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Role of AI in market surveillance in Capital Markets**Ms. Himani Manchanda**

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Abstract

Capital markets serve as the financial backbone of a country and play an important role in its economic growth. They must be protected from fraud and activities such as money laundering and insider trading. Artificial Intelligence (AI) is a computer program that can act like a being. AI acts as a market police force that safeguards capital markets from fake trading, the use of secret information (insider trading), and other illegal or fraudulent activities.

This paper examines the role of AI in market surveillance within capital markets. It also shows that AI not only finds errors but also helps prevent and protect against such fraudulent activities. AI acts as the immune system of financial markets, constantly scanning for threats, learning from attacks, and improving its protection capabilities. However, AI is only a tool that is programmed by humans. It can introduce bias and errors. It is a double-edged sword, with advantages as well as inherent risks. Our research indicates that humans should exercise caution when using AI. Our study posits that AI is just a tool; it should not be considered a hero. It can't replace humans, but it can assist humans.

In Conclusion, AI is an indispensable tool and a powerful element of market surveillance frameworks. But it remains a tool that demands prudent human governance. It acts like another immune system; sometimes it overreacts, misguides investors and fails to detect viruses. It should be engineered and applied judiciously and diligently by human experts.

Keywords: Insider trading, surveillance, engineered, money laundering, intelligence

Introduction

Capital markets have changed a lot over the past few decades. This is because of technology. The internet and computers have made it possible for people to buy and sell things online. This did not happen at once. It took time. Happened as computers and technology got better. Now capital markets are better. People can invest from anywhere and at any time. Capital markets are also more open to everyone, which's a good thing for investors. Capital markets like this make it easy for people to trade and do business.

Technology has really changed the way capital markets work. It helps set prices, makes buying and selling cheaper, and brings more people into the market. Now investors can access information and use specialised tools to analyse and trade more easily, which helps them make better decisions. This has made capital markets faster, easier to understand and more competitive. While technology has brought many benefits to capital markets, it has also introduced new problems and weaknesses in the financial system. Capital markets are still getting used to these changes. These changes are affecting capital markets in many ways. The technology used in capital markets is making them work better.

The speed of money moving around is getting faster and faster. This means the chance of people cheating the system is getting bigger. They are doing things like manipulating the market and

trading on information. These people are getting really good at hiding what they are doing. They are using computers to make trades really fast. They are making deals in many different markets at the same time. This makes it very hard to keep an eye on what's going on. Financial markets are like a game. When people cheat, it is not fair to everyone else. It also makes people lose trust in the system. It can cause big problems for financial markets. The risk of market abuse is. It is a big concern because market abuse can do a lot of damage to financial markets and investor confidence.

Market surveillance is really important for regulatory authorities to deal with the problems they face. Market surveillance involves monitoring everyone involved in the market, including investors, brokers, merchant bankers, and other market participants, to see what they are doing. They do this to catch and stop people from doing things. When market surveillance works well, it helps ensure the market is fair, transparent, and trustworthy. This is necessary for the market to work properly and last for a time. Market surveillance is key to keeping the market fair and trustworthy. That is what market surveillance is all about.

Market surveillance systems used to depend a lot on people watching things manually and on rules to find trading patterns. These systems used rules that people had set up beforehand. They relied on human judgement, which made them not very good at finding complex and changing market behaviours. As trading became faster and more complex, the old way of watching the markets did not work very well. Regulators often struggled to process large volumes of data, which meant they were slow to detect and address potential market abuse. Market surveillance systems were not doing a good job of keeping up with the markets.

The capital markets are changing a lot. This is making things harder. New technology has made markets work better and easier to use. It has also made it easier for some people to cheat the system and do bad things. They use tools and plans to do this. People watching the markets by themselves can not catch all of these things because they are very complicated and happen so fast. There is too much data to look at. So the people in charge need systems that can watch the markets and adapt to what's happening, and these systems need to be smart and work automatically. The capital markets need these systems to keep everything.

Concept of Artificial Intelligence

Artificial intelligence is really cool. It includes something called machine learning. Artificial intelligence has become a useful tool for monitoring what is going on in the markets where people buy and sell things. Artificial intelligence systems can quickly analyse a lot of information, both organised and unorganised. They can find patterns that're not easy to see and detect things that are not normal. This can help identify market activity.

