The Digital Economy: The Impact of AI Decision Making in the Financial Market

The current and potential impact of Artificial Intelligence on any area of life cannot be understated. AI is a field of ever growing significance that has the potential to make pivotal changes on how we function as a society. Economics also plays a role in all major life experiences, influencing how governments plan policies, the state of the housing market and overall, impacting how we live our lives. AI and Machine Learning techniques already have a hugely significant impact on the Financial Sector and have for some time now. It is important to see the benefit in this but also be wary towards the potential detrimental impact this could have if not regulated and managed correctly. The use of AI in the decision making process of life changing financial decisions can have huge impacts on people both individually and globally and has to be exercised with caution.

The use of AI and ML techniques already has an incredibly useful impact on the financial sector, with technological advances such as big data and cloud computing making ML systems feasible and greatly adopted by companies in the financial sector. AI is used to both provide trading strategy and completely automate the trading process, with systems that make predictions, choose the course of action based on that and then execute the trades.[1] These AI based trading systems need no human intervention and use techniques such as evolutionary computation, deep learning and probabilistic logic. The use of AI and its ability to learn so rapidly allows for a predictive capacity that is arguably fast outpacing the power of even conventional trading algorithms. In traditional algorithmic trading, programmers need to create a set of if/then rules that govern the trading process. The problem here is the systems cannot learn on their own, you need to feed in a set of instructions to follow constantly. This makes the whole trading process highly manual and slow. Contrastingly, AI trading is about employing machine learning in an attempt to adjust to ongoing market changes proactively[2]. With AI trading, the algorithms update automatically, handling all the transactions on its own. It constantly learns from what's happening in the market and adapts accordingly.

AI systems are also used in trading to assist traders in their risk management, being used to track the risk exposure and adjust or exit positions depending on the needs of the user. The use of AI and big data in sentiment analysis is common in the financial sector. NLP algorithms[3] use text mining of large amounts of data, both financial and non-financial to inform trading decisions. This is all only possible because of the staggeringly large scale of data AI algorithms can work on in comparison to humans. In recent years the use of ML models has shifted analysis towards prediction, whereas previously back-testing strategies were more popular which were slower to identify trends and required more human intervention[4]. The more predictive approach now taken adapts to trends in real time to reduce the risk of overfitting which was a more common risk amongst the previous back-testing strategies.

[1] Insider Intelligence, 2023, *Artificial Intelligence in Financial Services: Applications and Benefits of AI in Finance*

[2] Bostrom, N., 2014, *Superintelligence*, Oxford University Press, 2nd Edition, pg 89-95

[3] Burgess, M., *Artificial Intelligence: How Machine Learning Will Shape the Next Decade*, pg 53-62

[4] Boukherouaa, E. B., AlAjmi, K., Deodoro, J., Farias, A., & Ravikumar, R., 2021, *Powering the Digital Economy: Opportunities and Risks of Artificial Intelligence in Finance*, Departmental Papers

Interestingly, the more advanced forms of AI used today aren't used to optimise speed of execution but are instead used to try and remove the noise from data and extract only the relevant information. This is then used for the calibration of algorithm parameters and for improving an algorithm's decision logic, rather than just for execution purposes. AI is now being trusted more for not the speed of its decision making process but rather for the quality of its decision making process when compared to humans. Clearly the use of AI decision making in the financial sector has a hugely positive impact. Allowing traders to complete trades in a completely automated process as well as receiving insight that they wouldn't be able to produce otherwise.

However, it is important not to overlook the weaknesses and potential risk factors of involving AI in the decision making process of the financial sector. The 2010 Flash Crash of the market should serve as a stark reminder of the weaknesses of AI technology in the financial sector and, although a lot has changed, should still be a warning that we need to think about the extent to which we give AI decision making control. The Flash Crash occurred on May 6th 2010, leading stock indices, such as the Dow Jones, S&P 500 and NASDAQ, all tumbled and partially rebounded in less than an hour. Although the market indices partially rebounded on the same day, the crash erased almost $1 trillion in market value[5]. A report[6] conducted by the US Securities and Exchange Commission (SEC), found that a single selling order of an enormously large amount of E-Mini S&P contracts in an attempt to push the prices down and the subsequent aggressive selling orders executed by high-frequency trading (HFT) algorithms which reacted, triggered the massive decline in market prices. It was concluded that HFTs played a significant role in the crash and this highlights another weakness of AI in the financial field which is humans not always understanding the decision making process of an algorithm and therefore accidentally using it inappropriately, leading to calamitous effect.

