

CIO autumn update:

An AI inflection point



Foreword

Welcome to the revolution

AI is one of several structural changes underway, to which we must adapt on behalf of our clients – and future generations.

As investors have remained transfixed this year on the outlook for global growth and inflation, we have become increasingly focused on a theme that could reshape not just the investment landscape but almost every facet of our lives.

The explosive launch of ChatGPT in late 2022 highlighted the immense potential of generative artificial intelligence (AI). This is a type of AI that processes data to create new content – from text, to code, to molecular design and even art.

We have been well aware of AI for years. But the ability to generate material indistinguishable from that created by people, at almost unimaginably greater speed, suggests we have reached an inflection point. This places us firmly on the cusp of a new age of innovation.

And so, amid the relentless parsing of economic data and central bank interventions, markets have displayed a growing mania for the technology, without which year-to-date returns on the S&P 500 index, for example, would look decidedly less rosy.

Profound challenges

There are already many good papers in existence that outline how AI works and discuss its various applications. This document builds on that work, including our own analysis.¹ Rather than offering another explanation, over the coming pages teams from across LGIM assess the key implications of the technology for our clients. Our key takeaways include:

- Some companies are likely to find their business models profoundly challenged, just as others gain from AI-driven efficiencies
- Equity indices are more likely beneficiaries than credit markets
- The cycle of more data leading to more sophisticated models means the rate of change should continue to surprise
- The information and computing power required are likely to boost the prospects for data centres and renewable electricity generation

We also touch on the macroeconomic implications, arguing there's a strong case for tempering enthusiasm over the boost to growth, given the countervailing force of ageing demographics.

And because AI is as likely to disrupt our own industry of asset management as any other, we lift the veil on research our traders have undertaken to assess how the technology could deliver long-term benefits for clients, by slashing the time spent on 'low-touch' trades.

Development and deployment

Just as this new industrial revolution based around human-AI collaboration is ushering in vast opportunities, it also presents manifold risks. These range from the economic, given the potential scale of disruption, to the political, given the power now available to those who wish to sway elections through disinformation.

We are particularly attuned to these risks, as well as others that arise from questions of transparency, accountability and bias, in light of our purpose: to create a better future through responsible investing. So in this



The new industrial revolution presents vast opportunities and manifold risks.

report, we highlight the approach taken by LGIM's Investment Stewardship team to engaging with companies on the safe development and deployment of AI.

More broadly, the salience of AI as a trend underscores the utility of taking a thematic approach to markets in general, given that this is but one of several structural changes underway – to which we will have to adapt on behalf of our clients and future generations.



Sonja Laud
Chief Investment Officer

1. See [Artificial intelligence, investing and you, Which industries will AI upend? We asked ChatGPT, How is AI changing cyber security?](#) and our [Q1 Active Insights](#).

Asset Allocation

Probing the market impact of productivity gains

We survey what AI might mean for GDP growth, corporate margins, equities and fixed income.

How excited should we be about the AI revolution? Some analysts suggest it could boost global growth by around 1% per year through to 2030.² This sounds great, with two caveats.

One, we're running to stand still with ageing demographics hurting trend growth.³

Two, are we double counting? We had mainframes, then PCs, then the internet then mobile internet. AI refutes Robert Gordon's [dire warnings of the peak of technology](#), but it's hard to pinpoint how much better it will be than everyone's implicit extrapolation of previous innovations.

In other words, technologies like AI have always been needed to fulfil analysts' long-term growth projections.

Getting with the program

Of course, it's not just technological development that matters, but the rate of adoption. There's good news here in that recent technologies have become mainstream



faster than previous innovations did, as illustrated in the chart. That augurs well for the future.

We believe the benefits of AI are most likely to show up in corporate earnings before they appear in GDP data.

First, statisticians notoriously struggle with new technologies, particularly new products with no comparison. For example, the introduction of Netflix* was not counted as a lower cost/higher volume for movie rentals.⁴

Second, AI is likely to reduce the cost of existing services such as solicitor enquiries, medical consultations or drive-thru orders. Prior research on the corporate response to pandemic-era shortages suggests we have oligopolies rather than perfect competition.⁵ We would initially expect higher margins, and then, eventually, lower prices as new entrants compete those margins away.

2. Sources: <https://www.goldmansachs.com/intelligence/pages/generative-ai-could-raise-global-gdp-by-7-percent.html>; <https://www.mckinsey.com/~media/McKinsey/Featured%20Insights/Artificial%20Intelligence/Notes%20from%20the%20frontier%20Modeling%20the%20impact%20of%20AI%20on%20the%20world%20economy/MGI-Notes-from-the-AI-frontier-Modeling-the-impact-of-AI-on-the-world-economy-September-2018.ashx>

