AI Technology's Application and Impact in the Secondary Market of Virtual Currencies

Chunyu Hou

Sichuan University of Media and Communications, Chengdu, 611745, China

279016490@qq.com

Abstract. With the rapid development of the financial industry and artificial intelligence (AI) technology, the application of AI robots in finance has become a widely discussed topic in the academia. As an important part of the financial market, the secondary trading market of virtual currencies is characterized by high volatility, risk and decentralization, which poses significant challenges for traditional trading methods. AI technologies, especially machine learning and deep learning algorithms, provides a new path to optimize trading strategies and reduce investment risks thanks to their powerful data processing, pattern recognition and real-time analysis capabilities. This paper focuses on the characteristics of AI technology and the secondary trading market of virtual currencies, as well as the practical application of artificial intelligence technology in the financial industry, and explores the potential of applying AI robots to virtual currency trading. The research shows that AI robots can provide more accurate decision support for investors through massive data analysis, automatic trading execution and real-time risk assessment, improving market response speed and investment return rate. If the combination of AI robots and virtual currency trading is successful, it is expected to create more long-term and stable returns for investors, providing important theoretical and practical value for the development of financial investment.

Keywords: artificial intelligence, virtual currencies, secondary trading market

1. Introduction

At present, artificial intelligence (AI) technology, supported by machine learning, deep learning and natural language processing, shows extensive potential in the financial field, especially in the secondary market. AI technology can predict the price trends and develop intelligent quantitative trading strategies by analyzing a large amount of historical trading data and market information, thereby improving the efficiency and accuracy of trading.

AI technology has already solved and optimized several key problems in the trading market. First of all, in terms of data analysis and processing, AI can quickly handle and analyze massive financial data, including historical prices, trading volume, company financial data, etc., and discover valuable information and patterns from them. Secondly, in risk prediction and management, AI can predict market fluctuations and risks in advance through complex models, enabling investors to take proactive measures to mitigate potential losses. In addition, AI has also realized the automation of some trading processes, executing transactions based on preset strategies and conditions, which enhances both efficiency and accuracy.

In the area of fraud detection and prevention, AI uses machine learning algorithms to identify abnormal trading patterns and potential fraudulent behavior, ensuring the security of transactions. AI technology also plays an important role in optimizing investment portfolios, sentiment analysis, and credit assessment. It can optimize portfolio allocation based on investors' goals and risk tolerance, analyze market sentiment from social media, news, and other sources to aid in predicting market trends, and provide more accurate credit assessments to support decisions.

Despite these advantages, AI technology still faces certain limitations and risks. For example, AI models may suffer from overfitting, where they perform well on training data but poorly on new, unseen data. The "black box" problem—where algorithms lack transparency and are difficult to interpret—poses another challenge. Furthermore, AI may struggle with handling unexpected or emergency situations [1-2].

This paper aims to explore the advantages of applying AI robots to the virtual currency trading market and investigate ways to combine artificial means to make up for its limitations to the greatest extent, thereby helping investors improve returns while saving time and energy input.

2. Overview of Virtual Trading Market and AI Robots

2.1. Characteristics of the Virtual Currency Trading Market

The virtual currency market is characterized by high volatility. Due to the current lack of a clear and comprehensive regulatory framework, combined with the immaturity of the market, it is vulnerable to manipulation by large investors or institutions, resulting in severe fluctuations in trading prices. In the secondary market trading, virtual currency prices can rise or fall sharply in the short term, presenting both substantial opportunities and risks for investors.

Additionally, the virtual currency trading market operates 24-hour non-stop trading. Different from the traditional financial market, the virtual currency market is not limited by time and geographic location, allowing global participants to trade at any time. While this continuous market activity offers greater flexibility, it also intensifies market uncertainty and trading difficulty, requiring investors to be able to respond to sudden market changes at any moment.

2.2. Characteristics of AI Robots in the Financial Market

AI robots offer significant advantages in the financial market, mainly in the following aspects:

High-speed data processing: AI robots possess high-speed computing and processing capabilities, and can process a large amount of data and perform complex calculations in a very short time. This allows for rapid analysis of historical data, market trends, and financial indicators, facilitating timely trading decisions that greatly enhance both efficiency and accuracy of trading.

Emotional independence: Unlike human traders, AI robot are not affected by emotions such as fear, greed, optimism or pessimism, which can often lead to irrational decisions. By relying solely on objective data, AI robots maintain rational decision-making, avoiding errors caused by psychological fluctuations and consistently executing strategies with precision.