Artificial intelligence systems are better than traditional methods because they can learn from new information all the time. This means they get better and better at their job over time. Artificial intelligence is also effective at helping us keep markets safe. So, using intelligence in market surveillance frameworks is a big step forward. This improves how we regulate modern capital markets. Integrating intelligence into market surveillance frameworks is important for monitoring and detecting risks. Artificial intelligence is changing how we conduct market surveillance in capital markets.

Importance of Market Integrity and Investor Protection

Market integrity and investor protection are essential for markets to function properly. In simple terms, market integrity means making sure that trading is fair, transparent, and orderly. Investor protection is also crucial as it protects investors from people who try to cheat or trick them. When market integrity is maintained, investors feel safer. Are more likely to participate in the market. Market integrity helps to make markets more liquid. This is good for the economy. Investors are confident when they see market integrity in action, and this confidence is what makes markets work smoothly, which is what market integrity is, about. So, market integrity and investor protection are essential for the economy to grow. Regulatory Authorities play a prominent role in maintaining market integrity by monitoring trading activities and enforcing compliance with market regulations. Market surveillance systems play an effective role in identifying irregular trading behaviour and preventing practices that may harm investors. Consequently, protecting investors and ensuring market integrity remain key objectives of capital market regulation worldwide.

Global Regulatory Perspective

Globally, regulatory authorities are recognising the potential of Artificial Intelligence in strengthening market surveillance and investor protection. Global regulators, especially in developed countries, have started adopting AI-driven systems to monitor, prevent, and detect fraudulent activities. Financial regulators are also emphasising the responsible and ethical use of AI to ensure transparency and accountability in financial markets.

At the same time, global regulators face challenges related to data privacy, algorithmic bias, and regulatory coordination across jurisdictions. This section highlights the importance of integrating advanced technologies like AI into market surveillance systems to maintain market integrity in an evolving financial landscape.

Objectives of the Study

- The objective aims to explain the understanding of the concept of artificial intelligence and its relevance in capital markets. It focuses on the need for AI in traditional surveillance systems and how it will help monitor and foster the efficiency of capital markets.
- This objective focuses on examining the importance of market surveillance in ensuring fair and transparent functioning of capital markets. It emphasises the requirement of effective market surveillance in capital markets.
- This objective seeks to study suggested policy measures for the effective use of AI in capital market regulation. It also focuses on how AI -based tools improve monitoring and assist regulators in monitoring the financial markets.
- This objective emphasises the challenges and limitations associated with the use of artificial intelligence.
- This objective aims to find contributions of the researchers for market surveillance modern systems and highlights the unexplored areas and proposes the recommendations for policymakers and regulators.

Review of Literature

Traditional market surveillance systems

In recent years, capital markets have undergone significant transformation due to technological advancement and the widespread use of digital platforms. The increasing use of such platforms, like algorithmic trading, has created challenges for conventional market surveillance systems, which often fail to detect such complex frauds. As a result, scholarly research and regulators have emphasised the role of artificial intelligence-based tools to strengthen market surveillance in capital markets. Existing studies examine the effectiveness, regulatory implications, and ethical concerns associated with AI-driven surveillance systems. This review critically scrutinises the role of AI in market surveillance systems and how it should be implemented by human intelligence. It posits the need for AI and identifies gaps in market surveillance which must be covered by modern technology. As a result, scholars and researchers have increasingly emphasised the role of Artificial Intelligence (AI) - based tools in strengthening market surveillance in capital markets.

Studies on AI and Market Surveillance

Artificial intelligence has emerged as a transformative force in this domain, offering advanced capabilities for market surveillance that transcend traditional methods (Kholia, 2025)¹. Several studies examined the application of artificial intelligence in market surveillance systems. Ana Catarina Fontes (2022) conducted a study on “AI-powered public surveillance systems: why we (might) need them and how we want them” with the objective of examining the deployment of AI-powered surveillance technologies, particularly real-time facial recognition systems and contact tracing applications in public spaces. The study discussed a three-dimensional analytical framework comprising the function dimension, consent dimension, and societal dimension to assess both the potential benefits and risks of AI-based surveillance systems.

