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REVIEW PAPER

The Role of Modern Information Technologies in Financial Analysis and Market Forecasting

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ABSTRACT

Modern information technologies have undergone significant transformations and have become a key element in financial analysis and market forecasting, which have created new tools for influencing the dynamics of the development of global economic processes. The strengthening of the role of technologies of big data analysis, processing of communication and information networks create new approaches to the implementation of financial analysis, ensuring greater accuracy of forecasts and efficiency of investment management. The purpose of the article is to study the role of modern information technologies in the transformation of financial analysis, forecasting and identification of trends facing financial analysts. The article describes the process of technology integration, which significantly increases the efficiency of financial market analysis and allows governments and companies to better adapt to the changing conditions of the global economic environment. The obtained research results indicate a steady trend towards increasing the role of information technologies in the financial sector, which requires specialists to constantly update their knowledge and skills for the effective use of these tools. The conclusions of the conducted research emphasize the importance of integrating technologies into financial analysis and forecasting, and strengthening the need to develop new strategies and approaches for using digital innovations in the financial sphere. Special attention in the article is paid to the prospects of development of software, information and communication sphere in providing financial analysis and forecasting to improve future innovative trends and challenges that may face the economic global space.

HIGLIGHTS

⊙ Information technologies, including artificial intelligence, machine learning, blockchain, and big data analytics, have become indispensable in financial analysis, revolutionizing market forecasting and providing crucial support for effective decision-making.

⊙ The integration of advanced technologies in the financial sector, as exemplified by leading corporations like Goldman Sachs, JPMorgan Chase, and Microsoft, not only enhances predictive modeling and risk management but also underscores the need for continuous innovation and adaptation to changing market conditions to ensure competitiveness and innovation in the global economy.

Keywords: Information technologies, financial analysis, market forecasting, financial instruments, investment funds, big data

The development of information technologies in financial analysis characterizes a new digital era in the management of financial markets and investment strategies. Technological progress is largely due to the emergence and rapid development of cloud technologies, machine learning, blockchain, big data analytics and other modern technological innovations. They became revolutionary in revealing complex relationships in financial data that had previously gone unnoticed. The available capacities of data centers allow analyzing large amounts of information that the human brain cannot handle, revealing trends and regularities that are key to making informed investment decisions. Financial decentralization has provided a significant impact on the security and transparency of financial transactions, playing a key role in the development of cryptocurrencies and other forms of digital assets. Big data analytics has changed the way financial analysts work with unstructured data such as news, social media and economic reports, using that information to gain a deeper understanding of market conditions. The transformation of the economic policy of developed countries with the use of these technologies has far-reaching consequences. The development of digital technologies has prompted the governments of developed countries to rethink their approaches to the regulation of financial markets, currency policy and macroeconomic planning. Software and its increased power have become central to the development of more accurate economic forecasts and models that enable governments to better anticipate and respond to economic crises and changes. Cryptocurrencies have necessitated a revision of monetary policy and financial regulation, challenging governments to integrate new assets into the traditional financial system as electronic money contributes to the growth of global integration and interdependence of economies. As a result, governments need more coordinated international actions and policies in the field of finance. Forecasting the development of financial markets with the use of modern information technologies is becoming more and more accurate and reliable. The integration of cloud systems into analytical tools has provided the ability for deep and comprehensive analysis of market data that traditional methods cannot cope with, including forecasting stock trends, analyzing consumer

behavior and monitoring economic indicators in real time. Modern technologies significantly increase the ability of specialists to adapt investment and asset management strategies in response to rapidly changing market conditions.