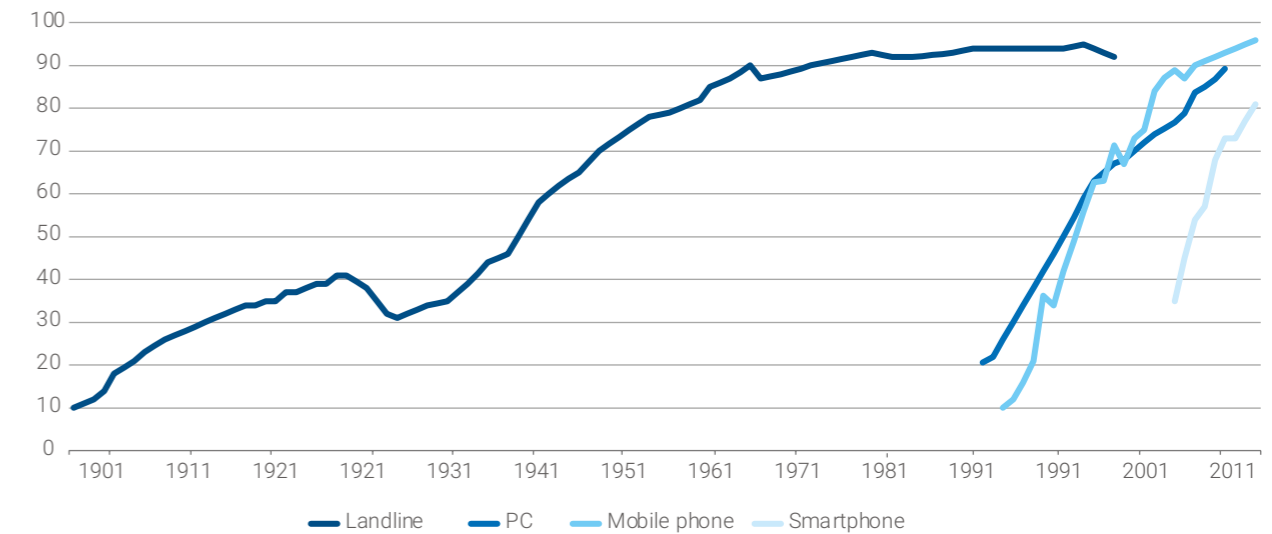
3. Sources: <https://www.imf.org/external/pubs/ft/fandd/2017/03/lee.htm>; https://www.lgim.com/landg-assets/lgim/_document-library/insights/long-term-thinking/long-term-thinking-demographic-drivers-june-17.pdf

4. Source: https://www.actuarialpost.co.uk/downloads/cat_1/LGIM%20Fundamentals%20booklet%20-%20Bean%20counter.pdf

5. Source: https://scholarworks.umass.edu/econ_workingpaper/343/; Source: https://scholarworks.umass.edu/econ_workingpaper/343/

*For illustrative purposes only. Reference to this and any other security is on a historical basis and does not mean that the security is currently held or will be held within an LGIM portfolio. Such references do not constitute a recommendation to buy or sell any security.

Adoption of new technology is accelerating



Source: Visual Capitalist data, accessed on 28 September 2023

Could AI delay the recession?

Perhaps, but it's possible a 'creative destruction' recession and job losses are needed to harness its benefits.

Reluctant technology adopters might only make the switch when it's forced upon them by legacy suppliers going bust, moving us to the steep part of the S-curve of innovation.

The boost to growth might come from displacing knowledge-based workers into other industries, just as the tractor helped displace workers from fields to factories.

Markets could look through any such pain as 'proof of concept' productivity enhancements become apparent. It all depends on how many winners and losers we have: will every company adopt AI equally, or will some lag behind and be forced to close? (For more on this theme, see Madeleine and James's piece.)

What might AI mean for real rates?

In general, stronger productivity growth should boost equity markets and real interest rates. In a classic production function, stronger productivity implies higher returns accruing to both labour and capital. The latter is good news for equity returns, where the ability to produce 'more with less' implies consistently higher margins.

However, that impact is likely to be highly asymmetric across the corporate sector. Just as we worry about 'stranded assets' from the climate transition, it's sensible to also worry about large debt-issuing losers from the AI revolution. We believe equity indices, with their constantly evolving constituents, are more likely beneficiaries than credit markets.

The impact on the rates market is less clear. Productivity improvements could bear down on inflation over time, putting downward pressure on yields. Or higher growth could push up the market's estimate of neutral real interest rates, having the opposite effect.

What we can say is that the benefits are most likely to accrue to those parts of the world whose regulatory environment is most amenable to AI. That implies yet another reason why King Dollar is unlikely to be knocked off its throne anytime soon.



