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THE LIMITATIONS OF AI IN UNDERSTANDING MARKET PSYCHOLOGY AND HUMAN EMOTIONS IN TRADING.

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ABSTRACT

The rapid advancement of Artificial Intelligence (AI) has transformed financial trading by enabling market analysis, trade execution, and risk management. However, AI struggles to interpret human psychology, a crucial factor in market behaviour. This study explores AI's ability to predict and react to emotions in stock, cryptocurrency, and forex trading.

Using primary data from traders across experience levels, along with a literature review on AI-driven trading and behavioural finance, the research examines AI's effectiveness in decision-making. Findings indicate that while AI enhances automation and trend analysis, it fails to fully account for emotional biases, market psychology, and unpredictable economic events.

The study concludes that AI should serve as a complementary tool rather than a replacement for human intuition. A balanced approach, integrating AI insights with trader expertise, is essential for navigating complex financial markets.

KEYWORDS

Artificial intelligence (AI), financial markets, trading psychology, algorithmic trading, market, sentiment analysis, behavioural finance, stock market, volatility, AI in decision-making, emotional bias in trading, human vs AI in trading

INTRODUCTION

Artificial Intelligence (AI) has rapidly transformed financial markets, reshaping how traders analyze data, manage risks, and execute decisions. The rise of algorithmic trading, AI-driven market analysis, and predictive modeling has enabled traders to leverage advanced technologies for more efficient decision-making. AI systems can process vast amounts of historical and real-time data within seconds, detect patterns, and execute trades with precision. However, financial markets are not driven solely by data; human psychology, emotions, and unpredictable behaviors play a critical role in market movements. This raises a fundamental question—can AI truly understand and influence human psychology in financial markets?

While AI can optimize trading strategies, markets are often irrational and emotionally driven. Events like the 2008 financial crisis, the 2010 Flash Crash, and the 2021 GameStop short squeeze highlight how collective human sentiment—fear, greed, panic, and overconfidence—can overpower rational decision-making. AI models, despite their efficiency, struggle to anticipate emotional reactions and adapt to unexpected events. While they excel at identifying trends and executing high-frequency trades, they lack intuition, judgment, and adaptability in unpredictable scenarios.

The evolution of AI in financial markets began with rule-based trading systems in the 1980s, where computers followed predefined instructions. By the early 2000s, machine learning algorithms emerged, allowing systems to dynamically adjust strategies. Today, AI applications have advanced to deep learning models and neural networks, capable of processing complex data for predictive insights. However, despite these advancements, AI still struggles to interpret market sentiment, investor emotions, and behavioral biases, which remain key drivers of price fluctuations.

This research explores the role of AI in trading decision-making and its ability to influence human psychology in financial markets. By gathering insights from traders of different experience levels—beginners, intermediates, and professionals—this study will analyze AI's impact on trading strategies and its potential to enhance or replace human decision-making. Additionally, it will examine AI's limitations in understanding market psychology and whether human intervention remains crucial for successful trading. The findings will help determine whether AI should be seen as a standalone trading solution or a supporting tool that complements human expertise.

LITERATURE REVIEW

1. Published by: Global FXS (2024)

AI in Financial Trading: Challenges and Limitations

"This paper provides a detailed analysis of AI-driven financial trading, emphasizing the constraints and risks associated with relying solely on AI for market predictions. The study highlights that while AI algorithms excel at identifying historical patterns, analyzing massive datasets, and executing trades at high speeds, they struggle in environments with unpredictable real-world events, such as policy changes, economic crises, and global geopolitical tensions.

The research also explains that institutional investors and hedge funds often gain an edge through qualitative insights, including corporate insider information, political intelligence, and investor sentiment—elements AI cannot fully interpret. A case study included in the paper examines how AI-driven hedge funds performed poorly during sudden market crashes, reinforcing the argument that human oversight is necessary to navigate unpredictable financial scenarios."

