

A NEW INTELLIGENCE CREEPS INTO THE CAPITAL MARKETS

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On October 10, 2023, the Ontario Securities Commission (“**OSC**”) and Ernst & Young LLP (“**EY**”) jointly released a report on the use of artificial intelligence (“**AI**”) in Ontario’s capital markets (the “**AI Report**”). AI is the theory and development of computer systems able to perform tasks that normally require human intelligence.^[1] The AI Report explores AI use cases in Canadian capital markets, the benefits and challenges of adoption, as well as the role of regulation and governance in managing the associated risks. The OSC has undertaken this research to consider how to best support responsible AI innovation and adoption, while fostering globally competitive capital markets in Ontario and keeping investors top of mind. In preparing the AI Report, the OSC and EY utilized on a broad range of sources, including academic and industry literature, roundtable discussions, and interviews with capital market participants. This bulletin provides a summary of the AI Report’s findings.

Canadian AI Statistics

Ontario is a notable hub for AI research and development, attracting investments on a global basis. According to Tortoise’s Global AI Index report, Canada was ranked fifth in the world in AI capacity. Vector Institute’s reports in 2022 and 2023 found that \$8.64 billion in venture capital was invested into Canada’s AI ecosystem in 2022-23 and about 22,458 new AI jobs were created in Ontario in the same time period.^[2] The OSC’s AI Report states that AI is considered to be at an intermediate stage of adoption in Ontario’s capital markets, with larger financial institutions displaying greater AI uptake than smaller capital markets participants.

Current Uses of AI in Capital Markets

The AI Report notes that capital markets participants are developing, testing and implementing AI systems for a variety of functions. For the most part, these relate to the enhancement of existing products and services rather than the creation of new ones. The AI Report states that the three primary purposes for AI adoption by capital markets participants are: (1) efficiency improvements, (2) revenue generation and (3) risk mitigation. A few examples of each are set forth below.

(1) Efficiency Improvements. The most widespread adoption of AI in capital markets is for efficiency improvement.

- **Trade Process Automation:** Trade process automation is the use of technology to complete various

tasks, such as trade validation, generating trade reports and ensuring compliance with regulatory standards. This can speed up different phases of trade operations, and reduce human errors and costs.

- **Liquidity Forecasting:** Reinforcement learning (“**RL**”) and natural language processing (“**NLP**”) techniques could provide better liquidity prediction than traditional methods, which would improve order execution. Specifically, NLP models can be used to extract insights from textual data. However, predictive performance may vary depending on the liquidity measure used. This assessment requires deep domain expertise in both liquidity and AI.
- **Customer Service:** Chatbots can quickly and effectively satisfy customer needs, while streamlining processes and reducing the human workload. The low-risk nature of this application, makes it a common strategy for experimenting with AI by businesses. However, the large amount of diverse and unstructured data required for proper training of AI models presents a challenge to implementation in the customer service domain.

(2) Revenue Generation. Capital markets participants are adopting AI systems for the purpose of generating higher revenue.

- **Sales and Marketing:** AI allows capital markets participants to enhance their marketing strategies by targeting customers and delivering personalized experiences. While large language models are being used to generate content for various marketing purposes, including social media posts and product descriptions, the limited availability of data and technological requirements present hurdles to the adoption of AI for this purpose.
- **Asset Allocation:** AI capabilities can be leveraged to optimize the allocation of resources among different asset classes to maximize the return on investment. This allows insurance companies, portfolio managers, investment fund managers, etc. to make frequent adjustments to the asset mix in a portfolio based on market conditions to achieve long-term and consistent returns. However, the AI models commonly utilized for this purpose are infamously complex, with outputs that are not always explainable or interpretable, limiting their application in asset allocation decisions.
- **Asset Price Forecasting:** There is also a growing practice of using AI techniques in asset price forecasting, due to its ability to process time series data more effectively and extract useful information about a stock from unstructured data.^[3] AI may provide a way to circumvent some of the limitations inherent in traditional models, such as the ability to handle high-dimensional data in the presence of irrelevant data. Nevertheless, AI models exhibit substantial variation in their predictive capabilities and have been observed to lack an upper bound on their predictive error, posing significant hurdles to implementation.
- **Trading Insights:** Capital market participants are using NLP and machine learning techniques to

automate the extraction of insights and sentiments from news articles and other diverse data sources (e.g., analyzing video data, collecting data from social media and web scraping). Although this can streamline the information-gathering process for trading strategies, one subject matter expert voiced that utilizing AI models for this purpose could contribute to share price volatility by generating random trading signals.