Models may perform poorly, as seen in the Flash Crash, potentially providing inaccurate decisions which could lead to adverse outcomes. This is normally a result of algorithms uncovering unknown correlations in data sets that we may struggle to understand or identify because the underlying causality is unknown[7]. This stems from not always having good quality, timely data which is difficult to come by as sensitivity and privacy of data are incredibly important. These same models may also begin to perform poorly in the event of major and sudden movements, which causes the breakdown of established correlations[8]. This leads to an argument for human traders currently having the edge over AI models, able to better adapt to drastic changes in circumstances as well a gut feeling that is unexplainable. This paired with the sometimes large scale of human effort to run a lot of these systems does question whether the trade off is actually worth it in performance gain and whether AI actually is a benefit or rather a hindrance. The current limitations of AI decision making and the sometimes poor judgement, or lack of understanding as to why an algorithm has made a certain decision, shows that there may not actually be a significant benefit for AI in the financial sector at this current time.

[5] CFI Team, 2023, *2010 Flash Crash: The Stock Market Crash of March 6, 2010*, Corporate Finance Institute
[6] SEC, 2010, *Findings Regarding the Market Events of May 6, 2010*
[7] OECD, 2021, *Artificial Intelligence, Machine Learning and Big Data in Finance: Opportunities, Challenges and Implications for Policy Makers*
[8] Domingos, P., 2015, *The Master Algorithm*, Penguin Books, pg 264-267

There is definitely a great potential with AI for a hugely positive future impact on the financial sector, McKinsey estimates the future potential value of AI in the banking sector to reach upwards of $1 trillion[9]. AI models are increasingly being used by banks to assess the creditworthiness of prospective borrowers and this is an area that is looking to expand in the future. ML models are looking to be used to predict borrowers defaults for credit scoring and have been found to have vastly superior forecasting accuracy when compared to standard statistical models such as logistic regression, crucially still being accurate when limited data is available. These ML models would not only use conventional credit information, but also combine this with other data not necessarily intuitively linked to creditworthiness, such as social media data, digital footprints and transactional data accessible through Open Banking initiatives[10]. This not only benefits companies by reducing the risk of who they loan to but also helps to allow people with limited conventional credit history to still be approved based upon these other data points, this is massively significant and will allow some people who previously didn't have access to credit the life changing access they need.

Implementing AI further into the financial sector will have a hugely significant impact, 77% of bankers believe that the ability to unlock the value of AI will be the difference between the success or failure of banks[11]. AI could be used to increase the quality of customer service and therefore generate a greater revenue. The decision making ability of AI could be used to help provide customers with financial advice and planning[12] of an incredibly high quality as well as be used to aid account management. The use of AI will allow businesses to offer these services to customers who may not have been able to previously access them. The future potential of AI in the financial sector is certainly a positive one. As AI technology also improves with time, the range of beneficial opportunities will broaden even further.

However, it is important to remember with such rapidly advancing technologies such as AI that there are inherent risks that need to be looked out for and managed against. There is still so much we don't understand about AI that by allowing it full control of decision making processes poses a significant risk. There are risks that need to be managed against such as potential human job loss, AI algorithms with an inherent inbuilt discriminatory bias, whether it is morally right for AI to make such impactful decisions and if the advance of AI in more economically developed countries will further the dichotomy between less economically developed countries and halt the journey for equality.

There is definitely a threat of lack of regulation having the potential for AI algorithms to start to be used that have an inherent discriminatory bias built into them and this is already seen with several algorithms today[13]. This becomes even more significant when we think about the potentially life changing implications that financial decisions made by AI could have, especially within the loan and mortgage sector. This certainly raises the question of whether we should let AI make this key moral decisions, especially as when algorithms become more

[9] Biswas, S., Carson, B., Singh, S, Thomas, R, 2020, *AI-Bank of the Future: Can Banks Meet the AI Challenge?*, McKinsey& Company
[10] Balakrishna D. R., 2022, *How AI is Changing the Future of the Financial Industry*, Infosys
[11] Economist Impact, 2020, *Forging New Frontiers: Advanced Technologies will Revolutionise Banking*
[12] Kreger, A., 2023, *The Future of AI in Banking*, Forbes
[13] Buolamwini, J., 2019, *Artificial Intelligence Has a Problem With Gender and Racial Bias. Here's How to Solve It*

complex we begin to understand less how the algorithm is generating its patterns and aren't able to always understand the rationale behind the decisions made. This leads to a high risk of algorithms that, due to poor training data, have inbuilt bias that isn't necessarily noticeable. Even now AI based credit scoring models remain untested over longer credit cycles and there is limited conclusive support to the benefits of these AI driven decision making techniques over human decisions. Whilst some analysis does suggest that the use of ML models for credit risk assessment results in cheaper access to credit lending only for majority ethnic groups, others find that lending decision rules based on ML predictions help reduce racial bias in the consumer loan market. Either way caution will need to be heeded to make sure that AI is used correctly and fairly in the decision making process.