James Carrick
Global Economist



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Active Strategies

March of the machines

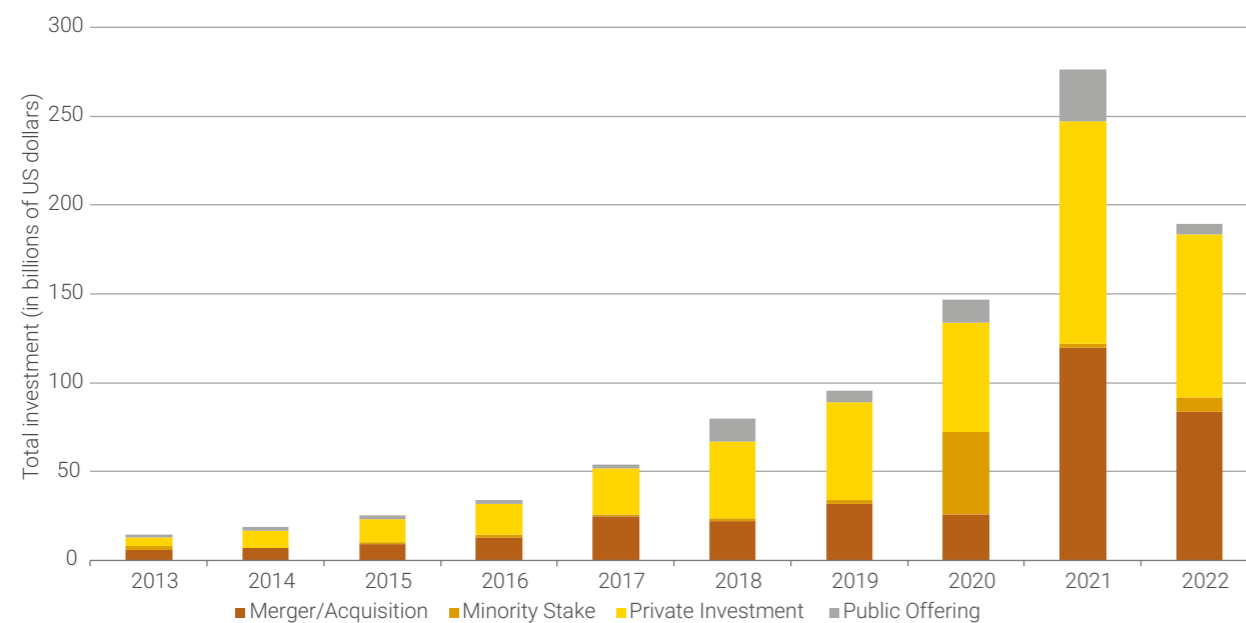
While some companies will benefit from AI-driven efficiencies, others will find their business models profoundly challenged.



Many companies are making considerable investments in AI – across sectors, spending on the technology increased 35% annually between 2018 and 2021.⁶ But will the companies that have invested the most be the greatest beneficiaries of the AI frenzy, or are they in fact those with the most to lose?

Companies across industries are exploring new ways to benefit from the AI revolution, as they seek to optimise their cost bases. In healthcare, AI heralds the prospect of de-risking the notoriously expensive and time-consuming business of drug discovery. The combined pipeline of 20 AI-native drug discovery companies has been found to have reached around 50%⁷ of the scale of the equivalent pipeline for 20 of the largest pharmaceutical companies, suggesting some degree of increased efficiency.

Global corporate investment in AI by investment activity



Source: NetBase Quid, 2022; 2023 AI Index Report

6. [Stanford University's Institute for Human-Centered AI, 2023.](#)
 7. AI in small-molecule drug discovery: a coming wave? Madura K.P. Jayatunga, Wen Xie, Ludwig Ruder, Ulrik Schulze, Christopher Meier.
 8. [Mercedes-Benz pioneers 'Digital First' production for next-generation MMA platform | Mercedes-Benz Group > Innovation > Digitalisation > Industry 4.0](#)
 9. Titan Cement international presentation as at August 2023.
 10. [BT to cut 55,000 jobs with up to a fifth replaced by AI - BBC News](#)

Paint shops, plants and M&A

Even in capital-intensive industries, we believe AI has the potential to deliver tangible cost benefits. At its plant in Rastatt, Germany, carmaker Mercedes-Benz* has used an AI system to increase efficiency in its paint shop. Compared with a more conventional control system, the AI-led approach has resulted in energy savings of 20%.⁸ Titan Cement has deployed AI-based, real-time optimisation software in eight of its plants, resulting in up to 10-15% improved throughput and a 5%-10% reduction in energy consumption.⁹

In a post-pandemic world, characterised by labour shortages, AI offers companies the prospect of reduced labour costs and increased efficiency. In May of this year, telecommunications giant BT announced a plan to cut 55,000 jobs by the end of the decade, with 10,000 being attributed, by the CEO, to roles that could be replaced by new technology including AI¹⁰ (although we are a little sceptical of this claim).

But while AI promises much in the way of cost savings and optimisation, we believe it also poses risks to companies with established business models, where barriers to entry may be lowered by a shift to a more AI-powered ecosystem. In May of this year, shares in education-technology company Chegg Inc, fell almost 50% after the company warned that ChatGPT threatened the growth of its homework-help services.

Moreover, at this early stage, it's far from clear which companies will dominate the eventual AI landscape, meaning that some incumbent technology businesses

may be left behind. For example, large language models (like ChatGPT) with their ability to generate high-quality text for search queries, web content, or advertisements could eventually disrupt the traditional business model of Alphabet (Google).

As new challenges surface, and new AI-powered enterprises emerge, we may also see an increase in M&A. In one of several AI-related deals announced this year, last month, tech company Cisco announced that it would be acquiring software firm Splunk for US\$28bn, in a deal aimed at beefing up its offering in AI cybersecurity.

Potential effects on equities and credit

The implications of this AI revolution may differ between equity and credit markets. Equity markets are more weighted and influenced by large US technology companies, as well as more service-focused businesses, with an asset base comprising a higher proportion of intangible assets. Credit indices, on the other hand, tend to include a greater proportion of companies that are either more established, or more regulated – suggesting a greater degree of risk and also reward in the equity market in the short term, with the impact taking longer to filter through to bondholders.



