Monthly Commentary
BMO Global Innovators Fund

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Is AI a Trick or Treat?

While there are many positive developments to discuss around AI, there are also challenges that need to be addressed. In this monthly, we discuss the spooky obstacles that could impede AI application development.

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AI Applications can Generate Spooky Content

Generative AI technology, while revolutionary in its ability to produce creative content, has sparked significant concerns primarily centered around the issue of hallucinations and the necessity for robust content guardrails.

Hallucinations refer to instances where AI systems generate content that is factually incorrect, nonsensical, or misleading, potentially spreading misinformation unwittingly. This issue is particularly concerning when generative AI is used in applications such as news generation, healthcare, or legal advice, where accuracy is paramount.

Guardrails counter hallucinations by integrating advanced validation checks, context understanding, and ethical constraints to ensure the AI-generated content aligns with factual correctness and societal values. Developing robust mechanisms to minimize hallucinations while enhancing transparency and accountability remains a critical challenge for AI developers and stakeholders. Unfortunately, this is a nascent area of development and while we are confident that the industry will solve these problems using robust Retrieval-Augmented Generation (RAG) software, these issues will slow down the development and stakeholder acceptance of AI applications.

Security Risks – Microsoft Recalls its "Recall" Feature

Generative AI can introduces new security risks that are very difficult to assess and even the most sophisticated companies with advanced AI programming capabilities can make mistakes.

For example, Microsoft was set to launch a new AI-powered feature called Recall[1], which would take regular screenshots of all activity on your PC as part of its new Copilot Plus PCs.   It was intended to enhance user experience with a searchable timeline of activities stored locally.   Cybersecurity experts however warned of significant security vulnerabilities. Kevin Beaumont, a cybersecurity expert, discovered that Recall stores data in an SQLite database in plain text, potentially exposing it to malware attacks and unauthorized access. Despite Microsoft's assurances of security and encryption, Beaumont demonstrated that the data could be accessed without administrator privileges.

Critics including privacy advocates have labeled Recall a potential privacy nightmare due to the risk of information theft by malware. Microsoft insists that users have control over certain aspects of Recall, such as disabling specific URLs and protecting DRM[2] content, but critics argue it lacks adequate content moderation. Concerns have also arisen over its opt-out nature, as the feature is enabled by default during the setup process of a Copilot Plus PC.

Despite measures to address the concerns over its product, Microsoft, under intense scrutiny over security and privacy concerns, "recalled" its launch of Recall, an AI-based product scheduled for a June launch this year[3]. Initially set to be on by default, Recall will now require user activation during setup to function; users will need to authenticate and the previously unprotected database will now be fully encrypted reducing the risk of remote data theft.

This is a great example of a flawed launch that will place higher scrutiny on vendors and AI-based products that have access to local private data. Analyst Wes Miller suggests that Microsoft's approach damaged user trust and could hinder widespread adoption within organizations, although some experts believe that Microsoft's new focus and approach could eventually rebuild confidence in the product.   Regardless, Microsoft has not announced a new launch date highlighting the importance of a thoroughly tested release and the need for a comprehensive and holistic view of AI application security.

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[1] https://www.theverge.com/2024/6/3/24170305/microsoft-windows-recall-ai-screenshots-security-privacy-issues
[2] Digital rights management (DRM) is the use of technology to control access to copyrighted material.

[3] https://www.forbes.com/sites/barrycollins/2024/06/14/recall-recalled-is-ai-on-windows-11-already-doomed/

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Productivity is only as Powerful as its Weakest Link

We have discussed the potential for AI to deliver much-needed global productivity gains but given its nascent nature there is still a great debate on how large these gains will be, if any.

