Expansion of AI in Stock Trading: A Growing Trend

Narinder K. Seera[1,] Jaspreet Kaur[2]

[1]Department. of Computer Science, IINTM, N. Delhi, [2]University of Westminster, London, U.K

[1]narinderkaur.ipu@gmail.com,[2] jaspreet.westminster@gmail.com

Abstract - The massive rise of AI in different domains, including financial institutions such as banks, stock exchange market, is empowering stakeholders to make informed decisions based on AI-driven tools & technologies. Employing AI in stock trading is not a new term, but it has certainly covered a long journey. These days Artificial intelligence trading strategies are playing a crucial role in market analysis, price prediction, stock selection, investment planning, portfolio management, etc. This paper is an attempt to explore the role of AI in stock trading with various types of trading options and portfolio management using AI based tool. It also throws light on recent developments in this field.

Keywords -Stock trading, Artificial Intelligence (AI), portfolio management, AI trading strategies

1. Introduction

Through the inception of Artificial Intelligence and its subsequent technological innovations over the last decade has significantly transfigured the way different functions and operations are performed in different sectors. With the expansion of AI technologies from IT industry to IoT, from organizations to educational institutes, from medical or health sector to banking sector, all have realized a drastic change in various operations that are being performed. Stock trading in financial market is also one of the areas which is greatly impacted by the potential of AI technologies which has changed the way securities are actively traded and stocks are sold or bought.

The financial markets are taking significant advantages with the use of AI. In stock trading, AI is being used to make effective financial decisions [7]. AI techniques are employed to identify and capture underlying relationships between large data sets to make decisions regarding intelligent asset allocation and stock selection. In this paper, we explore how AI has transformed different investment strategies and types of trading. We also delve into the benefits and risks associated with the use of AI in trading.

Technically speaking, AI trading utilizes deep learning algorithms and AI techniques to analyze market data and patterns [8]. It uses novel techniques from deep learning, machine learning, natural language processing, computer vision, etc. to analyze stock data to identify patterns and predict market trends. The model is trained using machine learning (ML) techniques to predict future price movements and trade in the market. AI technology processes and analyses large volumes of data to identify patterns, exploit market inefficiencies, and optimize trading strategies for increased accuracy and efficiency [9]. It improves the efficiency of decision-making by reducing human intervention and shortsightedness. With this improvement, buying and selling stocks is stress-less and efficient. Recent studies show that around 80% of the total trading volume is initiated through algorithmic trading.

Integrating AI into investment portfolios is no longer reserved for tech giants and hedge funds. However, from stock selection algorithms to machine learning models that predict market trends, AI tools have become far more available to retail investors. These technologies can process vast amounts of data, help allocate portfolios, manage risk, and even provide personalized investment advice. In the subsequent sub-sections we discuss the functions of AI and types of trading.

1.1 Key functions of AI in stock trading

The technological advancement of AI in trading provides individual investors and traders with deep insights and analytics which were earlier available to large firms only [1]. As an instance, AI systems can analyze sentiments on social media and news articles, allowing investors to gauge market sentiment and make informed decisions. This analysis allows retail investors to make better-informed choices, enhancing their investment strategies [10]. To perform this analysis, AI algorithms go through various operations which are mentioned below:

➢ **Data Gathering:** Collecting significant financial data from various internet sources like social media, sentiments, corporate financials, news stories, trends and patterns available on portals and historical pricing data.

➢ **Data Preprocessing:** This step is crucial for cleaning and transforming the obtained data to ensure consistency and accuracy before training AI models.

➢ **Feature Engineering:** This step involves identifying relevant features from the dataset with predictive value, to be used in the training.

➢ **Selecting an appropriate algorithm:** Among a bunch of available ML and NLP algorithms, selecting a suitable algorithm for accurate stock trading is important.

➢ **Training the Model:** The most important step is to train the model in order to derive patterns and connections in the market.

➢ **Live Trading:** It ensures implementation of AI models for real-time trading ensuring risk management procedures are in place in order to guard against unexpected market movements.