Madeleine King
Head of Research and Engagement



James Odemuyiwa
Senior Credit Analyst, Active Fixed Income

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Investment Stewardship

How we'll press for safe AI

We're engaging with companies on our baseline expectations on what is likely to prove a generation-defining issue.

You don't need to have seen *The Terminator* to recognise that in addition to having the potential to alter dramatically the way we live, work and play, AI also raises the prospect of cataclysmic risks for humanity.

Within LGIM's Investment Stewardship team, we are optimists. In our view, AI should drive long-term innovation, productivity and value creation, as outlined elsewhere in this document. To secure these gains, we believe investors must engage with companies and policymakers on baseline expectations for governance, risk management and transparency.

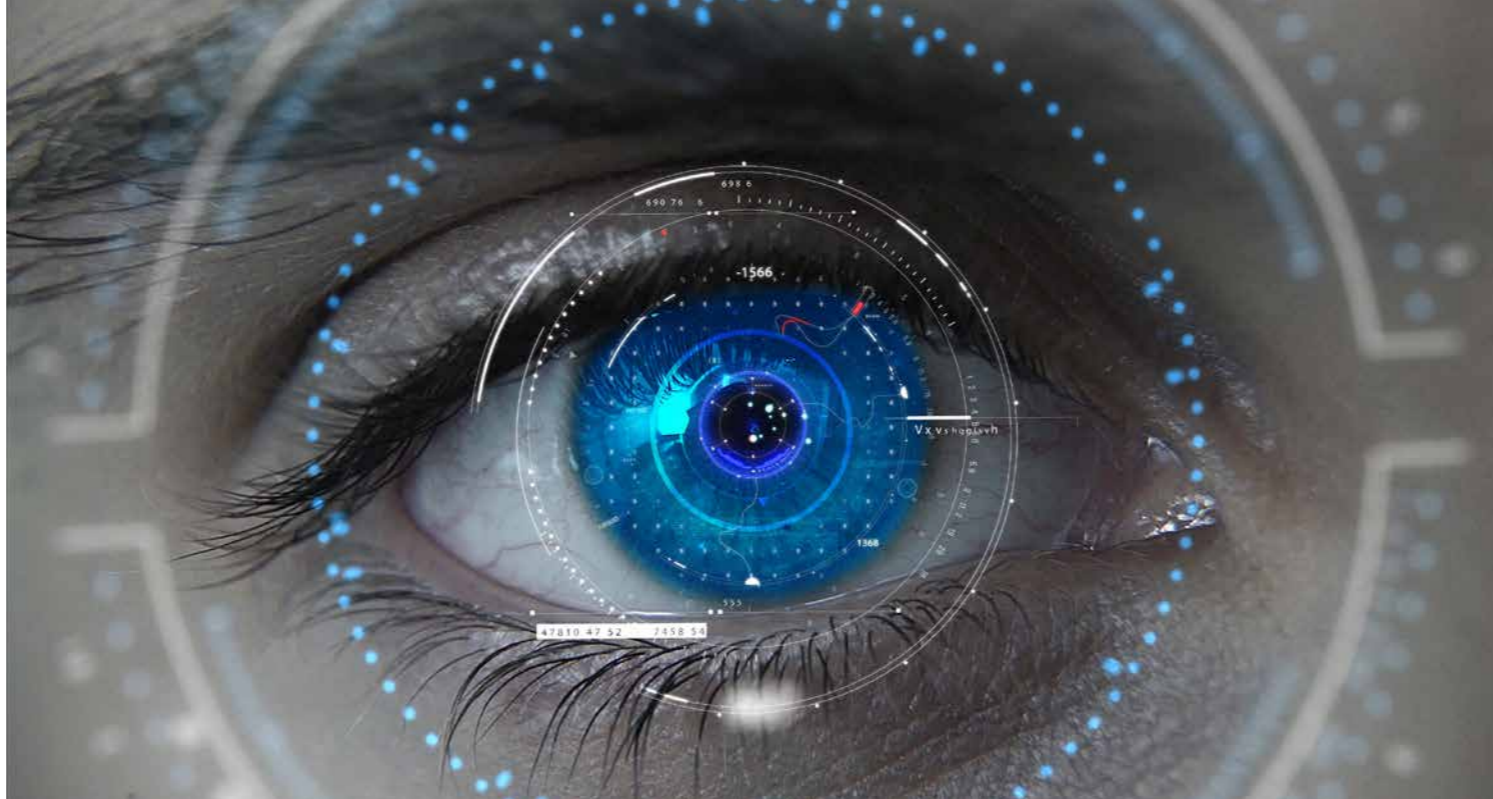
Nascent regulations

To name but a few, AI entails risks around data privacy and security; regulatory compliance; operational and critical infrastructure; workforce transitions; intellectual property; reputations; and trust in the information environment. There are also a host of ethical concerns as to its application.

Governments around the globe, as a result, are considering regulations aimed at facilitating the safe development and deployment of AI.¹¹

As AI progresses, policymakers, data providers, corporate advisers, NGOs and civil society will all have important roles to play. We anticipate a cycle of definition, measurement, assessment and risk management.