Speaking at a recent Federal Reserve conference[4], Federal Reserve Governor Lisa Cook predicts AI will boost productivity growth. Based on her background in researching innovation, she sees AI as having a substantial effect on labour markets and highlighted the potential for AI to enhance productivity and wage growth while maintaining stable prices. While she hopes increased productivity will counteract price pressures, enabling wage growth without causing inflation, Cook emphasized the difficulty in estimating AI's economic impact including the industries it will affect and the magnitude of its impact.

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[4] Source Bloomberg – "Fed's Cook Sees AI Boosting Productivity, How Much Still Unclear"
https://www.bloomberg.com/news/articles/2024-10-01/fed-s-cook-sees-ai-boosting-productivity-how-much-still-unclear

In stark contrast to Federal Reserve Governor Lisa Cook, MIT economist Daron Acemoglu believes AI is overhyped and will only impact about 5% of jobs in the next decade[5]. He warns that the current investment boom in AI might lead to wasted resources and won't result in an economic revolution. Despite AI's potential, Acemoglu argues that its limitations such as reliability issues and lack of human judgment will prevent it from replacing many jobs.

He adds that companies like Microsoft, Alphabet, Amazon, and Meta have invested heavily in AI but returns have not matched costs. Acemoglu is skeptical of claims that AI will automate a large portion of work tasks or lead to major breakthroughs. Overall, he emphasizes the need for a reality check on AI's current capabilities and foresees a potential crash if the AI hype continues unchecked.

We add another discussion point to the debate and it is not whether AI will deliver productivity or whether these benefits are overhyped, it is more about the adage that a system is only as strong as its weakest link. In productivity terms, this is rephrased as you will only be as productive as your weakest link.

For example, an organization that adopts generative AI to rapidly write and validate code may see a 50% productivity improvement from this department. Other departments may see a 20% improvement to their process. However, if the other departments in the process pipeline are slower because of unfamiliarity with generative AI, the need to develop new tests to validate the output, the need for incremental approvals, etc. – the whole process end-to-end may not save more time, or worse be slower.

We acknowledge this point and believe it may be a positive from an investment perspective as it may imply that more workflow tools need to be upgraded to meet this need. We shall see.

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[5] Source Bloomberg – "AI Can Only Do 5% of Jobs, Says MIT Economist Who Fears Crash"
https://www.bloomberg.com/news/articles/2024-10-02/ai-can-only-do-5-of-jobs-says-mit-economist-who-fears-crash