➢ **Continuous Optimization:** The last but not the least, a never ending task is to continuously keep adapting and learning from current data to stay updated and effective in the ever-changing market landscape.
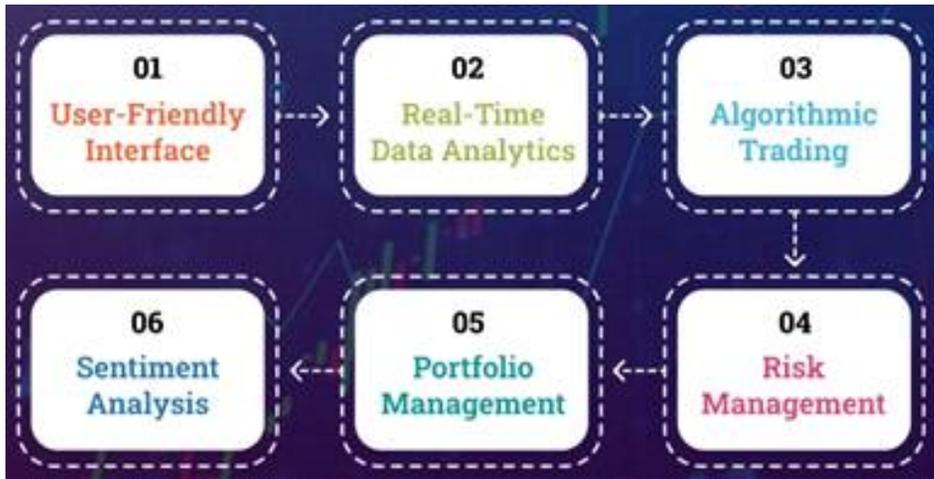

Fig. 1: Roles of AI in Stock Trading

1.2   Types of AI Trading

AI has expanded itself deep into trading and thus it can be categorized into four primary types:

➢ **Quantitative Trading:** This trading strategy examines price and volume data to find out the most profitable investment opportunities. This strategy is built on the fundamentals of statistics, mathematical models, data analysis, and machine learning algorithms. Its main aim is to analyze patterns, anomalies, and trends within financial markets to gain an in-depth insight of trading. The main advantages offered by this type of trading are – high speed and efficiency, elimination of emotional bias, robust risk management etc.

➢ **Algorithmic Trading:** It is the practice of purchasing or investing according to some prescribed set of rules tested on historical data or trends. In this type of trading, the traders make use of predetermined rules based on historical data to make trading decisions. These sets of rules are based on charts, indicators, technical analysis or stock essentials. For example, assume you have a proposition to purchase a particular stock presuming that the stock will end up in losses for next five consecutive days before its price rises. In this case, one can build an algorithm in such a way that the buy order for the particular stock is met when price touches a pre specified low point and sold when the price meet at its pre specified high point.

➢ **High-frequency Trading:** It falls under a subset of algorithmic trading strategy which involves frequently buying and selling large volumes of stocks. It is called high-frequency trading (HFT) as huge volumes of stocks and shares are sold and bought mechanically at very high speeds. Recently, it has been noticed that many regular stock market investors have moved towards HFT. It is predicted that it will become the most authoritative form of algorithmic trading in the future.

➢ **Automated Trading: It** automatically creates and submits order to stock market, eliminating the need of human intervention. The whole process begins with the defining the predefined rules for trade entries and their respective exit criteria [6]. On the basis of these predefined rules, strategies are formulated in online automated trading system. Once the system is finally set up, it continuously monitors the fluctuations in the real markets and hence searching for prospects where there could be a match for the predefined criteria. When the desired conditions are met, the trading system automatically runs the trade, including placing market orders, limit orders, or even more complex multi-leg options strategies. The entire process is shown in Figure 2.

Fig. 2: How Automated Trading Works [11]

2. Using AI in Portfolio Management

With AI technologies, portfolio management and decision making in algo trading for asset allocation can be enhanced. AI can efficiently analyze market trends, economic indicators, and corporate data to suggest suitable portfolio adjustments that are helpful in risk management and mitigation [3]. These AI based technologies include machine learning models that can understand huge volumes of data more swiftly and accurately than any human can do. AI frameworks for stock trading can also oversee diverse portfolios across various asset categories, thereby ensuring that the distribution matches the investor's risk preferences and strategic goals. This automated, data-driven approach helps maintain a balanced portfolio that can adapt to market changes and capitalize on emerging opportunities.

2.1 Stock Picking With AI

Investors have an overwhelming amount of data on all stocks traded on U.S. markets, which they examine to decide whether specific shares are worth buying or selling [1]. Stock picking with AI involves using machine learning models, natural language processing (NLP), and deep learning to analyze financial data, identify patterns, and make investment decisions. One of the main advantages of AI is that advanced algorithms excel at identifying complex patterns within the data, which may signal potential market moves [5]. There ae various AI stock picking platform & tools such as

➢ **QuantConnect, Alpaca, TradeStation:** Algorithmic trading platforms.

➢ **Bloomberg Terminal, Refinitiv Eikon:** AI-enhanced financial analysis.

➢ **Yahoo Finance API, Alpha Vantage, Quandl:** Data sources for AI models.