11. UK <https://www.gov.uk/government/publications/ai-regulation-a-pro-innovation-approach/white-paper>
 US - <https://www.whitehouse.gov/briefing-room/statements-releases/2023/09/12/fact-sheet-biden-harris-administration-secures-voluntary-commitments-from-eight-additional-artificial-intelligence-companies-to-manage-the-risks-posed-by-ai/>
 EU - <https://digital-strategy.ec.europa.eu/en/policies/european-approach-artificial-intelligence>
 Global - <https://www.reuters.com/world/g7-calls-developing-global-technical-standards-ai-2023-05-20/>

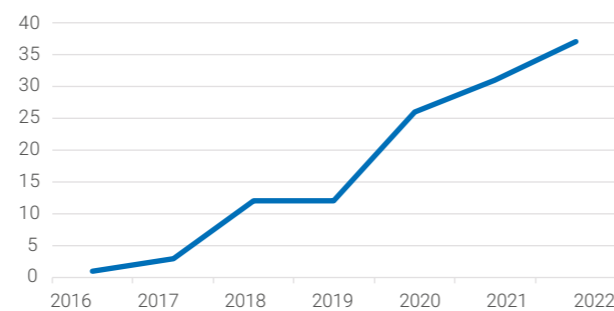


Where practical, we will take part in public consultations. We will also encourage the companies in which we invest on behalf of our clients to be transparent and to participate in good faith. And we intend to play a key role in helping data providers and other stakeholders acquire comprehensive and actionable data.

Our expectations

AI and the broader trend toward digitisation make up one of our six priority stewardship themes. With all such

Number of AI-related bills passed into law in 127 select countries



Source: 2023 AI Index Report

themes, we focus our influence on raising minimum standards through targeted action across market leverage points.

To this end, we are tiering our approach between companies that make AI systems and those that use the technology. The former group will have more AI-related liabilities, so will receive more of our scrutiny.

We outline below our current baseline expectations of companies, to which we suggest they dedicate resources in proportion to their risk exposures and business models.

Governance

- Name a board member or committee accountable for AI risk oversight and strategy
- Provide board education of business-specific AI risks at least annually. Consider utilising external expert groups to keep up to date

Risk management

- Conduct product safety risk assessments across the business cycle, including on human rights
 - This should include upstream and downstream considerations; for example, over data and clients
 - Companies exposed to high-risk AI systems should consider third-party assessments to supplement internal assessments

- Ensure AI systems are explainable, meaning the board and relevant business functions can describe inputs, processes and outputs
 - Establishing baseline understanding is critical for ongoing risk assessment and broader trust building
- Identify high-risk AI systems or inputs and describe current or future mitigation efforts
- Build trust by soliciting input on high-risk AI systems from third-party groups and civil society
- Provide reasonable paths to give feedback or seek remediation if AI systems cause harm

Transparency

- Disclose governance policies and risk processes on a regular basis
- Make it clear to customers or civil society when AI systems are used in services

These expectations will evolve over time. Initially, it will be difficult for us to assess if companies are meeting them, as disclosure is limited and data providers are still working through the relevant metrics. So, we hope to spur action by being clear and public about what we are seeking.

Should companies fail to meet our expectations, we will escalate our engagement on behalf of our clients, on what may well prove to be a generation-defining issue.



John Hoepfner
 Head of US Stewardship and Sustainable Investments

ETFs

Identifying upstream enablers in the AI revolution

The cycle of more data leading to more sophisticated AI models means we expect the rate of change to continue to take many by surprise.

Data is the fuel that fires the knowledge economy. This simple axiom explains AI's potential to increase productivity across virtually all industries, with a commensurately vast impact on overall productivity.

Goldman Sachs estimates generative AI could increase in global GDP by 7% over the coming decade,¹² while PwC believes AI could contribute up to \$15.7 trillion to the world economy in 2030.¹³

In the here and now, a 2023 academic paper analysed the impact of generative AI on more than 5,000 real-life customer support agents. It found a 14% increase in productivity as measured by issues resolved per hour, and improved customer satisfaction levels.¹⁴

For investors, those companies that are upstream enablers of AI are understandably the focus of attention. How can we conceptually frame the AI revolution and identify them?



A symbiotic relationship

As AI has become increasingly sophisticated and datasets have grown, these two fields have become symbiotic.

Just as humans draw on a vast range of experiences to formulate responses, AI systems need a vast training ground to be able to learn. These training grounds, meanwhile, are so large that they are only navigable with AI.

The symbiotic relationship between data and AI is increasingly gaining recognition;¹⁵ we believe it could provide a useful framework to identify the most important segments in this field.

Compute: the power behind AI

The computational intensity of today's AI systems – according to some sources, ChatGPT-4 has 1.7 trillion parameters¹⁶ – means the AI story is unavoidably a hardware story. Today, the task of processing this data falls to graphics processing units and Google's* tensor processing units, both of which are optimised for machine learning applications.

Looking further ahead, the level of computing power needed to train AI systems is rising exponentially,¹⁷ meaning we will run up against the limits of today's computers.

This problem has spurred increased investment¹⁸ into [quantum computers](#), whose fundamentally different architecture could herald a new era for AI computation.



The level of computing power needed to train AI systems is rising exponentially, meaning we will run up against the limits of today's computers.