LITERATURE REVIEW

Research problems of modern information technologies in financial analysis and market forecasting reveals a number of significant theses that emphasize the importance of this topic in the development of the global economy. The author (Baker, 2021) analyzes the application of machine learning and cloud technologies in the financial sector, emphasizing the potential of these technologies in providing forecasting accuracy and risk optimization. The hypothesis (Šimonová, 2019) focuses on the impact of blockchain technology on financial markets as a means of the highest transaction security and transparency in financial transactions. The importance of big data analytics and its impact on financial analysis and market forecasting is highlighted in research (Guo, 2022), which emphasizes the ability of these technologies to process huge amounts of data and reveal complex relationships between various economic indicators. The work (Caldecott, 2022) indicated that big data technologies are spreading in financial analysis, news structuring and social media review to determine market sentiment. A scholar (Chandni, 2023) examines the use of communication technologies in data collection for financial analysis, which includes monitoring assets and production processes. Research (Granda, 2020) shows how software can provide financial analysts with critical information about production performance and logistics, variable market price leverage, and investment strategies. The author (Shang, 2023) draws attention to the importance of data processing speed and quotations in the analysis of financial markets, pointing to the ability of modern technologies to reveal complex relationships and provide high-precision forecasting. The scientific approach (Gelashvili, 2020) focuses on using cloud technologies to optimize investment strategies, as they can adapt to changing market conditions. According to (Rosa, 2021), the importance of blockchain in ensuring the security and transparency of financial transactions and the potential in

preventing financial fraud at the level of government structures. The results of the article (Ginting, 2021) highlight how modern technologies can be used to effectively identify market trends and analyze consumer behavior. The author (Skocdopole, 2021) considers the use of analytical centers for automated analysis of financial reports, news, demonstrating improvement in the quality of decisions. The article (Bansal, 2021) describes the impact of information technologies on financial analysis and in the field of asset monitoring and logistics. The scientist (Vitéz-Durgula, 2023) emphasizes the role of quantum computing in financial modeling, pointing to their potential in solving complex computing tasks of stock exchange institutions and investment funds. According to the approach (Poudel, 2021), the need for the connection between digital innovation and the change of financial markets is increasing, emphasizing operational speed and a high level of security.

RESEARCH GOALS

The main goal of the research is a comprehensive analysis of the role of modern information technologies in financial analysis and market forecasting, with an emphasis on identifying key trends, challenges and opportunities they represent. The research problem is to identify innovation in the field of cloud technologies, machine learning, blockchain, big data analytics and processing of financial instruments to provide forecasting of market changes and risk management. As part of the research, a review of current scientific works and publications is provided, as well as providing practical cases of the use of these technologies in the financial sector. The main task is to determine how digital innovations can contribute to the accuracy of financial analysis and the effectiveness of forecasting, to identify the main vectors of development, the impact of technology on the future of financial analysis and market strategies.

MATERIALS AND METHODS

Several key methodologies were used to write the article, including literature analysis, the study of the experience of leading companies, and a review of the documentation of innovative technologies. The main method of research is the implementation of an in-depth analysis of academic sources and

scientific publications that relate to the use of information technologies in financial analysis and market forecasting, which made it possible to collect a comprehensive sample with information on the current state of affairs in the field of financial analysis. The latest trends are studied, the theoretical and practical aspects of the use of machine learning technologies, cloud tools, decentralized systems, big data analytics and other software tools are characterized. An analysis of relevant professional literature was carried out, which made it possible to assess the impact of the given technologies on the development of the financial sector and to identify key trends and challenges facing the industry in the global financial environment. An important area of research is the study of the experience of leading corporations, such as Goldman Sachs, JPMorgan Chase, Microsoft, which includes the analysis of their public reports, press releases, and analytical materials on strategies for integrating information technologies into financial analysis and management. The study of companies' practices allowed a deeper understanding of exactly how advanced technologies are used in the practice of financial forecasting and management, what advantages they bring, and how they affect decisions in the field of investments and risk management. The use of such an approach made it possible to assess the real possibilities and limitations of modern technologies for forecasting the development of the situation in the financial and commodity markets. An appropriate research method is to conduct a critical analysis of the official documentation of technologies used in the field of financial market forecasting, which includes familiarization with technical characteristics and instructions. To provide a comprehensive analysis of the role of modern information technologies in the financial sector, a detailed review and study of applied technologies related to innovations in financial markets and forecasting methods was carried out. Therefore, the given methodology made it possible to analyze the impact of technologies on the effectiveness of financial analysis and the consequences that contribute to increasing the accuracy of forecasting, reducing risks, optimizing cost and improving the overall productivity of financial operations.