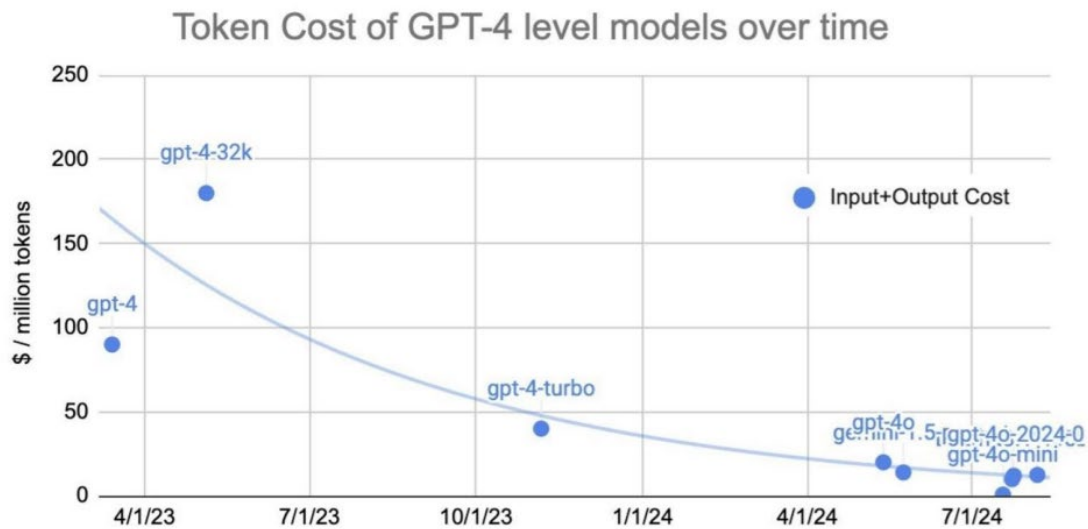# Too Many Players Could Lead to Zombified AI Foundation Models
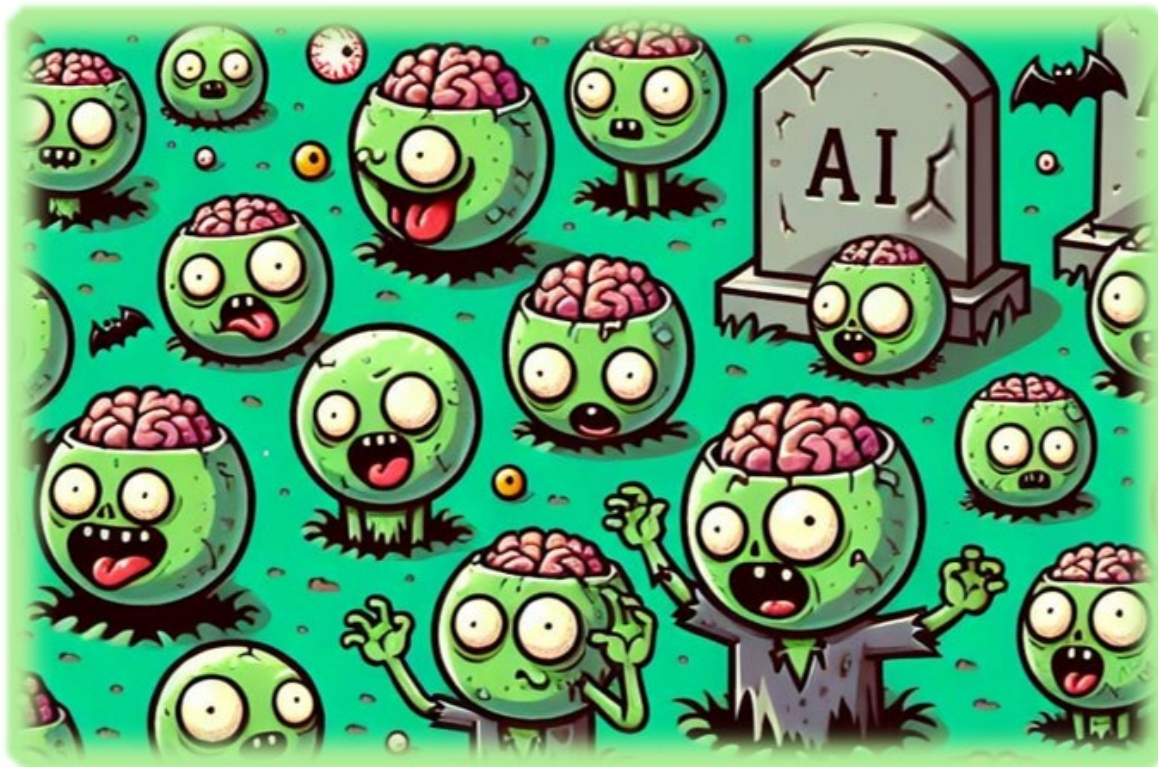
As we mentioned in our last monthly, users have benefitted from the rapid development of generative AI models for text processing, image, and video creation. What are generative AI foundation models? This topic is explained for readers in this article from Amazon Web Services who offers many of these models to consumers[6]. Summed up, Foundation models (FMs) are large deep learning neural networks trained on extensive datasets that have revolutionized how we use AI. OpenAI's GPT from which ChatGPT was derived is the best known one of these models. These models are trained on massive amounts of data and can perform a variety of tasks, such as understanding language, generating text and images, and engaging in natural conversation. Once trained they can then be integrated into other applications to provide features such as customer support, language translation, content generation, and simplified reasoning capabilities. You don't have to build these models, they are built for you and you simply use the final product. While fantastic for the AI ecosystem, it begs the question – how many foundational models will we need?