There is also an interesting hypothetical moral question to be posed about using AI in decision making and data processing circumstances. If AI becomes advanced enough to deserve some quantifiable form of rights then is it just and fair to cause it to carry out so many data calculations and keep it running on all these tasks. Furthermore, it often makes sense when carrying out complex tasks to run parallel processes with slight changes to try and find an optimum solution, is it right to terminate these processes then?[14] It is very much only a hypothetical debate but one that is definitely of note and interest and worth thinking about as the state of AI advances and evolves.

Clearly there is a massive potential benefit of AI decision making in the financial sector, however there are also many drawbacks, limitations and risks that arguably outweigh the upside. However, the progression and use of AI seems ultimately inevitable and, therefore, It's incredibly key as we continue to develop AI and ML models for use in this decision making process that regulations are strictly adhered to and the morality of decisions made is also constantly questioned. There is definitely a positive future with AI involved in the decision making process, however the journey to get there must be one that is exercised with extreme caution to avoid any danger.

1998 Words

---

[14] Shanahan, M., 2015, *The Technological Singularity*, The MIT Press Essential Knowledge Series, pg 184-187

Bibliography:

Books:

- Bostrom, N., 2014, *Superintelligence*, Oxford University Press, 2nd Edition
- Burgess, M., 2021, *Artificial Intelligence: How Machine Learning Will Shape the Next Decade*, Wired
- Domingos, P., 2015, *The Master Algorithm*, Penguin Books
- Shanahan, M., 2015, *The Technological Singularity*, The MIT Press Essential Knowledge Series

Articles & Reports:

- A-Team Insight, 2018, *Potential and Pitfalls of Artificial Intelligence in the Trading Environment*, https://a-teaminsight.com/blog/potential-and-pitfalls-of-artificial-intelligence-in-the-trading-environment/
- Balakrishna D. R., 2022, *How AI is Changing the Future of the Financial Industry*, Infosys, https://mobile-magazine.com/articles/ai-changing-the-future-of-the-financial-industry
- Biswas, S., Carson, B., Singh, S, Thomas, R, 2020, *AI-Bank of the Future: Can Banks Meet the AI Challenge?*, McKinsey& Company, https://www.mckinsey.com/industries/financial-services/our-insights/ai-bank-of-the-future-can-banks-meet-the-ai-challenge
- Boukherouaa, E. B., AlAjmi, K., Deodoro, J., Farias, A., & Ravikumar, R., 2021, *Powering the Digital Economy: Opportunities and Risks of Artificial Intelligence in Finance, Departmental Papers*, https://www.elibrary.imf.org/view/journals/087/2021/024/article-A001-en.xml
- Buolamwini, J., 2019, *Artificial Intelligence Has a Problem With Gender and Racial Bias. Here's How to Solve It*, https://time.com/5520558/artificial-intelligence-racial-gender-bias/
- CFI Team, 2023, *2010 Flash Crash: The Stock Market Crash of March 6, 2010*, Corporate Finance Institute, https://corporatefinanceinstitute.com/resources/equities/2010-flash-crash/
- Economist Impact, 2020, *Forging New Frontiers: Advanced Technologies will Revolutionise Banking*, https://impact.economist.com/perspectives/sites/default/files/eiu_temenos_article_1_forging_new_frontiers_may_2020_2.pdf
- Insider Intelligence, 2023, *Artificial Intelligence in Financial Services: Applications and Benefits of AI in Finance*, https://www.insiderintelligence.com/insights/ai-in-finance/
- Kreger, A., 2023, *The Future of AI in Banking*, Forbes, https://www.forbes.com/sites/forbesbusinesscouncil/2023/03/20/the-future-of-ai-in-banking/?sh=4433a3f45ed5
- Niekerk, M., Subramanian, A., 2022, *How AI is Shaping the Future of Financial Services*, Deloitte,

https://www2.deloitte.com/nz/en/blog/financial-services/2022/ai-in-financial-services.html

- OECD, 2021, *Artificial Intelligence, Machine Learning and Big Data in Finance: Opportunities, Challenges and Implications for Policy Makers*, https://www.oecd.org/finance/financial-markets/Artificial-intelligence-machine-learning-big-data-in-finance.pdf
- SEC, 2010, *Findings Regarding the Market Events of May 6, 2010*, https://www.sec.gov/files/marketevents-report.pdf