Big data analysis: AI robots have the ability of big data analysis, which can mine and analyze massive financial data and discover hidden patterns and trends. It can also evaluate and control risks more accurately through precise algorithms and models. AI robots can monitor the market 24/7 and capture dynamic market changes at any time. When the market meets the preset conditions, AI robots can quickly execute trading instructions to avoid human delays and improve trading efficiency. AI robots have the ability to learn and optimize by constantly learning new data and market conditions and optimizing their strategies and models. In the secondary market trading process, it always follows the preset rules and strategies, and the decision-making process is highly consistent.

3. Superiority of AI Robots Applied in the Secondary Market Trading of Virtual Currencies

3.1. Trading Time

A key feature of the secondary market of virtual currencies is 24/7 trading. Unlike traditional markets, virtual currency traders can conduct buying and selling operations at any time. However, due to human limitations, traders need rest and cannot monitor the price trend of virtual currencies continuously, often missing some key trading opportunities, especially when the trend emerges suddenly. AI robots, on the other hand, require no rest. With a well-designed trading strategy, they can execute trades automatically around the clock. This efficient round-the-clock operation not only reduces the burden on human traders but also provides more choices for investors, especially in high-frequency trading. AI robots can quickly analyze price data in a short time, capture tiny market fluctuations, and then perform precise trading operations, thereby improving the overall trading efficiency and optimizing the return on investment.

3.2. Volatility

Another key advantage of applying AI robots to the virtual currency market lies in their ability to cope with the high volatility of the market. Due to its immature regulatory environment and the possibility of capital manipulation, the virtual currency market is prone to frequent and extreme price fluctuations. Volatility—the degree of fluctuation of asset prices—creates potential profit opportunities [3-4]. However, these rapid fluctuations often make it difficult for human traders to time their entries and exits accurately. In contrast, AI robots can respond quickly in the moment of market fluctuations through advanced algorithms and high-frequency trading strategies. Through machine learning models and real-time data analysis, AI robots can identify market trends and short-term fluctuations, capturing tiny profit points and achieve ultra-high-speed trading execution. This improves market liquidity, reduces time costs, and allows for more precise entry and exit points, something human traders struggle to achieve in high-frequency volatile environments.

3.3. Risk Control

AI robots offer superior risk control compared to human traders. They operate according to the preset strategies and follow strictly risk management protocols. Unlike human traders, AI robots do not suffer from emotional biases and are less likelt to make irrational decisions such as not closing positions in time for profit taking and not stopping losses.

The application of AI robots in quantitative trading is grounded in the theoretical work of early finance pioneer Edward Thorp. Throp was one of the early scholars who applied mathematics and probability theory to investment strategies, identifying arbitrage opportunities through quantitative analysis.

For example, he noticed that stock warrants—"financial derivatives based on the underlying stock" were often mispriced due to speculation. He developed "a corresponding mathematical model based on the price process of the underlying stock, enabling him to calculate the intrinsic value of warrants and identify mispricings." By using the Kelly formula and other tools, he developed strategies such as convertible bond arbitrage, which involved buying low-priced convertible bonds and converting them into stocks to earn a profit [6-8].

In 1969, with the investment of wealthy individuals, Thorp's quantitative fund company was established. From 1969 to 1979, while the annualized return of the S&P 500 was 4.6%, his fund achieved 17.7%. Even during the 1987 Black Monday crash, Thorp's fund achieved a 10% profit through arbitrage operations within half a year, while the S&P index fell by nearly 30% during the same period. From 1969 to 1988, Thorp's fund had an average annualized return of 19.1%, and only had drawdowns in 3 of the 230 months, and the drawdowns were less than 1%. Thorp discovered a fund with exceptionally stable returns, which was considered a Ponzi scheme after research. He reminded relatives and friends to cash out, and later it was confirmed that the fund's boss, Madoff, created the largest financial fraud case in history.

4. Analysis of the Impacts of AI Robots on the Secondary Market Trading of Virtual Currencies

4.1. Positive Impacts

The use of AI robots in the secondary market for virtual currencies is gaining momentum, with two main types emerging. The first type involves robots that can ingeniously transform the carefully conceived strategies of traders into executable trading algorithms through natural language processing and AI learning. These robots then operate fully autonomously, without human intervention. The second type involves quantitative robots, hich replace human subjective judgment with advanced mathematical models. These models use historical data to identify trading opportunities and formulate strategies to execute transactions [9]. Such strategies conduct in-depth analysis of massive and complex dataset to create an effective quantitative trading system, which is then applied to the Bitcoin secondary trading market.

It is worth noting that both types of robots function as fully automated trading systems. The first type carries some degree of subjective thinking and judgment, influenced by the trader's strategy. The second type relies entirely on data-driven decision-making, with strict risk controls, including precise stop-loss and take-profit operations. Theoretically, the second strategy, with its pure data-driven and rigorous risk control mechanism, should be superior to the first strategy.

