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The Role of Artificial Intelligence in Predicting Risks in Financial Markets

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Abstract:

This research addresses a vital topic: "The Role of Artificial Intelligence in Predicting Risks in Financial Markets", in light of the growing challenges faced by modern financial markets due to price volatility and rapid global changes. These challenges highlight the urgent need for advanced tools to predict risks and maintain financial stability. The main objective of this study is to explore the theoretical framework of artificial intelligence (AI) techniques and their applications in the financial sector, with a particular focus on their ability to predict risks in financial markets. The research analyses key The most important machine learning tools and algorithms by reviewing relevant academic literature and prior studies. The study adopts a descriptive analytical methodology, relying on an extensive theoretical review of recent academic sources. It aims to provide a comprehensive scientific perspective on the effectiveness of AI in risk management and to clarify the differences between AI-based and traditional risk prediction methods. Ultimately, the research seeks to offer conclusions and recommendations that will benefit financial decision-makers and contribute to guiding further applied research that aims to enhance the use of AI in promoting stability and efficiency in financial markets.

Keywords: Artificial Intelligence, Financial Markets, financial risks, Risk Prediction, Machine Learning.

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Introduction:

The research highlights the vital role that financial markets play in driving economic growth, while pointing to the challenges posed by various risks to the stability of these markets. The adoption of advanced technologies, particularly artificial intelligence, is important in predicting and managing risks effectively. The study builds on the growing academic interest in the use of AI technologies in the fields of risk forecasting and analysis.

Research problem

Despite significant advances in traditional financial analysis tools, financial markets still suffer from difficulties in predicting sudden fluctuations and unexpected risks. In light of these challenges, there is a need to seek more efficient and accurate alternative solutions in the field of forecasting and risk management. Artificial intelligence is one of the most prominent of these solutions. Hence the problem of this research about the effectiveness of artificial intelligence technologies in improving the prediction of financial risks compared to traditional analytical methods.

Research objectives

- Review the theoretical framework of artificial intelligence and its main concepts.
- Analyzing the nature of risks in the financial markets and their classifications.
- Study the theoretical relationship between artificial intelligence technologies and financial risk forecasting.

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- Assess the feasibility of using artificial intelligence in reducing the effects of financial risks at a theoretical level.

The importance of research

The importance of this research lies in its contribution on several interrelated levels, as scientifically, it strengthens the theoretical framework for understanding the intersection between AI technologies and the financial sector, which opens up new horizons for research in this field. On a practical level, research is a good step that can be built on in developing future applications based on AI tools in financial data analysis and risk management. On the academic side, it provides scholarly content that can be relied upon in academic studies interested in the management of financial risks and related technological developments.

- Research Methodology

This research relied on the descriptive-analytical approach by reviewing and analyzing previous studies, scientific articles, and specialized books. The research tool is based on a systematic literature review that includes a theoretical comparison between different concepts and techniques relevant to the subject of the study.

- Some previous studies

1-study (al-muhaini et al., 2025): a research entitled "The role of using artificial intelligence technologies in managing the risks of climate change as a basis for improving the financial performance of commercial banking banks", the aim of the research is to explain the role played by artificial intelligence technologies to manage risks and climate changes represented by physical risks and transitional risks and how these variables can affect The impact of these risks on these indicators was measured through the integration of these technologies with banking governance, and the study found that there is a significant disparity between the banks of the study sample in the adoption of technologies for artificial intelligence, which led to enhancing the efficiency of the management of This has had a positive impact on the financial performance of banks.

I.2-study (Zouzou and besnan, 2023): master thesis entitled "Artificial Intelligence in financial markets", the thesis aimed to demonstrate the legal implications of the use of artificial intelligence technologies.

in the financial market as well as to reveal the use of intelligence mechanisms and techniques in the face of the risks and what are the most important uses within the financial markets, the study concluded I have also concluded that there are some special conditions that must be met to enter the financial market, and that despite the various initiatives undertaken by Algeria, artificial intelligence applications in the financial markets are still only an auxiliary element, and that it is not possible to dispense with or abandon the main market devices To develop artificial intelligence technologies, however, they are still very far from the optimal and correct exploitation of them within the market, although this use greatly helps to get rid of human errors.

3- Study (Koteche, 2025): Research entitled “Artificial Intelligence in the Stock Market The Trends and Challenges Regarding AI-Driven Investments”

The aim of the research is to find out how artificial intelligence can be used to address the challenges facing the financial market, including inefficiency, volatility, and barriers of entry, which hinder access to financial markets and their reliability for investors, how artificial intelligence can enhance market efficiency, investor decision-making, accessibility in the stock market, and what are

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the most important ethical and regulatory challenges associated with Artificial intelligence has the potential to transform the stock market into a more efficient and inclusive environment, and this requires responsible integration and strong supervision.

