International Journal of Social Science and Economic Research

ISSN: 2455-8834

Volume:11, Issue:08 "August 2026"

How AI has revolutionised stock markets

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DOI: 10.46609/IJSSER.2026.v11i08.045 URL: https://doi.org/10.46609/IJSSER.2026.v11i08.045
Received: 11 August 2026 / Accepted: 26 August 2026 / Published: 30 August 2026

ABSTRACT

The role of artificial intelligence (AI) in coming up with greater efficiency in stock markets together with improving market analysis and effective investment decision-making forms the basis of this research. This work seeks to assess both the problems and promises that AI has for contemporary financial markets. This method involves a secondary research methodology in which information collected from peer-reviewed articles, academic and editorial papers (2017-2023), journals and pragmatic industry reports, along with reliable online sources of information was focused on. Moreover, data gathering and exchange within AI have been amplified to a great extent which have shown betterment in algorithmic trading, predictive analytics and healthy risk management. Simultaneously, the paper highlights challenges associated with higher market volatility, cybersecurity threats, algorithmic biases and some regulatory implications. In conclusion, this research found that stock markets had become more efficient by being data-driven due to the advent of AI. With proper regulation, ethical AI practices and human oversight to maximize the benefits and minimize pitfalls on certain risks will exist.

INTRODUCTION

A stock, or equity, is a financial instrument that shows partial ownership in a company. When you buy a stock, you become a part-owner, or shareholder, of that business. Companies issue stocks to raise money to grow their business. Investors buy them for the possibility of financial returns.

The stock market connects businesses seeking funding to grow with everyday investors and institutions wanting to build wealth. It serves as a two-way engine that drives modern economies by facilitating three main functions:

- Capital Formation: Companies issue shares to the public to raise money for expansion, research, and hiring without incurring debt or paying interest.

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- Wealth Creation: Investors buy these shares to become partial owners of a business, sharing in the company's profits through dividends and increased stock value over time.

- Liquidity: The market has thousands of buyers and sellers, allowing investors to buy or sell their ownership stakes quickly and easily at fair, market-driven prices.

Why is AI becoming important in the stock market?

It's because AI has become more important in the stock market by maximising efficiency across three core pillars:

- Speed: Platforms use AI for high-frequency trading (HFT). They scan global stock markets at the same time. This helps them catch small price changes and execute trades in milliseconds, which is beyond human capabilitties.

- Data Analysis: AI uses machine learning to process large amounts of financial data. Because these systems can learn and improve on their own, they can find complex patterns across structured/unstructured data and market trends that human analysts miss.

- Automation: AI helps reduce human emotions like panic and greed from trading. It uses automated systems to manage portfolio rebalancing and enforce strict risk management rules around the clock. This brings institutional-level strategies to everyday retail investors.

What is the purpose of this research paper?

This paper examines how artificial intelligence impacts stock market operations, trading decisions, and market performance.

LITERATURE REVIEW

Before the era of artificial intelligence and advanced digital networks, stock trading was conducted using physical tools and human systems to process transaction data.

Pre-AI Market Infrastructure

- Human Brokers and Open Outcry System

However, prior to the automation wave, trades were done via face-to-face negotiations under the open outcry system. On a bustling exchange floor, hordes of traders shouted prices and waved their hands earnestly in rapid-fire gestures as they bought and sold shares to market makers. All of this activity centered on a single common visual reference known as the Big Board an actual display of real-time price and volume data that kept everyone on the floor in sync. In the past,

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when Artificial Intelligence and digital networks had yet to exert their authority over stock trading, all transaction data was processed using physical tools and human coordinators.

- Manual Analysis & The Mechanical Ticker Tape

The mechanical stock ticker refined by Thomas Edison to print stock symbols and transaction prices on a continuous strip of paper tape sent over electro-magnetic telegraph lines had been used for near real-time data delivery. Due to limitations on the speed at which they could transmit data via telegraphs, some of these machines could fall behind the frenzy on the trading floor. In return, broking companies hired young messenger runners to run physical price changes between offices, often quicker than the ticker machines could print them. Market trend analysis used to involve civilized manual examination of such paper tapes or manual ledger-keeping at the broking offices.