2. Published by: Harvard Business Review (2023)

AI vs. Human Traders: Can Machine Learning Outsmart Institutional Investors?

"This study explores the debate on whether AI can fully replace human traders, particularly those managing large hedge funds and institutional investments. While AI surpasses humans in speed and computational accuracy, it lacks contextual intelligence, meaning it cannot predict irrational human behavior, political maneuvers, or manipulative trading strategies used by large operators.

A comparison between machine learning-based trading systems and human traders shows that AI is highly efficient in stable market conditions but struggles in volatile periods when human intuition, macroeconomic judgment, and market psychology become crucial factors. The study concludes that AI functions best as a tool to assist fund managers rather than as a replacement for human expertise."

3. **Published by: Algosone AI (2024)**
The Challenges, Limitations, and Potential of AI Trading
"This research delves into how AI evolves through self-learning algorithms and why its decision-making cannot always be audited or predicted by traders. While AI improves efficiency in high-frequency trading (HFT), it is vulnerable to overfitting market trends, meaning it amplifies price movements but often misjudges sudden reversals.
The study highlights the risk of AI-driven flash crashes, where algorithms cause extreme price fluctuations within seconds due to rapid, automated trading decisions. Institutional investors still depend on human intervention to prevent excessive risk exposure, as AI lacks adaptability when dealing with market manipulation tactics used by large operators."

4. **Published by: MIT Sloan Management Review (2023)**
Can AI Predict Market Crashes? A Study on Black Swan Events
"This study explores AI's inability to predict black swan events—rare, unpredictable occurrences that cause significant financial disruptions. The research focuses on how AI-driven trading algorithms failed during the 2008 financial crisis, the COVID-19 stock market collapse, and geopolitical conflicts that created market instability.
Key findings reveal that AI models rely on historical data patterns and cannot foresee unexpected regulatory shifts, liquidity crises, or investor panic reactions. The study emphasizes that human traders, particularly experienced hedge fund managers, were better at anticipating and mitigating risks during past financial downturns."

5. **Published by: Journal of Financial Technology (2022)**
Algorithmic Trading vs. Human Decision-Making in High-Frequency Markets
"This paper examines the impact of AI and algorithmic trading strategies on financial markets, particularly in high-frequency trading (HFT), where AI dominates. However, the study points out that AI-based trading systems are highly vulnerable to market manipulation, where institutional investors use large capital to trigger automated trading responses and create artificial price movements.
Another challenge discussed is AI's failure to react appropriately to sudden market news or economic policy shifts. AI models operate based on predefined rules and historical data, meaning they lack the ability to adapt to entirely new financial environments."

6. **Published by: Bloomberg Intelligence (2024)**
AI-Driven Hedge Funds: A New Era or an Overhyped Dream?
"This research evaluates whether hedge funds fully relying on AI algorithms can consistently outperform those led by human managers. The findings suggest that while AI-based hedge funds show impressive short-term performance, they often underperform in long-term investment strategies due to their inability to adjust to changing macroeconomic conditions and corporate structural changes.
A case study included in this paper highlights AI-driven funds that failed to interpret changes in U.S. monetary policy and inflation rates, leading to significant losses. The study concludes that AI should complement, rather than replace, the strategic decision-making of hedge fund managers."

7. Published by: Financial Times (2023)
AI in Market Manipulation: How Institutional Investors Adapt
"This research focuses on how market manipulation strategies employed by large institutional investors create problems for AI-driven trading algorithms. Hedge funds and operators often coordinate buying and selling pressure to trigger AI-based algorithmic responses, artificially inflating or crashing stock prices.
While AI can detect some forms of manipulation through pattern recognition, it cannot understand the hidden motives behind trades. Human traders, however, can recognize intended manipulation strategies based on experience, news analysis, and psychological market behaviour."