4- Study (Bahoo&other, 2024): Research entitled "Artificial intelligence in Finance: comprehensive review through bibliometric and content analysis"

The study aims to provide a comprehensive look at the current research on artificial intelligence and identify research trends that need further research, and based on this, the tools of biometric analysis and content analysis were used, and for this a large number of articles published between 1992 and March 2021 were studied and examined, and it was found that the literature on this topic has expanded significantly since The beginning of the XXI century, where it covered a variety of countries and various artificial intelligence applications in finance, including forecasting systems, rating systems, detection and early warning, Big Data Analysis and its application to the stock market and trading, as well as forecasting volatility, portfolio management, risk assessment related to defaults, cryptocurrencies, derivatives and credit risks in banks, in addition to analyzing investor sentiment and managing Foreign exchange, respectively.

The current research is characterized by highlighting the importance of artificial intelligence as a technological technology that can be used to predict risks in financial markets through the use of existing data in financial markets. This research is distinguished from previous studies by its direct focus on risk forecasting in financial markets, unlike some studies that focused on climate risks, legal dimensions, or general trends of artificial intelligence technologies. And that this research complements the findings of previous studies, while providing a new, more in-depth and realistic perspective.

- Theoretical framework of research

- The Origin and Concept of Artificial Intelligence:

The origins of artificial intelligence are related to a conference held at Dartmouth University in 1955, where the goal was to enable machines to mimic human thinking. The beginning of AI was a long and centralized path. Advances in information technology during the mid to late twentieth century have automated data processing in a unified manner. After years of development, both AI theory and techniques are more mature than they were before. AI research has endured many volatile periods, and after several setbacks, it saw a new recovery in 2012, supported by the deep learning revolution. In January 2016, at the Davos Forum, both artificial intelligence and big data science were considered an essential part of the industrial revolution. AI has evolved from a simple simulation of human behavior to a complex, multi-functional application-focused system, enabling it to handle difficult tasks. Artificial intelligence represents progress from being just a tool to enhance human intelligence to achieving self-reflection and learning. Machine learning and deep learning technologies, linked to artificial intelligence, have become among the most advanced branches of the contemporary technological revolution (Aisha et al., 2024: 52).

Artificial intelligence is the transfer of human intelligence to machines, and has been defined as mimicking human intelligence in computers that can perform tasks that people would normally perform that often require human intelligence, such as problem solving, speech recognition, visual perception, decision-

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making, and learning (EissaSrour, 2025:134). Artificial intelligence is defined as the set of technologies that enable machines to sense, understand, act, and perform multiple functions that are comparable to those of humans. Artificial intelligence, also known as AI, is also known as" man-made thinking power", where the word" artificial "means" man-made", while the word" intelligence "means" thinking power " (LION& Ekefre, 2024: 85). As some have defined it as a large-scale field, based on various technologies based on human intelligence. These techniques use past experiences (such as a different data set) efficiently and intelligently (simulating human behavior) (Arsić, 2021: 28).

Artificial intelligence is a relatively new field in Computer Science, where it aims to develop and design intelligent computer systems that mimic human intelligence. These systems seek to perform tasks instead of people, and they serve to simulate human functions and capabilities through the use of their qualitative characteristics and logical and computational relationships. Artificial intelligence is associated with computer systems that are characterized by the characteristics of intelligence, the ability to make decisions and behave in ways that resemble human behavior in multiple areas. Artificial intelligence focuses on the design of systems that demonstrate aspects of human intelligence such as language understanding, learning, reasoning, and problem solving. It also shows some activities of the human mind such as understanding, creativity, education, perception, feeling, with the goal of applying them to computers. (Ashur, 2024: 374) .

From the above, we find that artificial intelligence is a computer science that is interested in developing systems capable of simulating human intelligence in learning, understanding, problem solving and decision making, based on techniques and algorithms that enable machines to perform tasks with accuracy and speed sometimes exceeding human ability, while remaining based on human knowledge and programming.

- Characteristics of artificial intelligence:

Artificial intelligence has several characteristics, including: (Wasel, 2025: 231), (Al-humail, 2024: 636-635), (Abu Bakr, 2024 : 58), (Kouam, 2024 : 4)

A-the absence of time and space restrictions, as artificial intelligence applications can work non-stop and when applied in reality and spread in various institutions, they can be reviewed around the clock, because they are not committed to a specific time.

B-speeding up procedures, due to the need for modernization and administrative development, many organizations have entered information into their systems, and have diligently sought to take advantage of the capabilities of artificial intelligence in meeting the needs of citizens easier and faster, in addition to reducing costs.