- Newspapers & Reports

Outside of the trading floor or broking offices, news travelled at a snail's pace. First of all, you were limited to calling the newspaper the next day for closing prices, or, if you really wanted to research a company, going through physical registries. Information was literally stuck on paper, and execution mostly depended on relationship banking and manual coordination rather than speed.

Current Applications of AI

Artificial intelligence is transforming the modern stock market in three major ways: trading execution, price forecasting, and market analysis. By processing vast amounts of information at incredible speed, AI helps investors and institutions make faster and more informed decisions.

1. Trading Algorithms

AI-powered trading algorithms remove emotional decision-making from the trading process and execute transactions at a speed humans simply cannot match. High-frequency trading (HFT) systems can analyze data from multiple exchanges at the same time and place millions of buy and sell orders within microseconds, taking advantage of tiny price differences before they disappear. For large institutional investors, AI also helps manage massive trades more efficiently. Instead of placing one huge order that could move the market, AI breaks it into thousands of smaller trades and executes them strategically over time. This reduces market disruption and helps secure better prices. Many of these systems use reinforcement learning, allowing them to continuously adapt and improve their strategies as market conditions and volatility change.

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2. Price Prediction

Modern AI models use advanced machine learning techniques, including deep neural networks, to forecast potential stock price movements. Unlike traditional models that rely on simple mathematical relationships, AI can analyse decades of historical market data and uncover complex patterns that might otherwise go unnoticed. These systems also incorporate alternative data sources to gain early insights into a company's performance. For example, they may analyse supply chain activity, shipping records, or even satellite images of retail locations to estimate business performance before official earnings reports are released. Rather than predicting a single future price, AI typically generates a range of possible outcomes along with probabilities, helping investors understand both potential returns and risks.

3. Market Analysis

Artificial intelligence also plays a critical role in understanding market sentiment through natural language processing (NLP). NLP systems can read and interpret financial news, regulatory filings, earnings reports, and corporate announcements within seconds of publication. They automatically identify key information and determine whether the news is likely to have a positive, negative, or neutral impact on the market. Beyond traditional news sources, AI monitors online forums and social media platforms to track investor sentiment and detect emerging trends. This can help identify growing optimism, fear, or momentum before it becomes visible in trading activity. Advanced NLP systems even analyse earnings call transcripts and executive speeches, examining not only the words used but also subtle changes in tone, confidence, and hesitation that may signal underlying strengths or concerns within a company. Together, these capabilities make AI one of the most powerful technologies shaping today's financial markets, enabling faster analysis, smarter decision-making, and more efficient trading than ever before.

Prior Research on AI in Investing

Source 1, Cao (2022)

Cao (2022) claims that AI and machine learning technologies have transformed how financial information is analysed. The research claims that AI-based models outperform conventional statistical approaches in predicting short-term stock price fluctuations and assessing financial risks. The author also claims that firms that fail to embrace AI technologies are unlikely to compete in the contemporary market.

Source 2 , Nobre & Neves (2019)

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Nobre and Neves (2019) claim that AI techniques such as XGBoost with principal component analysis have outperformed traditional forecasting methods in predicting stock price movements. The research claims that these techniques can improve the quality of investment decisions through better predictions of the market.

Source 3, World Economic Framework (2018)

The World Economic Forum report claims that more than 75% of the surveyed financial institutions had implemented AI technologies in at least one major operational area as of 2018, with risk management and trading being the predominant uses. The report also claims that AI is changing competition and the way firms operate in the financial industry.As shown on Fig 1 ([1])

Source 4, BlackRock Investment Institute (2026)

BlackRock's research analyses its use of the Aladdin platform, through which it uses AI to track and manage investment risk across a large volume of assets. Its research indicates that AI has helped speed up risk analysis and make it more accurate, and has become an increasingly important tool for large investment firms.