Tushar Kholia (2025) postulated that AI revolutionised the capital market by playing several roles. This study helps in our research to understand the role of AI in capital markets. The findings suggest that Artificial Intelligence (AI) revolutionised the capital markets through algorithmic trading, portfolio management, market surveillance, and predictive analysis. The study focused on balancing AI-driven systems with human intervention. This study is relevant to our research because it emphasised the role of AI in financial markets and the market surveillance by regulators.

Generative AI and Financial Market Monitoring

Artificial Intelligence (AI) has also proven to be a powerful tool for detecting insider trading and market manipulation. Traditional market surveillance often relies on predefined rules and human intelligence. Human-based systems are inefficient at detecting sophisticated trading strategies or coordinated fraudulent behaviour. Recent studies have examined the growing implications of generative artificial intelligence, particularly Large Language Models (LLMs) such as ChatGPT, for financial markets. This stream of literature highlights the ability of AI-based language models to analyse unstructured financial data, including annual reports, earnings call transcripts, and analyst reports, to extract sentiment and interpret qualitative information. The findings suggest that AI-driven sentiment analysis enhances the evaluation of

corporate performance and improves market transparency by reducing information asymmetry. Furthermore, existing research also explores the broader influence of generative AI on corporate policies and strategic decision-making. While these studies emphasise the transformative potential of generative AI in financial analysis, they also point to challenges related to governance, accountability, and regulatory oversight. This literature is relevant to the present study, as sentiment interpretation and disclosure monitoring are important components of modern market surveillance systems in capital markets. However, existing studies have received limited attention in capital market surveillance. The studies explored AI only as a regulator and monitor. The findings do not show the challenges and solutions AI provides for fraudulent activities. The study highlights that AI applications such as risk management, fraud detection, and credit scoring are increasingly used by financial institutions.

Existing literature has examined the role of artificial intelligence in improving decision-making and efficiency in financial institutions. Studies find that AI enables organisations to analyse large datasets and make more accurate predictions. The study shows a continuous increase in AI adoption in financial markets over the years, indicating the growing importance of AI in modern financial systems. Moreover, Research indicates that AI systems assist human traders by enabling high-frequency trading. The finding suggests that applications such as algorithmic trading, risk management, fraud detection, and credit scoring are among the most widely used AI-driven tools. This technological integration enables regulators and market participants to proactively identify and address illicit activities, fostering greater transparency and stability within capital markets (Petrillo et al., 2020).

A key contribution to understanding how regulators adopt Artificial Intelligence (AI) in financial oversight comes from the Financial Stability Board (FSB) 2020 global survey. The survey shows that AI has become an important tool for supervisory technologies worldwide. In contrast, it also states that actual use of AI is not consistent across different areas. Unexpectedly, even though AI technology has advanced rapidly, its use in core market surveillance activities-such as detecting manipulative trading patterns -has not expanded as much as in other areas like analysing misconduct or improving reporting.

Another contribution comes from a World Bank study (2018), which postulated early practical applications of supervisory technology. This study helps distinguish between Suptech and RegTech. Suptech is used by regulators to improve market supervision, whereas RegTech is used by financial institutions to streamline compliance processes.

In conclusion, the history of algorithmic trading and AI reflects a continuous quest for efficiency, speed, and precision in financial markets. From early computational experiments to the machine learning revolution, each era has contributed to the ever-evolving landscape of algorithmic trading, shaping the way financial markets operate today (Swathi and Pahuja, 2024). Algorithmic Trading, often referred to as algo-trading or black-box trading, refers to the use of computer algorithms to automate the process of trading financial instruments (Pothumsetty, 2020). These algorithms are designed to follow a set of predefined rules and execute trades at speeds and frequencies impossible for human traders (Gerner-Beuerle, 2022). Algorithmic Trading, a paradigm shift in financial markets, represents the intersection of advanced technology and financial strategies (Currie et al., 2022). Despite many advantages, it presents challenges for regulators, as the complexity and speed of AI-enabled trades require

sophisticated monitoring tools. For instance, Janardhan Reddy examines in his study that AI employs sophisticated techniques, including supervised learning, anomaly detection, natural language, and network analysis, to identify market manipulation more effectively than traditional systems.