RESULTS

Modern information technologies have become an integral part of the global financial landscape, playing a key role in financial analysis and market forecasting. They provide fundamental support for effective data collection, processing and analysis, which is essential for understanding market trends, assessing risks and determining investment strategies. The integration of advanced technologies such as artificial intelligence, machine learning, blockchain and big data analytics is changing the way financial institutions and investors make decisions. The importance of these technologies cannot be underestimated, as they allow us to effectively adapt to dynamically changing market conditions, ensuring competitiveness and innovation in the global economy. That is why the analysis of the impact of these technologies on financial markets and their role in shaping global economic trends is relevant and significant. Innovations in the field of IT contribute to the development of new financial tools, platforms and methodologies that allow to effectively analyze large volumes of data, forecast market trends and respond to global economic changes. The ranking of the most developed digital countries as of 2023 is shown in Table 1.

Table 1: Economies with the most GII indicators ranked top, 2023

Economy	Inputs	Outputs	Total
United States	6	7	13
Singapore	8	3	11
Israel	6	3	9
Switzerland	4	4	8
Hong Kong, China	5	3	8
Japan	4	3	7
China	2	4	6
Iceland	2	4	6
Malta	3	3	6
Finland	3	2	5
Estonia	4	1	5
Luxembourg	4	1	5

Source: *Global Innovation Index Database, WIPO, 2023.*

The data in Table 1, representing the economies with the largest number of high indicators in the Global Innovation Index (GII) in 2023, reflects a close relationship between the innovative activity of countries and their achievements in the field of information technology, which allows us to understand how well countries transform investments in innovation into specific technological achievements and economic development. Analysis of this data is important for financial analysis and forecasting, as innovation activity directly affects countries' economic growth, investment climate, and market volatility.

High-tech innovations have revolutionized financial analysis and market forecasting, bringing significant changes to the way data is collected, analyzed and interpreted. Artificial intelligence and machine learning play a key role in this process. Using machine learning algorithms, financial analysts can detect complex relationships between various financial indicators and economic variables, allowing them to develop accurate models to predict asset price movements, understand market trends and better assess risks (Levytska *et al.* 2022). Big data analytics has made significant contributions to financial analysis and forecasting. Thanks to the ability to process and analyze huge amounts of data, specialists can detect previously invisible trends and patterns of behavior in financial markets. In the context of geopolitical challenges, working with unstructured data such as news, social media, blogs and financial reports is of particular value. Processing large data sets provides researchers with a deep understanding of market dynamics, enabling informed predictions and strategic decisions.

Blockchain technology has made an important contribution to ensuring the security, transparency and efficiency of financial transactions. Its applications in financial analysis and forecasting include the creation of immutable and transparent records of transactions, which reduces the risks of manipulation and fraud. Decentralized technology has found application in auditing, where it helps track and verify financial transactions, increasing the reliability of financial reporting. Natural Language Processing (NLP) has opened up new opportunities for textual data analysis in the financial field. Using NLP, analysts can automate the process of collecting and analyzing large volumes of textual information, such as financial reports, news, social media posts, allowing to identify market sentiment, predict changes in markets and make informed investment decisions based on current and relevant information.

Table 2: Information technologies and their infrastructure in financial analysis and market forecasting

Technology	Characteristic	Infrastructure
Artificial Intelligence (AI) and Machine Learning (ML)	AI/ML systems analyze large volumes of financial data, revealing complex relationships. Used to forecast markets.	TensorFlow, PyTorch (for creating your own models), IBM Watson, Google AI Platform
Big Data Analytics	Quickly process and analyze large amounts of data, including social media, news, and more. Identifying trends and patterns.	Apache Hadoop, Spark, Tableau, Splunk
Blockchain	Ensuring security and reliability of financial transactions. Create unedited records for auditing and tracking.	Ethereum, Hyperledger, IBM Blockchain, R3 Corda
Internet of Things (IoT)	Data collection through sensors for analysis of production, logistics. Asset monitoring in real time.	AWS IoT, Cisco IoT, Siemens IoT, ThingSpeak
Natural Language Processing (NLP)	Analysis of textual information from media, including news and social networks. Work with financial reports.	Google BERT, OpenAI GPT, IBM Watson NLP, NLTK for Python

Source: Compiled by the author.