Source 5, Arunkumar Yadava (2024)

Research published by Yadava indicates that AI-powered algorithmic trading may increase market efficiency by quickly filtering information and executing trades. However, the research also shows that AI may increase market volatility when multiple firms use similar AI systems to respond to the same event at the same time.

METHODOLOGY:

This research is based on the secondary research methodology. Additionally, the information is sourced from peer-reviewed academic journals hosted on platforms such as ScienceDirect and MDPI, institutions' financial reports (BlackRock Investment Institute), international organisations' reports (World Economic Forum), and credible financial news platforms (Bloomberg and Reuters). Furthermore, the information collected from multiple sources was compared and evaluated systematically. Sources were selected based on relevance to AI applications in trading, risk management, and regulation, with a preference for publications from year onwards to reflect the most recent developments. Contradictions were resolved, and common findings and trends were highlighted concerning AI's impact on stock markets, trading behaviour, and investment decisions.

However this study does not involve the collection of primary data (e.g., surveys, interviews, experiments); it is entirely supported through secondary research., the conclusions depend upon

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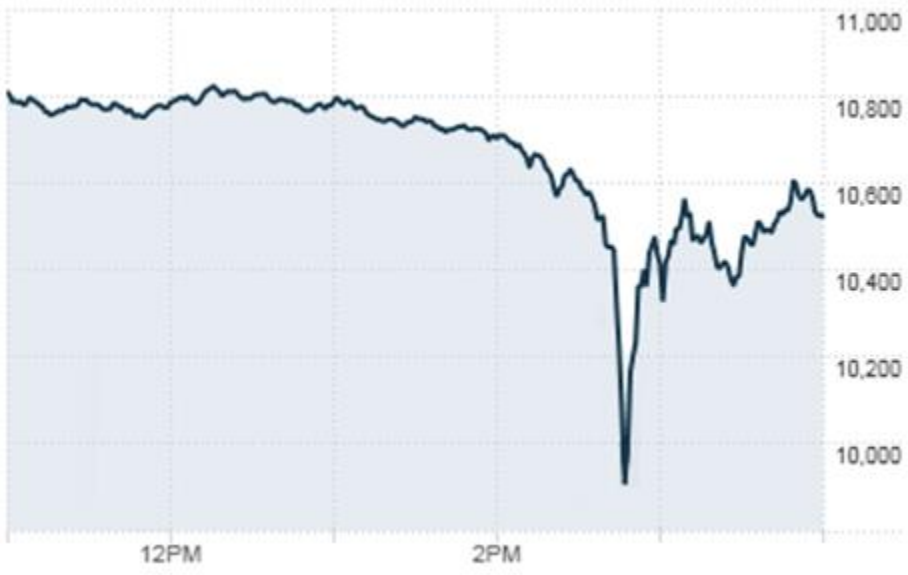
secondary sources of literature, industry reports, and other studies that may not take into account current market conditions or personal experiences in the real world. Some of this data, such as institutional claims examples such as Aladdin's performance from BlackRock and other players, can be self-reported and likely report results in their favour. Finally, there may be a publication bias in the literature available, with studies showing positive effects from AI more likely to be published than those observing negative or neutral results. These limitations could affect the fidelity and robustness of their conclusions. A broader understanding of AI in stock markets would require primary data, which can be pursued by future researchers.



RESULTS AND DISCUSSION:

AI is improving investors' decisions as it radically changes the speed and quality of investment decision-making. A conventional investment decision requires a team of analysts to spend days or weeks studying financial statements, economic reports, and market trends. AI can do the same thing in seconds by analysing structured data such as earnings or balance sheets and unstructured data such as news reports, social media, and even a satellite image of a company’s car park to estimate retail activity.