Limited focus on AI as a regulatory surveillance tool

The existing literature highlights the benefits of trading, portfolio management, and general market analysis. There is limited research on AI as a regulatory surveillance tool. The literature mainly focuses on how AI improves efficiency for financial institutions, examining its practical application by regulators to detect fraud, insider trading, and market manipulation. Moreover, Challenges faced in capital markets are still unexplored, such as data bias, algorithmic.

Transparency, ethical concerns and integration with human intelligence or sight. Therefore, there is a need for research that addresses how AI can be effectively implemented to strengthen market surveillance, enhance transparency, and protect investors.

Research Methodology

Research is defined as a systematic, scientific investigation undertaken to establish facts, solve problems, and reach new conclusions. It is "a scientific and systematic search for pertinent information on a specific topic" (Kothari, 2004, pg 1). The research process comprises sequential steps, beginning with the identification of a research problem, followed by the formulation of a research design, sampling strategy, data collection, analysis, and interpretation.

Research Design

The research design serves as the master plan or blueprint for conducting a study. It outlines the framework for data collection, measurement, and analysis, ensuring that the research question is answered validly, objectively, and accurately. The study adopts a systematic literature review approach to examine the role of artificial intelligence in market surveillance within capital markets. This type of review is used to collect, analyse, and synthesise the existing academic literature, regulatory reports, and policy documents related to AI-based surveillance systems. This approach is best for our study because the topic is interdisciplinary and involves perspectives from finance, technology, and regulation. The Systematic literature review was selected over narrative and scoping reviews because of its methodological rigour and replicability.

The present study uses a descriptive and explorative research design. Descriptive research helps explain the concepts of artificial intelligence, market surveillance, and capital markets, while an analytical approach helps examine the role of artificial intelligence in strengthening market surveillance mechanisms. This design is appropriate as the study aims to analyse existing literature, regulatory frameworks, and theoretical developments rather than testing hypotheses through primary data collection. The research does not test hypotheses but focuses on conceptual understanding and analytical interpretation of secondary data.

Nature of the study

This study is conceptual and qualitative in nature. The research focuses on theoretical analysis, interpretation of existing studies, and evaluation of regulatory perspectives related to AI-based surveillance systems. It emphasises understanding the application of artificial intelligence in market surveillance and its implications for capital market regulation.

Sources of Data

The study is based entirely on secondary data, collected from reliable and authentic sources. Primary data is not selected due to limited availability of sources related to regulatory surveillance systems and the technical nature of artificial intelligence applications.

The major sources of secondary data include:

- SEBI Reports and other regulatory publications such as the Financial Advisory Board
- Research papers published in national and international journals
- Articles from reputed databases such as Google Scholar, SSRN, Springer, and ScienceDirect
- Books, working papers, and conference proceedings related to artificial intelligence and financial markets
- Relevant websites and policy documents

Using these sources ensures that the analysis is credible, up-to-date, and relevant to understanding the role of AI in market surveillance. Specifically, this research will involve a systematic review of existing literature, industry reports, and real-world case studies to identify key strategies, benefits, and challenges associated with integrating AI and machine learning technologies into regulatory reporting and market surveillance frameworks (Hajj & Hammoud, 2023; Padmanabhan, 2024).

Methods of Data Analysis

The collected literature has been analysed using thematic and content analysis. The approach is organised in well-defined thematic categories, enabling coherent interpretation of findings.

- The First theme focuses on the applications of artificial intelligence in market surveillance, examining how AI tools such as machine learning algorithms, anomaly detection models, natural language processing, and graph-based techniques are employed to monitor trading activities, analyse large volumes of transactional data, and generate surveillance alerts.
- The Second theme addresses regulatory and supervisory technology (SupTech) Frameworks, exploring how regulatory authorities integrate AI-based tools into supervisory processes.
- The third theme focuses on challenges, ethical concerns, and limitations of AI-based surveillance systems. This study highlights issues related to data quality, algorithmic bias, model opacity, high implementation costs, and over-reliance on automated decision-making. Moreover, the literature helps identify institutional and technical barriers that limit the scalability and adoption of AI surveillance systems, particularly in emerging markets.

- The final Theme examines the role of AI in detecting market manipulation and fraud with particular attention to practices such as spoofing, wash trading, insider trading, front-running, and price manipulation. It also helps uncover hidden relationships between market participants, assess the effectiveness of AI models in identifying abnormal trading patterns, and reduce false positives compared to conventional surveillance systems.