4.2. Limitations

Despite the advantages, the practical application of these strategies does not always live up to expectations. The second type, while excelling in winning rate, especially in the oscillation range, may fail to capitalize on significant market trends, missing major breakout opportunities and incurring substantial losses [10]. Another challenge is that if robots want to operate at a high frequency, they need a nearly zero-fee account as support. Unfortunately, most investors do not meet this condition, so the majority of the market adopts medium and low-frequency trend strategies. Such strategies often have the problem of low winning rate, while the grid strategy has a relatively high winning rate but is accompanied by a large risk of loss. A truly excellent strategy must balance key elements such as the winning rate and the profit-loss ratio to ensure sustainable profitability. The profit-loss ratio fefers to the ratio of the average profit per profitable trading transaction to the average loss per loss-making trading transaction [11].

4.3. Optimization Directions

To address these challenges, several optimization directions can be explored:

First of all, in terms of data processing and algorithm optimization, continuously enhancing the robot's analysis ability of complex market data will allow it to capture market trends and risk signals more accurately. This will reduce the possibility of misjudgment and missed opportunities, improving overall performance.

Secondly, Research should focus on the integration of traders' subjective strategies and data-driven strategies, and explore how to give full play to the data advantages while reasonably integrating traders' experience and intuition to adapt to the more changeable market environment.

To support high-frequency trading, transaction costs need to be reduced. This could be achieved through the improvement of market mechanisms or technological innovations, making robot trading more accessible and effective.

Finally, in terms of risk management, developing more intelligent and flexible risk control modelsis crucial. These models should dynamically adjust stop-loss and take-profit strategies according to real-time market changes, improving both the security and profitability of investments.

5. Conclusion

Through research on the application of AI robots in the secondary trading market of virtual currencies, this paper finds that AI robots offer significant advantages in enhancing trading efficiency. The 24-hour nature of the virtual currency market provides global trading opportunities, but it also presents a challenge for human traders who cannot continuously monitor the market. In this context, AI robots, with their automatic execution capabilities and high-speed data processing advantages, can help investors achieve fully automated trading.

First of all, AI robots can monitor price fluctuations in the virtual currency market in real time and execute a large number of trading instructions in a short time through preset trading strategies, especially performing well in high-frequency trading. Compared with human traders, AI robots are not affected by emotions and can maintain rational decision-making when the market fluctuates sharply, thereby obtaining more trading opportunities in a high-risk and highly volatile market environment. In addition, AI robots can also identify market trends through big data analysis and machine learning algorithms, accurately capture the timing of entry and exit, thereby improving the overall trading efficiency and capital utilization rate.

However, the research also shows that AI robots still have some limitations in actual trading operations. But in actual trading, there are still restrictions, such as the need for human intervention in extreme market fluctuations and the issue of transaction fees. Despite certain challenges, the development prospects of AI robots in the secondary market of virtual currencies are still worth looking forward to. In the future, with the continuous progress of machine learning technology and deep learning algorithms, AI robots are expected to improve the trading strategies of AI robots through machine learning in actual trading, achieve more accurate market analysis and more optimized trading strategies, and bring a more convenient and higher-return trading system for investors.

References

[1]   Tan, H., Huan, Z., & Pu, Y. (2024). Machine learning, text big data, and nowcasting instant prediction. *Financial Development Review, (05)*, 59-74. https://doi.org/10.19895/j.cnki.fdr.2024.05.008

[2]   Wang, A., Kong, L., & Li, Y. (2024). Legal risk inspection and response of digital finance algorithm black box. *Financial Development Research,* 1-8. https://doi.org/10.19647/j.cnki.37-1462/f.2024.11.007

[3]   Zhu, F., Guo, W., & Yan, X. (2024). Volatility prediction of high-frequency trading financial data based on deep learning. *Intelligent Computer and Applications, (09)*, 82-87. https://doi.org/10.20169/j.issn.2095-2163.240912

[4]   Sun, X. (2011). Research on the volatility impact of warrant listing on underlying stocks in China. *Value Engineering, (16)*, 156. https://doi.org/10.14018/j.cnki.cn13-1085/n.2011.16.207

[5]   Wang, N. (2011). Research on the pricing method of warrants in China's securities market (Master's thesis, Shaanxi Normal University). Retrieved from CNKI

[6]   Zhou, K., Lin, C., & Wu, Z. (2023). The impact of short selling mechanism on enterprise innovation decision-making. *Industrial Economic Review, (01)*, 81-101. https://doi.org/10.14007/j.cnki.cjpl.2023.01.006

[7]   Shi, J. (2024). Research on convertible bond stock price effect and arbitrage (Master's thesis, Zhejiang University). Retrieved from CNKI