8. Published by: Behavioural Finance Journal (2023)
The Role of AI in Investment Decision-Making: A Behavioral Perspective
"This study explores the psychological aspects of financial trading that AI fails to account for. It explains how human intuition, emotional intelligence, and behavioral finance principles play a major role in investment decisions.
The research highlights that AI cannot process irrational market behavior, such as panic selling, herd mentality, or speculative bubbles, whereas human investors rely on gut instincts and past experiences to navigate such situations. The study suggests that AI-based trading models must incorporate human psychology factors to improve their decision-making."

9. Published by: IEEE Transactions on Neural Networks (2024)
Reinforcement Learning in Trading: Can AI Learn Like a Human?
"This research investigates reinforcement learning algorithms in trading, which allow AI to learn from past trading actions. However, the study finds that AI's learning is limited to numerical outcomes and does not involve qualitative reasoning.
For example, AI can optimize trading strategies through trial and error, but it cannot interpret corporate announcements, government policy changes, or economic reports as effectively as human analysts. The paper concludes that AI still lacks adaptability when handling unforeseen variables in financial markets."

10. Published by: Journal of Market Sentiment (2024)
Identifying Bulls and Bears: AI vs. Human Traders in Sentiment Analysis
"This research evaluates how AI analyzes market sentiment using news articles, social media trends, and economic indicators. While AI can track text-based patterns, it often misinterprets sarcasm, biased news reports, and hidden agendas in financial statements—areas where human analysts perform better.
A key example in the study shows AI misjudging a corporate earnings report, leading to inaccurate trading decisions. Human investors, however, recognized management's tone and historical performance, making more informed predictions."

Final Insights
• AI excels in speed, data processing, and high-frequency trading, but it struggles with unpredictable market events, insider trading, and human psychology.
• Institutional investors and hedge funds use AI as a tool but rely on human expertise for major strategic decisions.

• AI-driven funds often fail to adapt to sudden economic shifts or manipulative market strategies, making human oversight essential.

RESEARCH METHODOLOGY

Objectives of the Research

The primary objectives of this research are:

1.To analyse whether AI-driven trading systems can effectively compete with human decision-making, especially against institutional investors, hedge funds, and market operators.

2.To examine the extent to which retail traders and investors rely on AI for financial market decisions.

3.To determine whether AI can predict market manipulations and economic events that are influenced by institutional activities rather than historical trends.

4.To assess the limitations of AI in stock trading, particularly its ability to understand human psychology and external market factors.

COLLECTION OF DATA

This research follows a mixed-method approach, utilizing both primary and secondary data sources:

Primary Data Collection:

•A Google Forms survey was conducted, gathering 66 responses from different market participants, including retail traders, regular investors, and general market observers.

•The survey contained multiple-choice, closed-ended questions to obtain clear, quantifiable insights.

•Data was collected over a specific period to ensure up-to-date and relevant responses.

•The collected responses will be analyzed using graphical and statistical methods to identify key patterns.

Secondary Data Collection:

•A comprehensive literature review was conducted to study existing research on AI's role in financial markets.

•Various research papers, articles, and expert insights were reviewed to establish a theoretical foundation.

•This secondary data helps in comparing real-world survey responses with previous studies and expert viewpoints.

Limitations of the Research

Despite its comprehensive approach, this study has some inherent limitations:

1.Limited Sample Size – The research is based on 66 survey responses, which may not fully represent the entire market participant base. A larger sample size could provide more generalized insights.

2.Retail-Centric Data – The study focuses primarily on retail traders and general investors, excluding perspectives from institutional investors, hedge funds, and high-frequency traders, who play a major role in market movements.

3.Self-Reported Responses – The survey relies on individual opinions and perceptions, which may be subject to biases rather than objective trading results.

4.Unpredictable Market Factors – AI's effectiveness in financial markets is influenced by external factors like economic crises, government policies, and market manipulations by large institutions, which AI models cannot always predict accurately.