Ethical considerations & Limitations

The Study follows ethical standards applicable to secondary research. All sources have been properly cited to maintain academic integrity. Since the research is based on publicly available data, there are no confidentiality or privacy concerns. However, the study has certain limitations. Rapid advancements in artificial intelligence may cause some findings to become outdated over time.

Challenges And Limitations

Despite growing adoption of Artificial Intelligence in market surveillance, regulators still face challenges and limitations in effectively implementing regulatory systems. While AI offers various potential solutions, its deployment still raises ethical, technical, regulatory, and operational concerns that must be carefully addressed.

Technical and data -related challenges

One of the most critical challenges in AI-based market surveillance is the technical and data-related challenge. AI systems rely heavily on large volumes of accurate, clean, and well-structured data to generate meaningful insights. However, Capital market data is often collected from multiple sources, which are fragmented and inconsistent in nature. The data is collected from various trading platforms, intermediaries, and exchanges. This type of data is historical, inaccurate, and biased, which can lead to false alerts, misclassification of trading behaviour, and ineffective surveillance systems.

Explainability and Black-box challenges

The major problem of adopting AI-driven tools is lack of transparency; many AI models, particularly those based on machine learning and deep learning techniques, operate as “black boxes”. This lack of transparency brings a major limitation for regulators, as it hinders decision-making. Surveillance decisions must be explainable, auditable, and legally defensible. Regulators might hesitate in the absence of clear reasoning behind AI-generated outputs. Moreover, they can't rely fully on automated systems, especially in legal actions.

Regulatory and legal challenges

Artificial intelligence is evolving much faster than the laws and regulations enacted by regulatory authorities. It is difficult to determine who is responsible if an AI system makes a mistake, gives false signals, or causes losses. It also creates confusion in legal responsibility, data use, and compliance requirements.

Human resources and their skill gaps challenges

AI-driven systems require effective implementation by specialised technical expertise, including data science, machine learning, and financial engineering skills. But Regulators face shortages of skilled and expert personnel who are capable of designing, managing, and interpreting AI systems. There is a risk of over-reliance on automated outputs or misinterpretation of AI-generated alerts because of a lack of adequate human expertise. There is a requirement for continuous training and capacity building for effective surveillance systems.

Limitations of the Present Study

The study is primarily based on secondary data and conceptual analysis, which limits the ability to empirically assess the real-world effectiveness of AI-based market surveillance systems. The study restricts the depth of practical insights because of a lack of primary data such as interviews with regulators or case-specific enforcement outcomes. The study focused largely on selected regulatory frameworks and did not fully capture all the variations across global markets.

Conclusion

The present study focused on the role of artificial intelligence in strengthening market surveillance systems in capital markets for market integrity and investor protection. The review of existing literature, regulatory reports, and institutional studies. The research highlights that artificial intelligence has gradually transformed how market surveillance is conducted. Traditional surveillance is no longer sufficient to address complexity, data volume, and the speed of financial systems. It largely depends on rule-based alerts and manual monitoring.

The observations imply that AI-based tools such as machine learning algorithms, natural language processing, anomaly detection models, and network analysis appreciably enhance the ability of regulators and stock exchanges to detect irregular trading behaviour, market manipulation, and fraudulent activities. These technologies are useful in monitoring high-frequency and algorithmic trading environments, where human intervention alone is inadequate.

The study also shows that the integration of AI within supervisory technology (SupTech) frameworks has strengthened regulatory oversight by enabling risk-based supervision. The integration of AI in regulatory frameworks is driving a transition from reactive supervision to proactive and data-driven surveillance models. Nowadays, Regulators are using AI to prioritize high-risk cases, reduce false alerts, and improve decision-making efficiency. As a result, AI contributes immensely to enhancing market integrity and safeguarding investor interests.

