiple expansion as perceived risks to Google Search diminish.

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