(3) Risk Management. The adoption of AI in risk management is varied with limited use in highly regulated areas such as the calculation of regulatory capital requirements, and greater use for anti-money laundering and collateral optimization.

- **Hedging:** Traditional hedging techniques can be flawed due to reliance on human decision-making and unrealistic assumptions. There is a perpetual need in hedging to make decisions in response to changing market conditions, which makes it a good candidate for RL models. RL models automate the process of continuously adjusting hedge position to minimize risks or protect against losses. Before deploying RL models in real market conditions, it is critical to test them in an artificial setting due to the multifaceted and intricate behaviour exhibited by RL agents.
- **Trade Surveillance and Detection of Market Manipulation:** AI can be utilized to detect fraudulent or deceptive tactics that seek to create false or misleading perceptions of market conditions and undermine the integrity of our capital markets. The AI Report revealed that vendors of trading surveillance systems have implemented AI models for this purpose, as they can detect fraudulent activities better than traditional, rule-based approaches.
- **Data Quality Improvement:** Data quality is critical for AI users in capital markets, to foster accurate and complete AI analysis. Inadequate data quality or quantity can result in flawed assessments and unreliable predictions by AI, which can have significant implications for investment decisions. The AI Report revealed that AI is being used to generate synthetic data to ensure AI algorithms receive accurate inputs, enabling them to detect patterns, trends and anomalies with greater precision. One concern with this application is that the methods used for this purpose are prone to overfitting, where the model becomes too specialized in the training data.

Concerns/Barriers

The challenges facing the implementation of AI in capital markets can be categorized into the following areas:

1. **Explainability:** AI systems are highly complex and lack inherent explainability, which distinguishes them from traditional mathematical/statistical models. Developments in explainability are predicted to improve adoption rates.
2. **Data-related Challenges** (e.g., data volume, variety, sources, privacy concerns, aggregation, and quality):

The diverse sources and formats of data create problems for data aggregation, while maintaining data quality and consistency. Since AI systems collect vast amounts of data from diverse sources, they have the potential to identify individuals and therefore give rise to privacy concerns.

3. **Effective Governance:** Risks associated with AI systems are distinct and require non-traditional governance measures and approaches. Implementing a robust AI-specific framework can be effective in fostering responsible use of AI within an organization, however, resource constraints can hinder these objectives.
4. **Ethics:** Ethics can pose challenges for addressing AI-related issues. Adopting appropriate fairness metrics is difficult when there is no universally agreed-upon principle regarding fairness in the AI space.
5. **Research & Investment Costs:** Implementing AI in capital markets requires considerable research and financial investment, which disproportionately impacts smaller firms.
6. **Market Stability:** AI models have the potential to contribute to procyclicality and systemic risks in the market due to their dynamic adaptability and autonomy.
7. **Culture:** It can be challenging to modify entrenched processes and ways of working to new technology. Risk aversion can thwart the adoption of new processes and functions. However, as displayed by the colossal change in workplace norms brought on by the COVID-19 pandemic, it is possible to uproot the old way of doing things and adapt to new technologies and ways of approaching existing challenges and improving efficiencies.

Conclusion

Evaluating benefits and risks of AI will be an ongoing process for market participants as the technology and industry evolve. While there has been a notable increase in interest in AI, capital market participants are taking a phased approach, implementing low-risk AI applications before higher risk applications, such as those related to risk management and revenue generation. Given the uncertainties involved, a cautious approach is warranted. Market participants should refrain from implementing high risk AI applications until these have been tried and true.

The AI Report emphasizes that an approach that balances the potential benefits with protection of investors and the integrity of our markets needs to be taken with AI, allowing market participants to ensure appropriate safeguards and risk management processes are implemented. Though it is certain that AI will transform our capital markets, what this transformation will look like is still unclear and the hope is that it will be positive.

[1] Oxford University Press, "[Artificial Intelligence](#)" (2023).

[2] AI jobs involve the use of AI to perform tasks that normally require human intelligence in order to create products, services, or solutions. Examples include AI researchers, AI developers, data scientists, machine

learning engineers, etc.

[3] IBM, "[Structured vs. Unstructured Data: What's the Difference?](#)" (June 29, 2021): Structured data is generally categorized as quantitative data (including dates, names, addresses, credit card numbers, etc.), whereas unstructured data is qualitative (including text, mobile activity, social media posts, sensor data, etc.).

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A Cautionary Note

The foregoing provides only an overview and does not constitute legal advice. Readers are cautioned against making any decisions based on this material alone. Rather, specific legal advice should be obtained.

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