One of the key benefits of AI for investment decisions is sentiment analysis. Natural Language Processing (NLP) models analyse thousands of news sources and social media platforms in real time to gauge public and institutional sentiment towards particular stocks or sectors. This can enable investors to be exposed to relevant information before it has materialised in the market. For example, if the number of negative tweets about a firm’s CEO suddenly increases, AI can trigger a shift in position before traditional investors notice the article.

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Robo-advisors are another huge reason. Platform-based wealth management providers such as Betterment and Wealthfront use AI to construct and manage personalised portfolios for retail investors based on their financial objectives, risk tolerance and time horizon. This has opened up access to sophisticated investment strategies that used to be restricted to rich clients of private banks. As per Statista, assets managed by robo-advisors worldwide exceeded $2.5 trillion in 2023, and this is expected to grow to more than $4.6 trillion in 2027.

Stock price prediction has been one of the most difficult challenges in finance because the markets exhibit complex, nonlinear behaviour that is difficult to predict. ARIMA (AutoRegressive Integrated Moving Average) is a statistical method that models the linearity evident in historical price data but has difficulty modelling the complexity of world markets.

Artificial intelligence is used in stock price predictions to analyse historical data and make predictions about future price changes. The most common type of AI used has been deep learning models. Deep learning models are a type of artificial neural network that is designed to work with sequential time-series data. Long Short-Term Memory (LSTM) neural networks are a type of deep learning model that are designed to handle time-series data and have been shown to outperform statistical methods used for forecasting financial securities in peer-reviewed studies.

Reinforcement learning is a new, powerful AI method that is being explored in applications such as price prediction. Reinforcement learning is an AI approach in which an AI agent uses trial and error with a reward function to maximise performance. Reinforcement learning can be applied to create an AI market evaluator, which learns to price securities using simulations of trades that it makes in a simulated market. In addition to predicting stock price changes, AI models predict a variety of other variables that drive the price of a stock, such as predictions of earnings surprises, dividend changes, or merger probabilities. JPMorgan's research division has found that economically useful predictions can be made by AI models. The research shows that AI models can reduce forecast errors by up to 30% compared with the estimated consensus of human analysts. Speed is perhaps the most dramatic way that AI has altered financial markets. Until the rise of algorithmic trading, the fastest a human trader could act was on the order of seconds. Today, High-Frequency Trading (HFT) systems use algorithmic strategies to buy and sell securities incredibly quickly, at speeds measured in milliseconds and microseconds, much quicker than a human could ever react.HFT firms deploy these algorithms to simultaneously scan multiple markets and exchanges to instantaneously spot price differences between related securities or between the same security on two different exchanges and take advantage of these differences before they vanish, a process known as arbitrage. Supporters of HFT argue that this improves market liquidity and closes bid-ask spreads, making markets more efficient for all, because for any trade there is always a seller or buyer available on the other side of the

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transaction. In 2016, HFT firms were estimated to trade 10%-40% of the equity volume worldwide, a clear indication of how pervasive this technology is in modern markets.

Unfortunately, this huge speed advantage is a double-edged sword: the same systems that provide everyday liquidity can also suddenly withdraw during a stressed period and take that liquidity away at the very moment it is required, a phenomenon explained in further detail down below.

Behavioural finance is an area of research into how psychology affects the decisions of investors and financial markets. The field, initially explored by psychologists Daniel Kahneman and Amos Tversky (1979) challenges the assumption that investors are fully rational and have self-control. The field has revealed various psychological and cognitive biases that affect the decisions of investors, including overconfidence after winning streaks, panic selling during downturns and herding behaviour, leading to suboptimal investment outcomes.. That said, it is worth noting AI does not eliminate all error; it moves the source of error from feelings and bias to possible flaws in data, model design, or training assumptions.