Despite its potential benefits, the adoption of AI in capital markets is still limited by various limitations. The study highlights several challenges, including lack of data quality, algorithmic opacity, explainability issues, ethical concerns, regulatory uncertainty, and shortage of skilled professionals. In developing and emerging markets, Regulators face many technological and institutional constraints that hinder the effective implementation of AI-based surveillance systems. Additionally, Concerns related to bias in historical data and over-reliance on automated decision-making raise important questions about fairness and accountability. To conclude, the study states that although artificial intelligence possesses significant potential to

enhance market surveillance systems, technology cannot work alone. The success of Market surveillance can't be determined by the technology alone; it depends largely on how responsibly and thoughtfully it is implemented by human intelligence within existing regulatory frameworks. Strong regulatory governance is necessary to ensure that AI tools operate transparently, fairly, and in alignment with the objectives of market integrity and investor protection.

Therefore, Artificial Intelligence should not be viewed as a replacement for human regulatory expertise but rather as a complementary tool that enhances decision-making efficiency and effectiveness. A balanced approach is required that combines technological innovation with regulatory responsibility, and human accountability is essential for ensuring that AI contributes positively to the long-term stability and credibility of capital markets.

Implications

Regulatory and Policy Implications

The study suggests that regulators and policymakers are responsible for maintaining market integrity and protecting investors. As Artificial intelligence is becoming a core component for market surveillance systems, there is a need for regulators to develop a clear, comprehensive, and adaptive regulatory framework for use. Existing regulators can't keep up with the complexities and rapid development of modern models. Existing regulators are mainly designed for traditional, rule-based surveillance systems and are not fully able to address the complexities introduced by AI-driven systems.

Moreover, Regulators should formulate explicit guidelines concerning transparency, accountability, data governance, and ethical deployment of AI technologies. One major concern is explainability. AI-driven tools must be interpretable to regulators so that regulatory decisions based on AI outputs can be clearly understood, justified, and defended in legal and administrative contexts. Therefore, AI is not merely a technical preference but a regulatory necessity, and it must be clearly explainable.

Furthermore, policymakers must address issues related to data privacy and security. AI surveillance systems mainly rely heavily on large volumes of sensitive and transactional data. Strong data protection policies are essential to prevent misuse, unauthorised access, or discriminatory outcomes. The study also states the importance of international regulatory coordination. Regulatory authorities can be strengthened by harmonised standards and cross-border cooperation.

Implications for financial Institutions

Financial institutions include brokers, investment firms, and trading entities. As regulators, the increasing adoption of AI is becoming an implication for financial institutions. Market participants are expected to maintain higher standards of transparency, ethical conduct and compliance due to sophisticated regulatory surveillance. Firms that use sophisticated AI-driven systems alongside traditional surveillance systems must ensure that their trading strategies are well-documented, auditable, transparent, ethically sound, and aligned with regulatory expectations.

The study also observes the growing relevance of Regulatory Technology (RegTech) solutions for financial institutions. Firms can easily manage regulatory risks, detect potential violations internally, and respond more effectively by adopting AI- driven compliance systems and monitoring tools. Additionally, the link between RegTech used by institutions and SupTech used by regulators can lead to more efficient regulatory interactions and reduced compliance costs.

Academic and research implications

The study mainly contributes to the growth of interdisciplinary literature at the intersection of finance, artificial intelligence, and regulation. The study identifies various research gaps that warrant further scholarly attention. Most existing studies are theoretical and conceptual, which limits empirical evidence on how effective AI surveillance works. Future research may focus on emerging and developed markets to understand how AI adoption and outcomes are influenced by institutional capacity. It also focuses on research on ethics, explainability, and bias concerns by adopting AI-surveillance systems. New technology, including Blockchain, Federated learning and Decentralized data systems, may enhance AI-based surveillance and open new research opportunities for researchers.

Societal and investor implications

AI -based surveillance systems offer various benefits to society as well as investors. It improves the fairness and transparency of capital markets. AI helps regulators detect market manipulation, insider trading, and fraudulent activities more effectively. Fair and well-regulated markets increase public confidence and support stable economic growth. For instance, AI-driven tools reduce unfair activities, which boosts the confidence of both society and investors. Investors, especially retail investors, feel that markets are transparent and well monitored; their trust in the market increases due to the adoption of AI-driven surveillance systems. AI-driven surveillance is much better than traditional surveillance systems because it can easily detect manipulation or fraudulent activity by insiders. However, the use of AI also raises important concerns related to data misuse, algorithmic bias, privacy, and accountability.

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