12. Source: <https://www.goldmansachs.com/intelligence/pages/generative-ai-could-raise-global-gdp-by-7-percent.html>

13. Source: <https://www.pwc.com/gx/en/issues/data-and-analytics/publications/artificial-intelligence-study.html>

14. Source: https://www.nber.org/system/files/working_papers/w31161/w31161.pdf

15. See, for example, the EU's comments on the importance of open data for regional AI development: <https://data.europa.eu/en/publications/datastories/open-data-and-ai-symbiotic-relationship-progress>

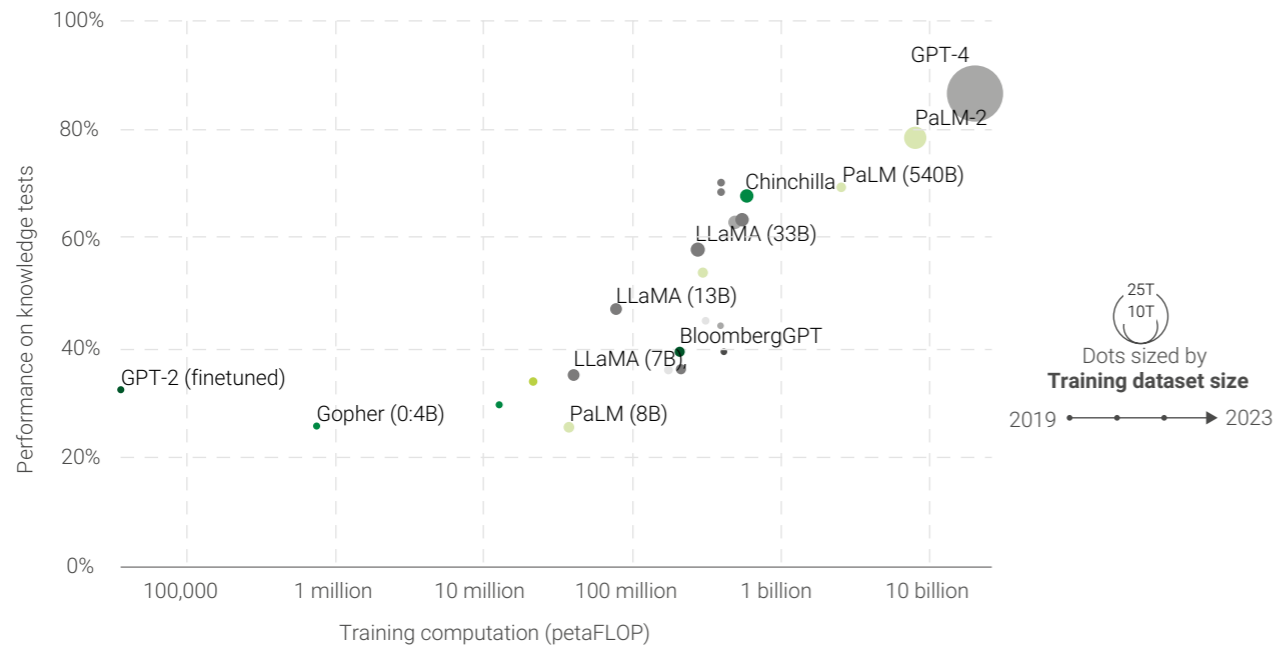
16. Source: <https://medium.com/@mlubbad/the-ultimate-guide-to-gpt-4-parameters-everything-you-need-to-know-about-nlps-game-changer-109b8767855a#354b>

17. Source: <https://montreal.ethics.ai/compute-trends-across-three-eras-of-machine-learning/>

18. Sources: <https://www.zdnet.com/article/us-taps-startup-qsecure-for-post-quantum-cybersecurity/>; <https://ionq.com/news/september-30-2022-ionq-afri>; <https://techmonitor.ai/technology/emerging-technology/vodafone-quantum-cryptography-ibm>

Artificial intelligence: Performance on knowledge tests vs. training computation

Performance on knowledge tests is measured with the MMLU benchmark¹. Training computation is measured in total petaFLOP, which is 10¹⁵ floating-point operations?



Source: Epoch (2023)

OurWorldInData.org/artificial-intelligence • CC BY

Note: The values for training computation and dataset size are estimates and come with some uncertainty, especially for models for which only minimal information has been disclosed, such as GPT-4.

1. MMLU benchmark: The Massive Multitask Language Understanding (MMLU) benchmark mimics a multiple-choice knowledge quiz designed to gauge how proficiently AI systems can comprehend various topics like history, science, or psychology. It has 57 different sections, each one looking at a particular subject. The MMLU test has 15,908 questions in total, which are split up into smaller sets. There are at least 100 questions about each subject. The questions in the test come from many places, like practice tests for big exams or questions from university courses. The difficulty of the questions varies, some are as easy as elementary school level, while others are as hard as what professionals in a field might know. The scores achieved by humans on this test are largely dependent on their level of expertise in the subject matter. Individuals who are not specialists in a given area typically achieve a correctness rate of around 34.5%. However, those with a deep understanding and proficiency in their field, such as doctors sitting for a medical examination, can attain a high score of up to 89.8% on the test.

2. Floating-point operation: A floating-point operation (FLOP) is a type of computer operation. One FLOP is equivalent to one addition, subtraction, multiplication, or division of two decimal numbers.