However, AI also increases market volatility; this is one of the most well-documented risks of AI and algorithmic trading. The clearest historical example is the Flash Crash of May 6, 2010, when U.S. equity markets experienced a brief but severe drop, falling more than 5% in a matter of minutes before recovering shortly after. The official joint investigation by the U.S. Securities and Exchange Commission (SEC) and the Commodity Futures Trading Commission (CFTC) found that the crash began when a large institutional trader used an automated sell algorithm to sell a large volume of futures contracts without regard to price or time and that this interacted badly with high-frequency trading activity already present in the market, rapidly draining liquidity. A visual representation of the May 6, 2010, flash crash, also called the '2:45 crash' or just 'flash crash', was a United States trillion-dollar flash crash (a type of stock market crash) that began at 2:32 p.m. EDT and endured for about 36 minutes. The event demonstrated how automated systems reacting to the same signals, at the same time, with no human circuit breaker in the loop, can cause prices to spiral far more violently than in markets driven primarily by human decision-making. This remains the canonical case study cited in discussions of AI- and algorithm-driven market instability. Furthermore AI models do get some things wrong, as AI models can only be as good as the data they learn from and can fail badly in markets that behave in ways with no precedents in data. The Financial Stability Board (FSB), the international body set up by the G20 to monitor global financial stability, has formally recognised this as a systemic issue. In its founding 2017 report and its follow-up 2024 report, the FSB pointed to model risk, data quality and governance as one of the core AI-related vulnerabilities that can amplify systemic risk across the financial system. The 2024 report is particularly concerned about generative AI and the potential for financial misinformation and the consequences of AI systems that are not properly

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calibrated to legal and regulatory boundaries. The FSB has identified that risk, noting the issue with events that have no formal parallels in historical data, sometimes referred to as "black swan" events such as the March 2020 COVID-19 market crash. In these cases, AI models have no benchmark or precedent to reference and are thus particularly unreliable. Apart from that, well-documented risks of machine learning in finance include data quality and overfitting (an AI model that performs well on historical data but fails to generalise to new conditions).Additionally, too much dependence on AI can cause risks to investors. The FSB's 2024 report explicitly names third-party dependencies and service provider concentration as a top AI-related vulnerability, because a small number of AI model developers and cloud providers now underpin much of the financial industry's AI infrastructure; a failure or attack at one provider could cascade across many institutions simultaneously. This is sometimes called concentration risk. A complementary 2025 IOSCO report (the global body that coordinates securities regulators from roughly 130 jurisdictions) revealed that cybersecurity is the single biggest AI-related concern for market participants, who scored this at 4.26 out of 5 in its global survey. The same report also revealed that algorithmic trading is the second most common AI use case for regulated firms, identified by 63.3% of IOSCO member respondents, indicating that a substantial part of the market now extensively relies on these systems working properly. There is also a risk of "strategy crowding", in which many institutions are using similar AI models trained on similar data, resulting in independent decision-making being replaced by correlated behaviour, suppressing the normal diversity of opinion that helps to underpin market stability. Furthermore, IOSCO's 2021 final report on AI and machine learning identified the following specific risk areas of concern that regulators around the world are monitoring: governance and oversight, algorithm testing and monitoring, data quality and bias, transparency and explainability, outsourcing and third parties, and overarching ethical concerns such as fairness. The report explicitly states that "biases in the training data for machine learning models could be magnified by AI and machine learning algorithms leading to adverse impacts for consumers and investors," a clear algorithmic bias risk.

Regarding security, IOSCO's most recent work in 2025 categorised "cyberrisk was the highest-ranked issue as an AI risk, according to capital markets participants, presenting new challenges as AI systems are increasingly used for trading and communicating with clients (the most common AI use case, cited by 66.7% of IOSCO members). The advent of AI also means that any cyberattack or system failure may have larger consequences, as clients' funds are being routed through AI systems. However, there is also an open question about ethics and fairness: "Organisations with the resources to develop and deploy sophisticated AI systems could obtain a structural advantage over smaller firms and retail investors. " IOSCO and the FSB (the latter responsible for setting global financial playing rules) will both be increasingly concerned with this question as regulators set evolving regulatory frameworks rather than final rules.