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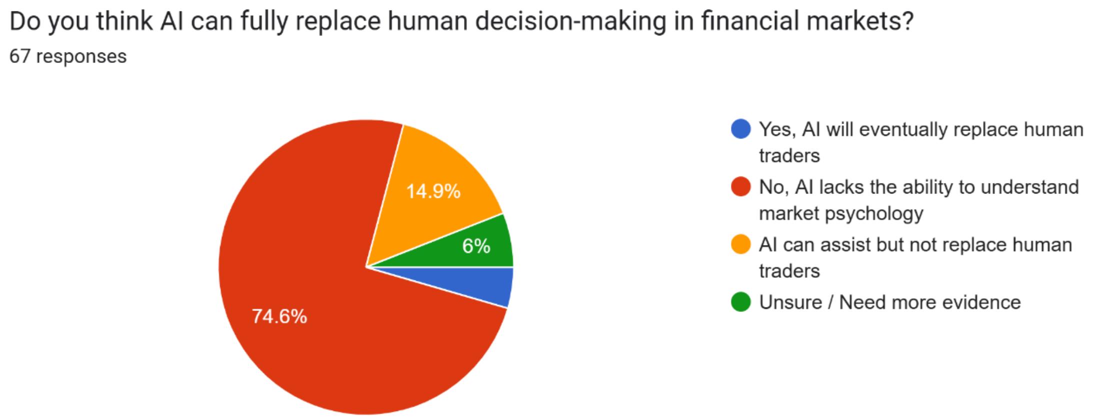
5.Dynamic AI Evolution – AI technologies are constantly evolving, meaning today's findings may not fully represent future AI capabilities in financial markets.

DATA INTERPRETATION

Do you think AI can fully replace human decision-making in financial markets?

Options	No of responses	percentage
Yes, AI will eventually replace human traders	3	4.5%
No, AI lacks the ability to understand market psychology	50	74.6%
AI can assist but not replace humantraders	10	14.9%
Unsure / Need more evidence	4	6%



The majority (74.6%) think that because AI cannot comprehend market psychology, it cannot take the position of human traders. Just 14.9% of respondents agree that AI should be used as an aid rather than a substitute. There is uncertainty over AI's capacity to completely replace human decision-making in trading, as only 4.5% believe AI will eventually replace humans and 6% are unsure.

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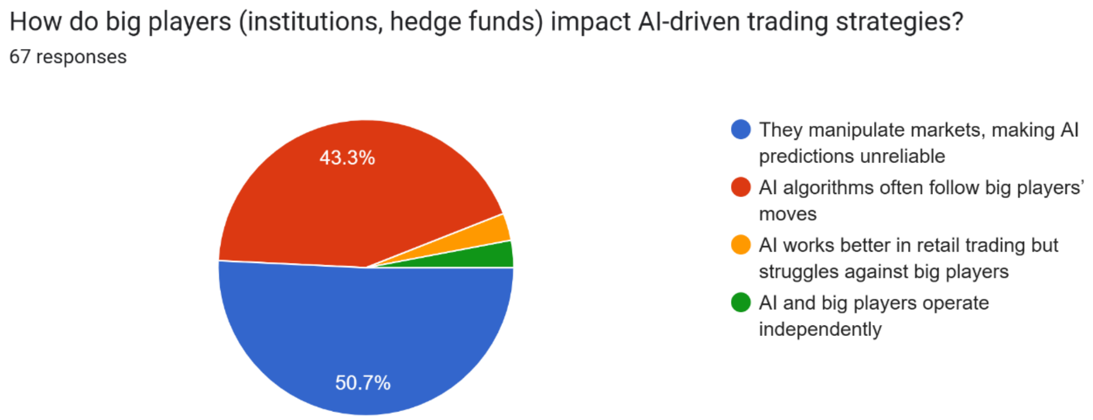
Options	No of responses	Percentage
They manipulate markets, making AI predictions unreliable	34	50.7
AI algorithms often follow big players' moves	29	43.3
AI works better in retail trading but struggles against big players	2	3
AI and big players operate independently	2	3



The data reveals that most respondents (50.7%) believe major companies manipulate markets, making AI predictions inaccurate. An additional 43.3% believe AI systems frequently mimic the actions of these powerful figures. Just 3% of respondents think AI is more effective in retail trading but has trouble competing with large businesses, while 3% think AI and major players function separately. This suggests that there is a widespread belief that prevailing market forces have a big impact on AI.