Big data: separating signal from noise

Big data refers to datasets that cannot be captured, curated or processed using conventional computational approaches in a tolerable timeframe.¹⁹

The challenges posed by big data are best encapsulated by the 'three Vs':

- 1. Volume:** The sheer quantity of data creation creates issues around storage
- 2. Velocity:** The rate at which new information is created is increasing rapidly
- 3. Variety:** Data is being created in an increasing range of formats

19. Source: <http://eprints.staffs.ac.uk/3551/1/Towards%20Differentiating%20Business%20Intelligence%20Big%20Data%20Data%20Analytics%20and%20Knowledge%20Discovery.docx>

Exponential rate of change

The self-perpetuating cycle of more data leading to more sophisticated AI models that can make better use of data means we expect the rate of change to take many by surprise.

As the volume, velocity and variety of data grows year on year, its potential utility continues to increase.

Companies that can address these challenges – as well as the additional vectors of veracity and value – will, in our view, play an essential part in the evolution of big data and AI.

AI subsectors

Enablers and developers of AI systems and capabilities, including companies at the forefront of the AI ecosystem



Big data/analytics: Companies providing solutions to the growing scale and scope of data



Cloud providers: Public and private clouds are the solution to storing the vast amount of data needed for AI development



Semiconductors: A new generation of chip architectures targets the highly parallel processing needed for machine learning applications



Network and security: As the value of data continues to increase, sophisticated solutions are needed to protect it from falling into the hands of cybercriminals



Cognitive computing: Computing platforms that replicate some of the functionality of the human mind, encompassing machine learning, natural language processing and narrative generation



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Trading

Can AI save time and cut costs?

With a significant amount of time still spent on 'low-touch' trades, we're looking at whether machine learning could potentially deliver long-term benefits for clients.

When anyone not directly involved in finance considers an investment trading floor, cinematic images of traders waving pieces of paper and running around furiously may come to mind.

Today's reality is rather different: physical trading has been replaced by [computer-based trading](#), which is faster, cheaper and more efficient. However, that's not to say there are no further gains from automation to be had. In fact, we're currently investigating the potential benefits of machine learning, a type of AI focused on the use of data and algorithms that imitates the way humans learn.

Although most trades are now communicated to counterparties electronically, given that they are routed using financial information exchange protocols, we still divide trades broadly into two clear categories:



'Low-touch' trades, a portion of which can be fully automated



'High-touch' trades that require traders' time, skills and attention

Four goals

It's in the organising and executing of low-touch trades where we see the most potential for AI to deliver time and cost efficiencies. In this vein, our trading research team has established four clear, underlying goals, which are to see whether a machine-learning module (MLM) could:

1. Accurately predict whether a trade will be high- or low-touch prior to trader involvement, to reduce the time spend on sorting trades
2. Provide execution channel suggestions, adapting dynamically to market conditions
3. Use model predictions to identify 'hot spots' where we expect a trade to be low-touch, but it is currently executed as high-touch (findings can be used to challenge and align strategy across the trading desk)
4. Investigate the potential to automate with smart execution routing strategies

In short, the aim of our research is to deliver an MLM that can correctly classify the execution channel of each order, thereby allowing a greater proportion of traders' time to focus on executing high-touch trades.



The days of time-intensive involvement in the sorting and execution of trades could soon be banished to history.

Model on London trading desks

		Predicted		
		Low touch	High touch	
Actual	Low touch	24,742 90.68% (True negative)	1,891 6.93% (False negative)	TN Rate: 92.9%
	High touch	37 0.14% (False negative)	614 0.14% (True negative)	TP Rate: 94.3%

Source: LGIM, as at September 2023. Assumptions, opinions and estimates are provided for illustrative purposes only. There is no guarantee that any forecasts made will come to pass.

Early results from our initial model testing have been promising. We tested our model on a significant subset of 2022 trading desk data and found that it predicted the execution channel of trades with 93% accuracy (results shown in the graphic opposite). In particular, the model was trained to minimise prediction errors for high-touch trades (0.14%).

Our research into using AI for trading is still in its early stages, with a lot more testing both in London and across our trading desks globally required before a MLM could be fully deployed. But if the early signs are anything to go by, those days of time-intensive involvement in the sorting and execution of trades could soon be banished to history.

Selected trading systems providers have understood this trend and started to offer some integration between their platforms and trading desks' in-house MLMs. This way, traders and clients have the potential to benefit from the best of both worlds: the convenience and reliability of the platforms, and the flexibility and innovation of their own AI capability.



Ed Wicks
Global Head of Trading



Sami Ragab
Head of Trading Research



Real assets

AI in the real world

The data volumes and computing power required for AI are likely to boost the prospects for data centres and renewable electricity generation.

Infrastructure and real estate can generate long-term, sometimes counter-cyclical income streams when there are structural imbalances in supply and demand. We believe the widespread adoption of AI will trigger such a shift in demand.