C-direct and reliable monitoring is one of the advantages of artificial intelligence, as it can follow various work sites through screens, digital cameras and sensitive devices.

D-improved decision-making processes: AI technologies facilitate advanced data analysis, enabling better risk assessment, credit rating, and customized financial products.

E-learning ability, this ability includes learning from previous experiences and operations, in addition, it can improve performance by analyzing past mistakes. This ability also relates to the possibility of generalizing information and inferring similar situations, it is also selective and may lead to the provision of additional information.

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F-he does not have emotions like humans, which means that he cannot be manipulated, cooperate with him with the aim of deception or control the results. In addition, it serves to preserve human experience, helps reduce dependence on experts. It also does not feel tired or bored, and allows the production of multiple copies of the system to compensate for the need for experts, also, it aims to simulate a human in terms of thinking and style, which provokes new ideas that lead to innovation.

- Artificial intelligence in financial forecasting :

Trading financial instruments is one of the most important activities in the money market, forecasting in the money market is an attempt to determine the future value of financial instruments traded in the financial markets, as technical and fundamental analysis or time series analysis is used by most stock brokers while making forecasts. In fundamental analysis investors look at the intrinsic value of a security, the performance of the sector, the economy, the political climate, among others, to make an investment decision and avoid risks. As for technical analysis, it is the study of the development of securities by studying the statistics of market activity, such as prices and previous trading volumes.

The object of a possible prediction can be the future price, price volatility or market direction. In forecasting there are two types: fictitious forecasting and spot forecasting, which is used in stock market forecasting systems. In fictitious forecasting a set of rules and forecasting the price of a future security are determined by calculating the average price. As for instant forecasting, it is required to use the internet to see the current price of securities. The advancement of technology has led to the introduction of machine learning techniques for forecasting systems in financial markets (Reddy, 2018: 1032). Machine learning is one of the artificial intelligence models used in financial forecasting and is explained below:

- Machine learning: it is part of artificial intelligence, and is considered a technology for analyzing data and learning from it, and then using this knowledge to make informed decisions, machine learning gives machines the ability to learn based on data analysis, as machine learning refers to a comprehensive system that focuses on using data and algorithms automatically, without the need for programming, while humans learn to perform Tasks through experience and practice, machine learning algorithms learn how to complete tasks using additional data and various models. (Aisha et al., 2024 : 51) . Machine learning contains a set of algorithms such as decision trees, random forests, neural networks, linear regression and logistic regression. Although machine learning technologies share certain characteristics such as self-learning, the ability to learn and update, the principles on which each of them is based are different. Each algorithm has specific uses, such as pattern prediction, classification, and prediction (Hassan, 2025: 681).

Machine learning includes several techniques, including supervised learning (where the model learns using classified data), unsupervised learning (where the model identifies patterns and relationships in unclassified data), and deep learning (where the model interacts with a certain environment and receives positive or negative feedback). These methods enable models to learn from huge datasets, identify patterns, predict asset price movements, and take actions with increasing levels of autonomy (Ng, 2024: 2).

Supervised learning is based on the collected data, tries to predict the results using partial least squares, Principal Component Analysis,

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minimum absolute shrinkage coefficient, selection operator, simplex regression and supporting vector machine, artificial neural networks, deep learning techniques.

Unsupervised learning is used to better classify data and to create clusters that enable signals to be included in decision-making. Deep networks and neural networks are seen as part of supervised and unsupervised machine learning because they can be applied to predict outcomes as well as learn from data and provide more reliable indicators for risk management, and artificial neural networks are widely used to predict various risks (Arsić, 2021: 28).

As for deep learning is a part of machine learning that aims to improve the current structure of this technology, it includes deep learning that detects and creates different patterns and trends necessary for the detection or classification of unstructured data, as this type of learning relies on artificial neural networks, where algorithms are organized within multiple processing layers, which facilitates learning complex tasks, These networks mimic human intelligence in their operations, thereby reducing the need for manual intervention (Aisha et al., 2024 : 51) .

Machine learning algorithms are fundamental in forecasting processes, they analyze patterns found in old data, estimate various parameters, and help predict complex scenarios in the future (almihi et al., 2025: 269).

- The impact of the use of artificial intelligence in improving risk forecasting in financial markets.