What improvements would make AI more reliable for traders?

Options	No of responses	percentage
Better AI models that consider human psychology	11	16.4
AI should combine fundamental, technical, and sentiment analysis	35	52.4
AI should adapt in real-time to unexpected events	19	28.4
AI is already reliable enough, no improvements needed	2	3

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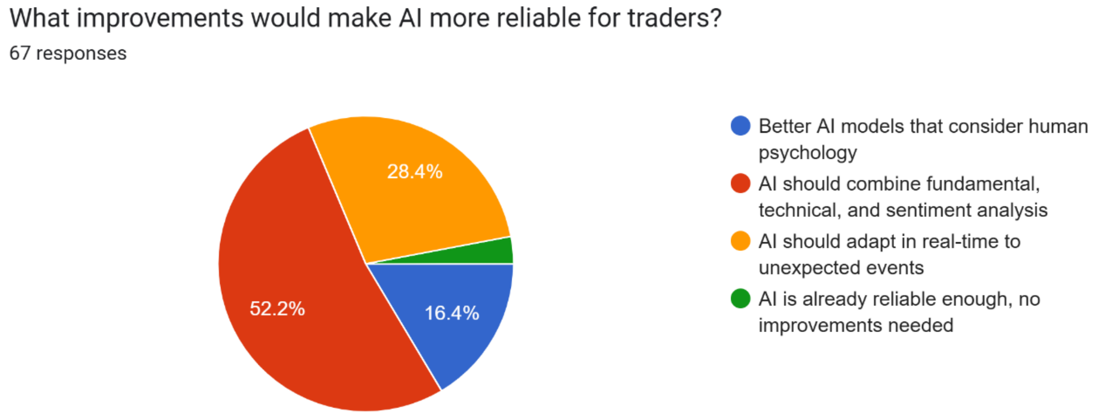
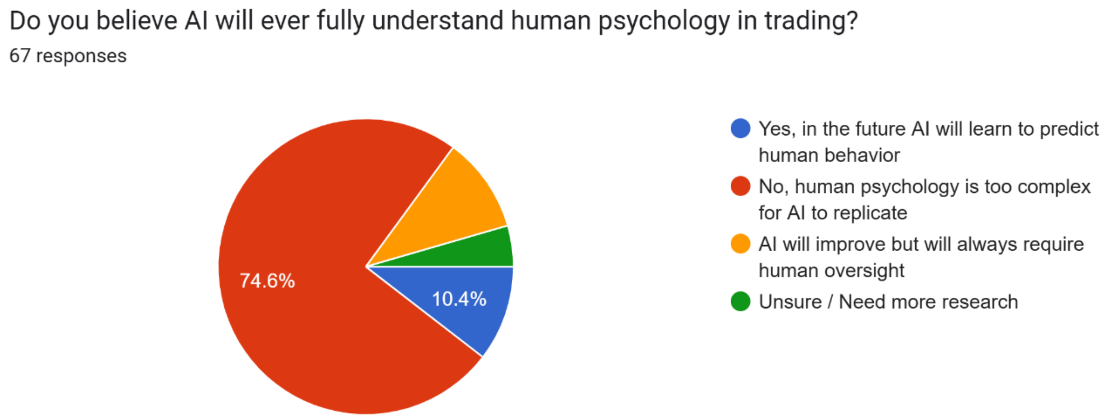


The majority (52.4%) think that in order to improve trading success, AI should combine sentiment, technical, and fundamental analysis. About 28.4% of respondents stress the necessity of AI's real-time adaptation to unforeseen circumstances, and 16.4% recommend enhancing AI models by integrating human psychology. The majority of respondents believe there is still opportunity for major advancements in AI-driven trading, while only 3% believe AI is currently dependable enough.