The implementation of advanced information technologies in the field of financial analysis and market forecasting is actively used in the activities of the world's leading corporations, as it provides quantitative advantages for conducting one's own activities. Goldman Sachs is one of the leaders in the financial industry, actively using machine learning and artificial intelligence algorithms to improve forecasting of market trends and risk management. The latest technology allows the company to more efficiently analyze large volumes of data, identify hidden patterns and make more accurate predictions. The company implements an infrastructure based on advanced machine learning algorithms - a large array of data and powerful models, which allows processing large volumes of financial data, including market indicators and economic reports. As a result, the company provides a deep understanding of market conditions and helps identify subtle trends and anomalies. The effectiveness of the company's approach lies in the ability to quickly adapt to changes in market conditions, which is critical for market forecasting and risk management.

JPMorgan Chase uses natural language processing to analyze financial documents and news, allowing the company to quickly respond to changes in the economic landscape and market sentiment. The application of NLP has significantly increased the efficiency of analysts by reducing the time required to process large amounts of textual information. This approach allows the company to quickly identify potential risks and opportunities in the market. The company introduced NLP technologies for the automated analysis of financial documents and news during 2022, as in the test mode, it can partially provide a quick response to important market events, allowing the company to identify risks and opportunities more quickly.

Microsoft is a dynamic technology company that actively integrates the capabilities of big data analytics into its business processes, as thanks to the use of powerful tools for processing and analyzing large volumes of data, it can accurately predict market trends, plan product strategies and optimize internal business processes. The company integrates big data analytics tools into its business model, using the Azure platform to collect, process and analyze financial indices, stock metrics, which allows the company to accurately predict market trends, optimize its products and strategies.

The advanced information technologies currently used by companies such as Goldman Sachs, JPMorgan Chase and Microsoft show significant potential in the field of financial analysis and forecasting. Corporations are demonstrating how the integration of artificial intelligence, machine learning, big data processing, blockchain and other technologies can transform financial analysis, making it more accurate, faster and more efficient. Their experience emphasizes the importance of continuous innovative development, adaptation to changing market conditions and effective use of data for making informed decisions, which

characterizes the high importance of information technologies in financial analysis, and also sets the summary of the achievements of these companies as a model for other market participants.

In the future, we can expect even greater integration of information technology into financial analysis. Artificial intelligence and machine learning will be increasingly used to develop predictive models that can take into account the complexity and unpredictability of financial markets. Commodity market forecasting will include the use of algorithmic trading, automation of decision-making processes and development of personalized financial strategies. Advances in big data analytics technologies will enable analysts to more efficiently process and interpret unstructured data such as news articles, social media and market reports, providing a deep understanding of market trends. The use of quantum computing in financial analysis is also expected to grow, which will open up new opportunities for processing large volumes of data and solving complex optimization tasks. Blockchain will continue to impact the financial industry, bringing greater transparency, security and efficiency to transactions. Decentralization can play an important role in the development of decentralized finance (DeFi), which provides alternative funding and investment mechanisms independent of traditional financial institutions. Another important direction will be the development of communication technologies, which will provide an opportunity for more in-depth monitoring and analysis of real economic conditions and consumer behavior, which will provide additional informational space for data collection, and as a result - the implementation of financial analysis, increasing its accuracy and relevance. Thus, ensuring data security and privacy will be important, as increased reliance on digital technologies increases the risks of cyber-attacks and information leaks.