Market risk refers to changes in the values of financial instruments "or contracts" due to unexpected fluctuations in asset prices, i.e. commodity prices, interest rates, foreign exchange rates and other market indicators, and this indicates that each participant in the financial markets is exposed to market risks directly or indirectly, based on financial strength and the size of the exposed position In this regard, financial institutions strive to manage these risks effectively, by choosing the type of market risk they wish to be exposed to base on their knowledge of market price fluctuations, artificial intelligence technologies can be useful, and their application in market risk management may lead to significant improvements, and machine learning contributes as a technology Fundamental to artificial intelligence, significantly in managing market risks better . (Arsić, 2021: 29)

In the first stage of cooperation between artificial intelligence and the financial sector, it focused on reducing the workload of financial practitioners through the computing capabilities of computers, and until the Eighties of the last century, expert systems (knowledge-based intelligence system) were used in the financial sector to predict market trends and provide customized financial plans, as the basic expert system includes six components, namely: Knowledge base, database, inference engine, annotation tool, knowledge acquisition, user interface. Hodgkinson Walker has developed an expert rule-based system for realizing the decision-making process, which helps financial institutions make decisions. (Xie, 2019:2)

AI big data analysis is characterized by processing large amounts of high-speed data from multiple sources and relies on machine learning, and as evidenced by its technical ability, big data analysis consists of four aspects: volume, speed, versatility, and honesty. Volume refers to the huge amounts of data generated daily, such as stock prices, financial reports and media coverage. As for speed, it is the speed of producing this data and how fast it is necessary to maintain its relevance.

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In the financial market, speed is an extremely important factor for fast-moving strategies and short-term trading. Diversity refers to the data format used in the processing of structured data, such as spreadsheets, and unstructured data, such as news articles. Finally, credibility focuses on the reliability of data, which is an essential aspect of the financial market due to the large volume and speed of information. Machine learning integrates the four aspects of big data analytics to identify key patterns and trends, and uses these patterns to create its own algorithms, while building on its knowledge through the continuous processing of data in real-time (Kotecha, 2025: 712). The main technology of artificial intelligence is machine learning, which makes it possible to prepare and predict data, which contributes to making decisions related to various risks. (Arsić, 2021: 28) since it can be used to analyze huge market data and predict the price movement of stocks or other assets, machine learning algorithms can identify complex patterns and provide more accurate investment signals. (Hidayat, 2024:3). In the stock market, predictive analysis is crucial and is often used for risk management because it can help hedge against market risks such as high volatility, and artificial intelligence addresses the volatility problem by leveraging sentiment analysis to predict how news and public sentiment will affect stock prices. These AI-enhanced models also reduce the ambiguity of public opinion by analyzing real-time Sentiment data and providing comprehensive reports on market sentiment. In general, as discussed by the Institute of Chartered Financial Analysts (CFA), AI-enhanced models show better accuracy in predicting market trends and financial risks than traditional methods. (Kotecha, 2025: 720) Moreover, hiring a human financial advisor may be much more expensive than investing based on artificial intelligence or hiring an AI-specialized advisor. Artificial intelligence can make investing more accessible to the general public, which may provide a more convenient option that people can use instead of financial advisers. (Kotecha, 2025: 719)

From the above, we find that artificial intelligence has contributed to improving market risk management by relying on predictive analysis that reduces the impact of high volatility and takes advantage of sentiment analysis to predict the impact of news and public opinion on financial markets. AI-enhanced models have also proven their superiority in forecast accuracy and risk management, as well as their role in reducing financial consulting costs, which has made investing more inclusive and accessible to a wide segment of investors.

Thus, it can be said that artificial intelligence represents a strategic opportunity to enhance the efficiency and effectiveness of financial markets, with the need to adopt thoughtful policies to ensure optimal utilization of these advanced technologies.

- Conclusions:

- Machine learning is the main technology of artificial intelligence, as it enables to analyze huge market data and predict price trends, with the ability to detect complex patterns and provide accurate investment signals.
- Artificial intelligence enhances market risk management, as it has proven its ability to support financial institutions in dealing with market risks resulting from asset price fluctuations, by predicting and providing more effective solutions compared to traditional methods.
- AI-enhanced models show remarkable superiority in forecasting accuracy and Financial Risk Management, which makes

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them a more efficient alternative compared to traditional analytical tools.

- Relying on artificial intelligence in investing may reduce the cost compared to hiring traditional financial advisers, and make investing more accessible to the general public.

- Recommendations

- Promoting the use of machine learning: encouraging organizations to integrate machine learning algorithms into risk management strategies because they provide high accuracy in forecasting and decision-making.

- Integrate machine learning techniques and predictive analytics into risk management strategies and hedge against market fluctuations to enhance forecast accuracy.

- Expanding the provision of financial advisory systems based on artificial intelligence to make investment services available to wider segments of society at a lower cost.

- Encouraging scientific research and continuous development in the field of financial artificial intelligence to constantly update models and algorithms, in line with the rapid developments in global markets.

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