There is a reason for some diversity of these models. Closed models such as ChatGPT cannot be customized whereas others such as Meta Communication's Llama can be customized and fine tuned on your specific data. Some are open source and some are commercial by design. That said there are currently at least 20 models for language alone[7] and a similar number for image generation.

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[6] https://aws.amazon.com/what-is/foundation-models/

[7] https://explodingtopics.com/blog/list-of-llms

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# Massive Price Declines – Great for Usage / Bad for Monetization

Figure 1 - Graph Showing the Rapid Decline in the Cost of GPT 4 Usage

The economic impact of so many foundational models can be seen in the decline in the pricing of these models as shown in **Figure 1 - Graph Showing the Rapid Decline in the Cost of GPT 4**. While great for consumers of AI models, who are now discovering that previously unaffordable applications can now be run economically, this presents a huge challenge for startups developing foundation models.

The challenge comes from the need to spend enormous amounts of capital on training these models while simultaneously aggressively hiring and promoting one's service while dealing with aggressive price declines that create revenue headwinds. Increased demand through pricing elasticity should solve this problem in the long-term along with a stabilization of these foundation models that should require less capital spending. However, the timing of that is uncertain and the current environment remains a land grab at all costs. Using history as a guide, we view this as a "winner-take-most" market and survivors will have to create a large competitive moat or partner with a deep-pocketed vendor if they wish to survive.

A Monstrous Amount of Capital Spending is Required

Hyperscaler Capital Spending ($MM)

Legend: Past Capital Spending, Expected Capital Spending
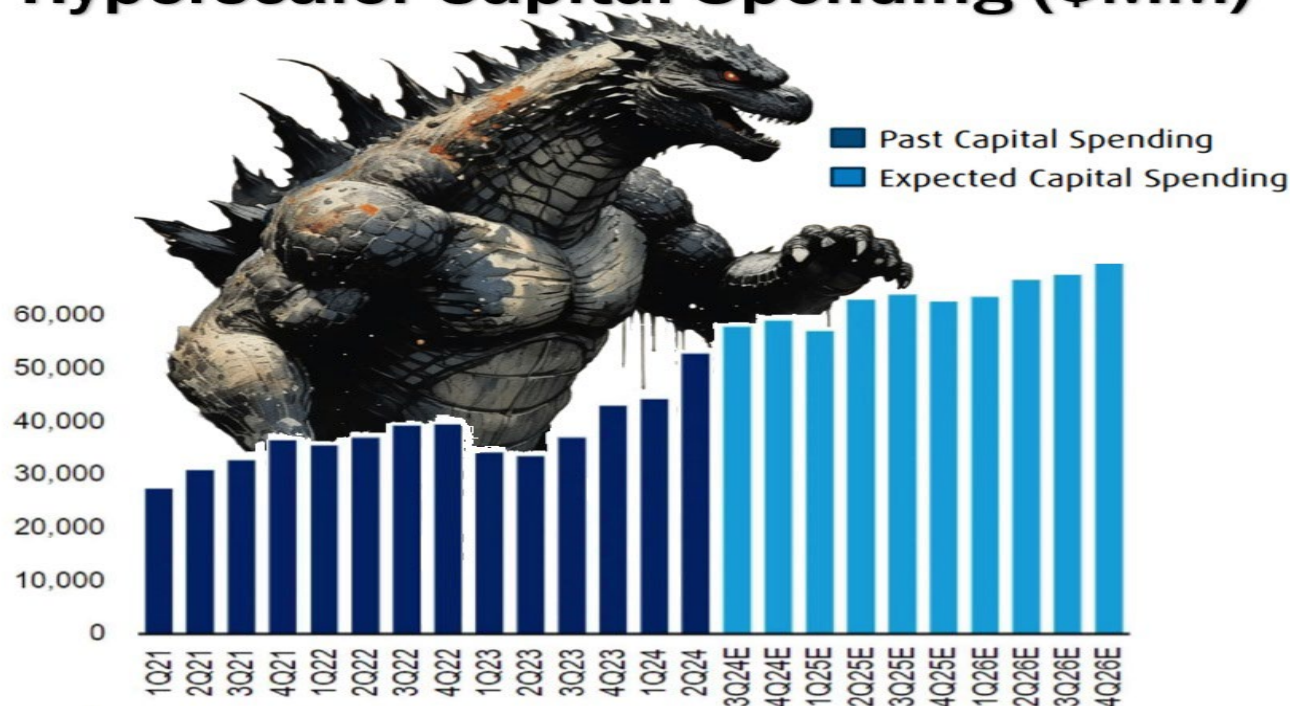
Source: BofA, FactSet as at Aug 27, 2024