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Real Life Examples

Many modern-day companies or investors indulge in the use of AI for stock trading, such as:

- **BlackRock**
- **JPMorgan Chase**
- **Goldman Sachs**
- **Renaissance Technologies**

BlackRock (2026), the largest asset manager in the world, currently controls more than $11 trillion in assets. BlackRock's proprietary platform Aladdin (Asset, Liability, Debt, and Derivative Investment Network) employs AI and machine learning to provide portfolio risk analytics and scenario modelling and includes natural language generation of investment reports, providing risk analytics across a sum of $20 trillion plus in assets once licence-out usage by other institutions is included. BlackRock chief executive Larry Fink has argued that the firm's long-term investment in technology, especially its Aladdin platform and AI capabilities, allows the firm to scale its operations, improve operating leverage and manage large growth in assets under management without corresponding increases in headcount.

JPMorgan Chase created LOXM (LO's eXecution Manager), an AI system that uses machine learning to assess and execute large equity trades using billions of historical transactions as a training set to minimise market impact. An independent survey of equity traders found that LOXM improved order execution efficiency by 15% compared to standard algorithms.

Goldman Sachs's 2000-to-2017 transformation provides one of the most striking examples of how finance is being transformed by AI. MIT Technology Review reported that in 2000, the 600 traders who staffed Goldman Sachs's U.S. cash equities desk in New York were reduced to the two human equity traders that still operate today, assisted by around 200 computer engineers.

Renaissance Technologies' Medallion Fund, run with mathematically-based, AI-powered models that average annualized 66% before fees from 1988 to 2018, has the longest-standing track record in hedge fund history. Since mid-1993, it has been closed to outside investors and is owned by current and former employees.

Figure 2 shows the major domains where artificial intelligence is used in the financial sector, such as trading, risk management, fraud detection, and customer service:

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What are some examples of AI tools used for investing?

A technology called **Kensho**, originally an AI analytics platform birthed out of Harvard and MIT, was acquired by S&P Global in 2018 for approximately $550 million, the largest deal ever for an AI company at the time. Kensho's platform allows users to ask a complex financial question in plain English and get an answer in seconds instead of having a human analyst dig through data.

Robo-advisors like **Betterment** and **Wealthfront** use AI to generate and automatically manage diversified investment portfolios for retail investors based on their financial goals and risk tolerance, with automatic rebalancing, tax-loss harvesting, and other capabilities once performed by a human financial advisor.

Do the advantages of AI outweigh the disadvantages?

On the positive side, there is strong institutional evidence to support the theory that AI can help; BlackRock's Aladdin system now risks over $20 trillion in combined assets for the firm and its investors. JPMorgan's LOXM system improved the efficiency of trade execution. Renaissance's Medallion Fund, heavily reliant on AI, has had the strongest long-term hedge fund returns in history. On the negative side, regulators have confirmed the very real risks of using AI systems in markets. The official investigation of the 2010 Flash Crash by the SEC and CFTC showed that bad automated systems can swing markets. The Financial Stability Board has identified real risks in its 2017 report and follow-up 2024 monitoring report across AI concentration, third parties, model risk, and cybersecurity. In a similar manner, the 2012 Knight Capital event illustrated how

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one software deployment gone wrong can cascade into a crisis scenario for the firm: in roughly 45 minutes, an erroneous trading algorithm flooded the market with orders that generated over 4 million executions on 154 stocks, representing 397 million shares. The wrongful orders were incurred at a pre-tax loss of roughly $440 million, which almost wiped out the firm's capital base and resulted in significant doubt about its continued ability to operate. The episode resulted in Knight Capital being charged by the SEC with violating the Market Access Rule, a rule requiring firms to maintain adequate risk controls around automated trading systems leading to a $12 million settlement, the SEC's first enforcement action under the rule. IOSCO's global survey found that cybersecurity is the number one AI risk according to capital market participants. The throughline across the regulatory literature is that these are not reasons to reject AI but reasons to govern it carefully. The FSB, IOSCO, and the EU (through its AI Act) are all actively building frameworks specifically because the underlying technology is already deeply embedded in markets and not going away. On balance, the evidence supports the view that AI's benefits to market efficiency and decision-making outweigh its risks, provided that governance, transparency, and oversight keep pace with adoption, a condition regulators are still working to fully achieve.