2.2 AI-Automated Portfolios

Robo-advisors like Wealthfront and Betterment automate the traditional process of working with an advisor to outline investing goals, time horizons, and risk tolerances to create a portfolio. AI-automated portfolios leverage machine learning, deep learning, and quantitative finance techniques to construct and manage stock portfolios dynamically. These portfolios aim to optimize returns, reduce risk, and adapt to changing market conditions without human intervention. [2].

2.3   Portfolio Optimization

Portfolio optimization is the process of selecting the best combination of assets to maximize returns while minimizing risk. AI and machine learning have revolutionized this process by analyzing vast amounts of financial data and identifying optimal portfolio allocations dynamically. Once you select a particular type of portfolio, a platform's AI can be used with modern portfolio theory to choose stocks and other assets that fall on the efficient frontier. This is a set of optimal portfolios that offer the highest expected return for a preset level of risk [1]. Various AI driven portfolio optimization models utilizes Monte carlo simulations, clustering and SVM algorithms, RNNs, transformer models and deepQ networks. A key advantage of AI based portfolio management is that AI continuously monitors and adjusts portfolio weights of rebalancing. It does so by automatically making adjustments in factors like momentum, growth rate, value etc.

3.   Risk Management in AI Trading

It's a general perception that investing with AI is safe, however it may have fewer chances of risks involved. AI-powered tools can provide more sophisticated risk management, better diversification, and reduced emotional bias in decisions. However, they are prone to errors, if fed inaccurate data or their algorithms are flawed. There's also the risk of overreliance on AI, potentially leading to herd behavior if many investors use similar AI models.

Recent novel AI models are trained to identify potential risks in data, such as unusual market volatility or deviations in trading activities, and can auto-tune themselves to trading strategies to reduce the chances of losses. Hence, AI-powered models are considered to support ongoing risk evaluation, consistently monitoring market dynamics and modifying asset allocations as required. Using such modern and advanced AI tools allows investors to maintain the optimal balance between risk sand returns, significantly reducing the chances of large-scale financial losses while capitalizing on market opportunities.

Different ways of managing risks by AI tools are mentioned below:

➢   **Managing risks for specific trades**: AI-powered tools use many complex strategies, such as stop-losses, conditional orders and take-profit levels, to manage risk on active trades. In addition, AI tools can design and automate hedging and income generation processes, adjusting these strategies in real time based on market conditions.

➢   **Sophisticated risk analysis**: AI tools manage portfolio by assessing and measuring risk under various market scenarios and generate a comprehensive outcome.

➢   **Dynamic risk adjustment**: AI-powered tools can continuously monitor market trends, news, and alternative data sources to detect potential risks that may produce losses in trade.

➢   **Behavioral risk management**: AI can help reduce the emotional aspect of trading. AI systems can implement preset rules, helping you stick to your risk management strategies even in volatile markets.

➢   **Tail risk management**: AI models can identify potential risks in extreme events which in turn helps in preparing for tail risks, sometimes also referred as "black swan" events.

4.   Benefits of Using AI Tools for Stock Trading

Integration of AI techniques offers numerous advantages for making trading less stressful and more efficient [4]. Few of the most significant benefits offered by AI are listed below:

➢   AI can assist in analyzing trends and patterns that might be hard for us to catch. With AI-based stock analysis, you get better insights of the financial market.

➢   Setting up an automated stock trading platform let us trade automatically based on set rules, avoiding sitting for the entire day and watching trade patterns.

➢   AI provides data-driven recommendations, empowering and helping us make wise choices.

➢   AI offers automated risk management and portfolio optimization techniques that can help in risk factor analysis, measuring volatility, and identifying diversification opportunities to minimize risk exposure and carefully optimize portfolio allocation.

➢ The AI based trading system continues to learn and adapt itself to continuous changing market conditions to improve its predictions and performance.

5. Recent Developments in AI Trading Strategies

With the dynamic nature of financial markets, AI solutions have emerged as a revolutionary element in the area of stock and trading. AI based trading tools integrates sophisticated machine learning models and advanced predictive analytics strategies to automate and improve trading process, leading to effective trading operations. Few recent developments of AI in this field are listed below:

➢ **Generative Adversarial Networks (GANs):** They are used to generate synthetic stock price data, and incorporating market sentiments and volatility in newly generated samples.

➢ **Evolutionary Algorithms:** They train the models for both the trading decision and the trade volume simultaneously. The evolutionary learning process depicts the best strategy by finding and manipulating the weights, to identify the right composite trading rule.