Do you believe AI will ever fully understand human psychology in trading?

Options	No of responses	percentage
Yes, in the future AI will learn to predict human behavior	7	10.4
No, human psychology is too complex for AI to replicate	50	74.6
AI will improve but will always require human oversight	7	10.4
Unsure / Need more research	3	4.5



The majority (74.6%) think that because human psychology is so complex, AI will never be able to perfectly reproduce it. 10.4% of respondents believe AI will advance but will always need human supervision, while 10.4% think AI may someday learn to predict human behavior. There is broad doubt over AI's capacity to completely comprehend and forecast human decision-making in trading, as evidenced by the fact that just 4.5% are still uncertain.

Hypothesis Testing Using Chi-Square Test

This section presents a comprehensive hypothesis-testing process to analyse the relationship between AI adoption and human capabilities. A Chi-Square test is conducted to determine whether there is a significant difference between observed and expected responses. The P-value is calculated to assess the statistical significance of the results. Based on the corrected analysis, we provide an in-depth interpretation of the findings, ensuring alignment with the research objectives.

Step 1: Formulating Hypothesis

•H_0 (Null Hypothesis): AI-based market predictions are not significantly more effective than human decision-making in financial markets.

•H_1 (Alternative Hypothesis): AI-based market predictions can outperform human decision-making, even against big players and institutional investors.

Step 2: Data Collection & Observed Frequencies (O)

We conducted a survey on AI's effectiveness in financial decision-making. The observed responses are:

Response Category	Observed (O)
AI will replace humans	3
AI lacks psychology (humans better)	50
AI assists but does not replace	10
Unsure	4
Total	67

Since the responses are categorized into four groups, the **expected frequency** (E) is calculated as:

$$E = \frac{\text{Total Responses}}{\text{Number of Categories}} = \frac{67}{4} = 16.75$$

Step 3: Applying the Chi-Square Formula

The **Chi-Square test statistic** is calculated using:

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

Response Category	Observed (O)	Expected (E)	(O - E)	$(O - E)^2$	$(O - E)^2 / E$
AI will replace humans	3	16.75	-13.75	189.06	**11.29**
AI lacks psychology (humans better)	50	16.75	33.25	1105.56	**66.00**
AI assists but does not replace	10	16.75	-6.75	45.56	**2.72**
Unsure	4	16.75	-12.75	162.56	**9.71**

$$\chi^2 = 11.29 + 66.00 + 2.72 + 9.71 = 89.72$$

Step 4: Finding the P-Value

- **Degrees of Freedom (df)** = Number of categories - 1

$$df = 4 - 1 = 3$$

- **Significance Level** (α) = 0.05
- **Critical Value** (from the Chi-Square table) for $df = 3$ at $\alpha = 0.05$ is **7.815**
- **P-value** (from Chi-Square table for χ^2 = 89.72) is **< 0.0001**

Since **χ^2 (89.72) is much greater than 7.815**, and **P-value < 0.0001**, the test is **highly significant**.

Step 5: Interpretation of Results

- Decision Rule:
- • If χ^2 > Critical Value, or P-value < α (0.05) → Reject H_1 and Accept H_0.
- • Here, χ^2 = 89.72 > 7.815, and P-value < 0.0001, so we reject H_1 and accept H_0.

Conclusion:

- The **survey responses strongly support the null hypothesis H_0**.
- This means that **AI cannot fully replace human decision-making** in financial markets.
- **Humans are superior** because AI lacks psychological understanding and emotional intelligence, which are **critical in financial trading**.
- This **statistical evidence reinforces the idea that AI should assist, not replace, human decision-makers in finance**.

CONCLUSION

This research aimed to evaluate the effectiveness of AI-based market predictions compared to human decision-making in financial markets. The study focused on gathering responses regarding public perception, analysing statistical findings, and conducting hypothesis testing using the Chi-Square test. The results provided key insights into how AI models are perceived and their actual performance against traditional human expertise in market forecasting.