CONCLUSION:

What were the main findings of the study?

AI has dramatically and radically altered how the stock market works. In everything from individual retail investing through robo-advisors to institutional risk analysis at BlackRock to the nuts and bolts of trade execution at JPMorgan, AI demonstrably advances prediction accuracy and execution efficiency, as evidenced by academic literature and real-world institutional performance. Without a doubt, however, regulators see that risks have not been eliminated, but have instead grown along with AI technology, having already documented risks from flash-crash-style volatility to model failure under unprecedented conditions to cybersecurity vulnerabilities, according to the SEC, CFTC, FSB and IOSCO.

How has AI changed the stock market?

The stock market has gone from human-paced trade execution to machine-paced. By 2016, high-frequency trading firms accounted for an estimated 10–40% of the global equity trading volume. From periodic, manual review to continuous, automated monitoring, risk management now involves trillions of dollars in assets. From the realm of institutions to ordinary retail investors, sophisticated portfolio management is now more broadly available through robo-advisors. From 600 cash equities traders to 2, Goldman Sachs's workforce makeup illustrates how the composition of the workforce has changed dramatically.

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Is AI more harmful or beneficial to stock markets?

Overall, artificial intelligence appears to benefit stock markets more than it harms them, but those benefits and risks are not equally shared, and much will depend on whether regulators can stay ahead of the technology. Retail investors are benefitting from cheaper access to research tools historically held by professional investors, but they can still fall victim to AI-generated fake news and often have a delayed reaction when algorithms reprice assets in milliseconds. Many large investment firms and hedge funds gain the greatest efficiency and predictive advantages, but when many firms are in fact using similar AI models, their trading decisions may converge, turning what would have been individually sound trades into contagious, market-wide disruptions. Traders usually have better conditions with market makers to work with, but if the AI systems were to all turn off and stop buying in times of stress, they could lose liquidity very fast. In theory, that should lead to better capital allocation for companies whose shares are traded (and so, in principle, more reliability); but it can also create price volatility with next-to-no impact from underlying performance and driven largely by rapid turns in sentiment instead. A key danger is systemic stability: when AI-related shocks propagate through interconnected institutions, accountability becomes difficult to assign, and effective action is delayed. As a result, the benefits of AI accrue largely to well-resourced institutions while its risks magnify during crises and affect the financial system at large which is precisely why sound governance continues to be critical on the net

What does the future of AI in investing look like?

Regulatory frameworks are moving to meet AI's role in finance. The EU AI Act, which entered into force on 1 August 2024, is the first globally binding legal framework for AI. It specifically classifies AI used in some financial contexts, such as credit scoring and insurance risk assessment, as high-risk, subject to compliance obligations phasing in through 2026 and beyond. IOSCO's most recent 2025 report found that 24 jurisdictions are now actively engaged in developing AI governance frameworks for capital markets, ranging from technology-neutral rules to AI-specific regulation. The FSB continues to monitor systemic risk as generative AI and large language models introduce new use cases, including document summarisation and information retrieval, into financial institutions.

The likely trajectory is continued deep integration of AI into trading, risk management, and client services, paired with a steadily maturing global regulatory response. The institutions and investors best positioned for this future will be those that combine AI's analytical power with strong human oversight and compliance with emerging rules, rather than treating AI as either a replacement for human judgement or an unregulated free-for-all.

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