On the capex[8] side, the theme this Summer was an acute awareness of how much was being spent on AI capital spending by global data centres (hyperscalers). This led to speculation from investors that AI spending was a "bubble" or must be "peaking" accordingly and this in turn led to volatility around AI capital spending beneficiaries.

This is not our current thesis. Capital spending is projected to increase as seen in the figure above. What naysayers miss is that yes capex is high but the players spending this are the richest corporations in the world with a collective market capitalization exceeding 15 trillion dollars. A cumulative annual capex spend approaching $300 billion dollars will still only represent a small percentage of capitalization. This dynamic is not similar to the dot-com era where market participants did lose access to capital markets and ran out of money. Investors should understand the difference of history rhyming not repeating. Our fear, if any, is not access to capital but rather the law of large numbers - it gets difficult to spend this much in a physical world constrained by land, availability of labour, and access to power. We shall see.

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[8] Capital expenditures (CapEx) are funds used by a company to acquire, upgrade, and maintain physical assets such as property, plants, buildings, technology, or equipment. CapEx is often used to undertake new projects or investments by a company.

Summary

We still think AI is a treat but we do have to acknowledge the tricks, as challenges exist. However, we remain positive in the near term because of one hard-to-quantify factor we have seen over the past two years. That factor is the industry's ability to overcome obstacles in its path. Whenever there was a challenge, for example developing an algorithm that can convert text to video, any initial problems or errors were quickly solved and a solution appeared in a faster-than-expected timeframe. The same holds true for the semiconductor and server hardware vendors. They are reinventing the nature of computation[9] by adjusting it to accommodate the creation of neural networks instead of logical branching traditionally done by a CPU[10]. This required a radically rearchitected computational infrastructure to accommodate need features such as more parallelism, seamless integration, higher data density, and heat dissipation for hotter system run times.

Our point – it is hard to bet against the momentum of the industry. This is not a call to be complacent - we still need to be vigilant and monitor potential cracks in the system. But in the near-term, we believe investors can safely collect the treats the industry has to offer and not get too spooked.

Happy Halloween from the Team.

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[9] More information on these changes can be found at https://www.nvidia.com/en-us/data-center/gb200-nvl72/

[10] For more information read "What's the Difference Between GPUs and CPUs?" (https://aws.amazon.com/compare/the-difference-between-gpus-cpus/)

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Fund Codes & Fees – BMO Global Innovators Fund

Series	Fund Code/Ticker	MER (%) *
Advisor FE / US$ FE	BMO99164 / BMO79164 (USD)	2.05†
T6 FE	BMO34269	2.14
Series F / US$	BMO95164 / BMO40164 (USD)	1.05†
Series F6	BMO36164	1.05
ETF - BMO Global Innovators Fund Active ETF Series	BGIN	1.05

*Annual Management Expense Ratios (MERs) are as of September 30, 2023. †The U.S. Dollar purchase options do not have audited MERs. For an approximation, please see the Canadian dollar equivalent of this series.

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