This is likely to create equity and debt investment opportunities, alongside potential operational efficiencies in the management of existing assets. While some of the longer-term consequences of AI adoption are uncertain, from a Real Assets perspective there are three outcomes in which we have high conviction:

1. A rapid increase in requirements for data processing and storage facilities
2. Substantial additions and upgrades to digital infrastructure networks
3. Increased electricity generation, storage and distribution requirements

Data centres and renewable energy

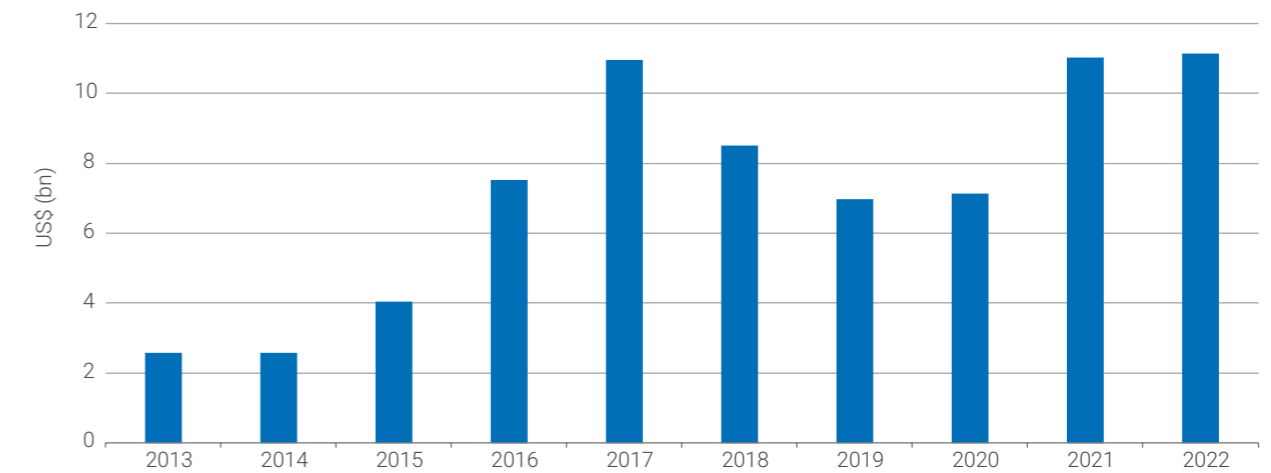
We expect a material positive impact on the investment prospects for data centres²⁰ and renewable electricity generation. The computing power and data volumes required for AI is significantly greater than for other digital tasks.

AI applications typically use around 30kW of power per rack,²¹ according to Knight Frank, whereas more traditional data centre racks need 8-10 kW.²² This thirst for greater computing power nets out to greater physical space requirements: Green Street reported record-breaking demand for data centre space in the second quarter of this year.

We anticipate that it will be challenging for supply to keep pace with this growing demand. Power constraints are already restricting data centre development in Frankfurt, while increased planning hurdles are likely to emerge as local authorities seek to understand these large sites with comparatively low employment density. Increased space demands combined with restrictions around new supply are likely to create favourable supply and demand dynamics, supporting rental growth.

Data centres do have negative environmental externalities, with their networks estimated to account for 1.5% of global electricity use in 2022,²³ despite the sector remaining in its infancy. The International Energy Agency highlights the materiality of the potential future electricity requirements of the sector, noting that data centres accounted for 18% of Ireland's electricity consumption in 2022, with the potential to increase to 28% by 2031.

Global Data Centre Annual Transaction Volumes



Source: JLL, Global Data Centres Outlook, 2023

To support the rollout of AI without undermining the transition to net-zero carbon emissions, data centres will likely require further efficiency improvements alongside increased renewable energy generation. Modern data centres have already made substantial improvements in energy efficiency, and we expect the sector to continue to innovate to contain the growth in energy demands.

The growth in data usage and storage, turbocharged by generative AI, represents a tailwind in support of further investment to upgrade digital and renewable energy infrastructure networks. The potentially huge sums involved could, in turn, lead to lending opportunities within private credit.

High-quality, human environments

Perhaps counter-intuitively, more automation of analytical and clerical processes through AI may, in our view, increase the value associated with creativity, idea generation and human interaction. While there might be some negative implications for overall office demand, we think AI could increase the focus on high-quality spaces, be it best-in-class offices or leisure and hospitality environments.

We note that leisure has grown as a proportion of consumer spending over the past decade,²⁴ despite a concurrent rapid growth in digital connectivity and usage, reflecting the continued value of social spaces within a more digital world.

All this said, we should not underestimate the risks associated with AI – notably around data security, the potential displacement of workforces and the environmental costs of increased power requirements not being met by equivalent increases in clean energy generation. However, we see AI as a material trend with upside potential for productivity and growth, creating new investment opportunities within the real assets universe.



Matthew Soffair
Senior Research Manager, LGIM
Real Assets

20. Data centres are facilities designed to house and operate critical computing infrastructure that organisations use to assemble, process and store large amounts of data. AI use requires different cooling technology to 'normal' data storage and there are therefore building specification implications.

21. A data centre rack is a physical steel and electronic framework that houses data servers, networking devices, cables and other computing equipment

22. <https://www.knightfrank.com/research/article/2023-09-13-real-estate-and-artificial-intelligence-clusters>

23. IEA, July 2023

24. [For the fun of it: The evolution of leisure spending | Visa](#)

Contact us

For further information about LGIM, please visit lgim.com or contact your usual LGIM representative



Key risks

The value of an investment and any income taken from it is not guaranteed and can go down as well as up, you may not get back the amount you originally invested.

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