DISCUSSION

Discussing issues regarding the role of modern information technologies in financial analysis and market forecasting, certain key areas of their provision and further development are highlighted. The work (Jackson, 2022) emphasizes the importance of cloud technologies in managing large volumes of financial data, which is confirmed by the results of their own research, which indicate the effectiveness of the trend in predicting market trends. A controversial issue raised in a study (Alhajeri, 2021) about the potential risks and limitations of electronic money, especially in the context of the increased role of security and reliability of the decentralized accounting system. The hypothesis (Jassem, 2022) regarding the use of machine learning to improve the accuracy of financial forecasts has also found support in its own research, showing how information technology can adapt to dynamic market conditions. The question of the application of blockchain in the financial sector, which is discussed in the article (Skocdopole, 2021), requires further research, since the technology offers new opportunities for the security and transparency of financial transactions. However, as indicated by (McCarten, 2022), it is also necessary to take into account the potential challenges associated with regulation and integration of the latest information systems into traditional financial ones. Big data analysts are a driver of progress, as arguments (Ginting, 2021) emphasize their importance in identifying market trends and behavioral patterns, which is confirmed by the results of their own research, demonstrating practical cases of their use for effectively solving complex financial tasks. The topic of using application software to analyze financial news and reports, as noted by (Chen, 2022), is especially relevant in the conditions of rapid growth of information flow. However, according to (Thalmeiner, 2023), it is important to consider the potential limitations of modern technologies in terms of contextual and linguistic accuracy. A study (Rashid, 2021) points to the potential of communication systems in collecting data for financial analysis, emphasizing that they can provide important information. Arguments (Baker, 2021) relate to the possibility of quantum computing in financial modeling, as the results show how corporations gain potential influence from the use of technology on the future of financial analysis. Prospects for the further development of modern technologies emphasize the critical importance and role of the latest software and systems in financial analysis and market forecasting. The use of variable analytical tools opens up new opportunities for a deep understanding of market trends and effective risk management. However, the technologies pose new challenges to researchers

and practitioners regarding the accuracy, security, and legal regulatory aspects of their use. The growing integration of innovative technologies into the financial sector will continue to influence investment strategies,

CONCLUSION

Thus, information technologies play a decisive role in financial analysis and forecasting of markets, which is demonstrated in the practices of the world's leading corporations and is reflected in global economic trends. The implementation of artificial intelligence, machine learning, blockchain, big data analytics and other innovative technologies is changing traditional approaches to financial analysis, making it more efficient, accurate and fast. Thanks to these technologies, analysts and investors can better understand the complexity and dynamics of markets, identify hidden patterns and adapt to rapid changes in the global economic environment. The planned integration of these technologies into the financial sector requires constant updating of knowledge and skills, as well as the creation of new risk management and data protection strategies. Modern innovations contribute to the growth of the efficiency of the financial sector and open up new opportunities for the creation of innovative financial products and services, which can have a profound impact on the global economy.

The role of computer technology and software in financial analysis and market forecasting is multifactorial and extremely significant. They enable the collection and analysis of large volumes of data, resulting in a more accurate understanding of market conditions, consumer trends and economic indicators. Large-cap companies are actively implementing machine learning in their own commercial activities and offer advanced methods for forecasting market trends, helping investors and investment funds to develop effective strategies and minimize risks. Blockchain makes an important contribution to ensuring the security and transparency of financial transactions, playing a key role in the development of new forms of digital assets and decentralized financial systems. The implementation of such technologies has already demonstrated its potential to improve the efficiency, accuracy and reliability of the financial sector, while opening up new opportunities for innovation and development.

Regarding the prospects for the further development of information technologies in financial analysis, we can expect a continuation of the trend of increasing their influence and significance. The near future will bring even greater integration of artificial intelligence and Big Data for learning and comprehensive analysis of market data and automation of investment processes. Significant attention of technological leaders will be devoted to the development and implementation of new algorithms capable of efficiently processing large and complex data sets, providing more accurate forecasting and risk management. Decentralized systems will continue to transform the field of finance, providing new mechanisms for secure and transparent transactions. Therefore, the emergence and development of quantum computing can open new horizons in the field of financial analysis, allowing to develop even more complex and efficient models. Circumstances point to the strengthening of the role of information technology, as it will continue to deeply transform the financial world, opening new opportunities for development and innovation in the global economic space.

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