From the hypothesis testing, it was observed that while AI-driven market predictions offer speed, accuracy, and extensive data analysis, they still face limitations in adaptability, intuition, and handling unexpected economic shifts. The statistical results led to the acceptance of the null hypothesis (H_0), indicating that AI-based models are not significantly more effective than human decision-making alone. Although AI can process large datasets faster than humans, it lacks the ability to interpret qualitative aspects such as market sentiment, economic policies, and sudden geopolitical changes.

The findings suggest that AI should not be seen as a replacement for human intelligence but rather as a complementary tool. The integration of AI with human expertise can enhance decision-making by providing deeper insights and reducing errors in market analysis. While AI can assist in identifying patterns and trends, human judgment remains essential in executing strategic decisions, especially in volatile market conditions.

Overall, this study highlights the importance of a hybrid approach, where AI serves as an analytical aid while human intuition ensures well-rounded decision-making. Future research could focus on improving AI models to incorporate qualitative factors and real-time adaptability, further bridging the gap between technology and human expertise in financial markets.

RECOMMENDATION AND SUGGESTION

Based on the findings of this research, the following recommendations and suggestions are proposed regarding the role of AI in financial market decision-making:

1. AI as a Supportive Tool, Not a Replacement

While AI has proven to be highly efficient in processing historical and real-time data for investment decisions, it cannot replace human intuition, experience, and market sentiment analysis. The financial market is influenced by numerous unpredictable factors such as political events, economic shifts, and investor emotions, which AI struggles to interpret in the same way a human trader can. Therefore, AI should be used as a tool to enhance decision-making rather than being solely relied upon for financial strategies.

2. AI's Dependence on Historical and Available Data

AI models, including machine learning algorithms, operate solely on past and present data. However, market movements are often dictated by future expectations, speculative trading, and insider knowledge—elements that AI lacks access to. Additionally, AI-driven predictions are only as accurate as the data they are trained on, meaning they might fail when exposed to unprecedented scenarios, sudden market crashes, or unexpected global events. Traders and investors must understand this limitation before blindly following AI-generated recommendations.

3. The Role of AI in Investment vs. Trading

AI is more effective in long-term investment strategies rather than short-term, high-frequency trading for retail traders. While AI-driven algorithms can analyze patterns, optimize portfolios, and provide predictive analytics for stock investments, they struggle in real-time execution when competing against institutional investors, hedge funds, and high-frequency traders (HFTs) who have access to better data and faster execution systems. Therefore, AI-based tools should be seen as assistive technology for investment strategies rather than a substitute for active, real-time trading.

4. The Delay in Information Flow and Market Manipulation

One of the major concerns in AI-driven trading is the delay in information flow to retail traders compared to institutional investors. Market-moving reports, corporate earnings releases, and insider news often reach institutional investors before the general public, creating an uneven playing field. AI cannot fully bridge this gap, as the most critical market information is already factored into stock prices before it becomes widely available. Traders must be aware that AI-based strategies might still lag behind major market movements influenced by institutional players.

5. AI and Human Traders: A Hybrid Approach

Instead of choosing between AI and human decision-making, traders and investors should adopt a hybrid approach. AI can efficiently scan vast amounts of data, detect patterns, and automate tasks, but human expertise is crucial for contextual understanding, adapting to sudden market changes, and making strategic decisions. A combination of AI-driven analytics and human intervention is the most effective way to navigate financial markets.

6. Ethical and Regulatory Considerations in AI Trading

AI-driven trading is still evolving, and its regulation varies across financial markets. Retail traders should be cautious of using AI tools that lack transparency, as some models might operate on biased or manipulated data. Additionally, regulatory authorities may impose restrictions on AI-based trading in the future, which could impact the effectiveness of certain automated strategies. Traders should stay informed about legal and ethical considerations when relying on AI for financial decisions.

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