➢ **Reinforcement learning:** It helps to identify the best plan for stock or mutual fund after being trained on a plenty of stocks that ultimately leads to better return on investments (ROI). This type of learning paradigm has a number of applications in stock trading such as building trading bots, chat-bots, price setting strategies, automated portfolio management etc [7][8].

➢ **Explainable AI (XAI):** Using Explainable AI, different feature selection strategies have been developed for applied financial setting where there is a need to predict the next-day returns for a set of input stocks It is transparent and addresses the problem statement of lack of transparency of AI strategies used in decision making

➢ **Transfer learning:** It is a technique under deep learning where a model trained on a particular task is re-used or applied on another related task. With respect to stock market prediction, this technique allows a pre-trained model trained on large-scale dataset, to adapt it to stock dataset for making predictions on financial data. This approach can significantly save time and computational resources, as training a deep learning model from scratch on financial data can be a challenging and time-consuming task.

➢ **Multi-Agent systems**: These systems operate like a well-coordinated team of expert traders, with each one specializing in some different aspect of the trading process. The agents then work collaboratively to make decisions on market entry, asset selection, timing, monitoring, and whether to buy, hold or sell the stock. They facilitate interactions between multiple agents to achieve a common goal.

6. Conclusions

AI stock trading uses artificial intelligence to help investors and traders make smart choices based on data-driven decisions. The AI based stock analysis platform, can analyze huge amounts of data super fast and capture market trends and patterns in rapidly changing market landscape. They look at things like stock prices, news, and even social media to predict how stocks might move. This paper was an attempt to explore the use and functions of AI in stock trading and to discuss how to deal with portfolio management and risk management hen dealing with buying and selling stocks.

References

1. E. Tsang. "AI for Finance," Pages 2-11. Taylor & Francis Group, 2023.

2. Tan, Gordon Kuo Siong. "Robo-Advisors and the Financialization of Lay Investors."Geoforum, vol. 117, 2020, pp. 46-60.

3. R. Chopra, G.D. Sharma, "Application of artificial intelligence in stock Market forecasting: a critique, review, and Research agenda: Journal of Risk Financ. Management., Vol 14, Issue 11, Nov. 2021, p. 526, 10.3390/jrfm14110526

4. Ferreira, Fernando & Gandomi, Amir & Cardoso, Rodrigo, "Artificial Intelligence Applied to Stock Market Trading: A Review" IEEE Access. pp. 1-1. Doi : 10.1109/ACCESS.2021.3058133.

5. Chin Yang Lin, João Alexandre Lobo Marques, "Stock market prediction using artificial intelligence: A systematic review of systematic reviews", Social Sciences & Humanities Open, Volume 9, 2024, 100864, ISSN 2590-2911, https://doi.org/10.1016/j.ssaho.2024.100864.

6. Ness Kotecha, "Artificial Intelligence in the Stock Market: The Trends and Challenges Regarding AI-Driven Investments" Open Journal of Business and Management, Vol.13, No.2, March 2025, 10.4236/ojbm.2025.132037

7. Di. Fengqian and L. Chao, "An Adaptive Financial Trading System Using Deep Reinforcement Learning with Candlestick Decomposing Features," IEEE Access, vol. 8, pp. 63666–63678, 2020, doi: 10.1109/ACCESS.2020.2982662.

8. Q. V. Dang, "Reinforcement Learning in Stock Trading," Adv. Intell. Syst. Comput., Vol. 1121 AISC, pp. 311–322, Dec. 2019, doi: 10.1007/978-3-030-38364-0_28.

9. M. Corletto, M. Kissel, and K. Diepold, "Impact of real-world market conditions on returns of deep learning based trading strategies," Int. Conf. Electr. Comput. Commun. Mechatronics Eng. ICECCME 2021, Oct. 2021, doi: 10.1109/ICECCME52200.2021.9590955.

10. C. C. F. Chu and P. K. Chan, "Mining profitable high frequency pairs trading forex signal using copula and deep neural network," Proc. - 2018 IEEE/ACIS 19th Int. Conf. Softw. Eng. Artif. Intell. Netw. Parallel / Distributed Computing. SNPD 2018, pp. 312–316, Aug. 2018, doi: 10.1109/SNPD.2018.8441125.

11. https://www.ig.com/en/trading-platforms/algorithmic-trading/what-is-automated-trading

12. https://economictimes.indiatimes.com/markets/stocks/news/the-growing-role-of-ai-in-trading-and-stock-market-democratization/articleshow/116766438.cms?from=mdr

13. https://www.angelone.in/knowledge-center/share-market/how-ai-is-helping-traders-make-more-informed-decisions

14. https://business.fiu.edu/academics/graduate/insights/posts/artificial-intelligence-in-the-stock-market-how-did-it-happen.html