IRSTI 07.73.35
UDC 336.761
JEL G10

https://doi.org/10.46914/1562-2959-2026-1-1-464-477

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DIGITALIZATION AND ARTIFICIAL INTELLIGENCE AS DRIVERS OF VOLATILITY IN THE KAZAKHSTAN STOCK MARKET

Abstract

With ongoing improvements in economic conditions, the integration of finance and science and technology has become increasingly extensive. Big data, cloud computing, blockchain, artificial intelligence, and mobile banking are rapidly developing and integrating into the financial sector. The development of the Artificial Intelligence industry is an important force shaping a new round of technological revolution and industrial innovation. Against the backdrop of accelerated digital transformation in Kazakhstan's economy and growing interest in digitalization and artificial intelligence (AI), demand for accurate tools for capital market analysis is increasing. Volatility forecasting is a critical component of investment risk assessment, particularly in the context of an emerging financial market such as Kazakhstan's. This study aims to analyze the impact of digitalization and AI technologies on the volatility of Kazakhstan's stock market. The empirical focus is placed on major publicly traded companies listed on the Kazakhstan Stock Exchange (KASE), such as Kaspi.kz, KazMunayGas, Kazakhtelecom, and Halyk Bank. Using methods such as correlation analysis and the «Turnover/ Free Float» indicator, this research explores the relationship between technological changes and market behavior. The findings suggest that digitalization reduces transaction costs and improves market liquidity, whereas AI enhances forecasting capabilities and investor adaptability. The academic value of this work lies in its demonstration of AI applications in emerging market environments. From a practical standpoint, the results can support digital transformation strategies, improve investment decision-making, and inform financial regulation in Kazakhstan.

Keywords: artificial intelligence, digitalization, stock market, market volatility, investment risk, financial technologies, liquidity, algorithmic trading.

Introduction

Digitalization is a technological advancement that integrates modern technologies across sectors, including the financial industry. As digitalization rapidly evolves, its emergence in the financial

sector – through the application of big data, cloud computing, blockchain, and artificial intelligence (AI) – has significantly transformed traditional financial business models and operations. The use of AI in finance has become increasingly widespread, encompassing areas such as risk management, investment decision-making, customer service, fraud prevention, stock market operations, and more.

The advancement of digitalization has altered the risk dynamics within the financial market. Insights into how digitalization affects stock volatility in the AI industry enable investors to better evaluate potential risks and returns, leading to more informed investment decisions. It also enables financial institutions to effectively detect and manage potential risks, contributing to stock price stability. Furthermore, this understanding supports the sustainable development of both the digitalization and AI sectors.

AI is commonly referred to as a machine's ability to learn from experience, adapt to new inputs, and perform human-like tasks. The concepts of AI and AI systems emerged in the 1950s., AI has experienced its ups (AI springs) and downs (AI winters). With the rapid advancement of Big Data technologies, e.g., improved storage capacity and the high processing speeds of data processing machines, AI is being revitalized by the availability and power of Big Data.

Artificial Intelligence (AI) is commonly defined as a machine's ability to learn from experience, adapt to new inputs, and perform tasks that typically require human intelligence. These tasks include problem-solving, decision-making, speech recognition, language translation, visual perception, and pattern identification. The foundational concepts of AI and intelligent systems emerged in the 1950s, when researchers began exploring whether machines could simulate human thinking processes.

Throughout its development, AI has experienced periods of rapid progress, often referred to as "AI springs," as well as periods of reduced funding and interest, known as "AI winters." During AI springs, breakthroughs in algorithms, computing power, and theoretical research stimulated optimism and investment. Conversely, AI winters occurred when technological limitations and unmet expectations led to skepticism and decreased financial support.

In recent years, AI has been revitalized by the rapid advancement of Big Data technologies. The exponential growth in data generation, combined with improved storage capacity and significantly increased processing speeds, has created a favorable environment for AI development. Modern computing infrastructures, cloud technologies, and distributed systems allow organizations to store and analyze massive volumes of structured and unstructured data efficiently.

Moreover, advances in machine learning, particularly deep learning techniques, have enabled AI systems to extract meaningful insights from complex datasets. The synergy between AI and Big Data has accelerated innovation across various sectors, including finance, healthcare, manufacturing, education, and transportation. As a result, AI is now considered a key driver of digital transformation and a strategic tool for enhancing productivity, competitiveness, and decision-making in the global economy [1].

AI is the most powerful of modern technologies, and ignoring it is a mistake. Leaders of countries and companies see significant opportunities in it and fear being left behind in the race for AI. Business leaders agree with this. Amazon CEO Jeff Bezos is confident that we have entered the «golden age» of AI and can solve problems that previously belonged to the realm of fiction. Google co – founder Sergey Brin assures: «The new leap in the development of AI is the most significant event in the computer field in my entire life». According to Microsoft CEO Satya Nadella, AI is «the defining technology of our time». Klaus Schwab, founder and Executive Chairman of the World Economic Forum, like many others, considers AI (especially in combination with other technological innovations) the engine of the fourth industrial revolution, which is transforming all aspects of business and society. This is an artificial intelligence industry that originated to increase the efficiency of time and labor use, generate income, and prevent financial fraud [2].

When estimating stock prices, two traditional theories are often considered: the Efficient Market Hypothesis (EMH) and the Random Walk (RW) theory. The EMH suggests that stock prices at any given moment reflect all available market information. Because investors optimally use this information, price movements are inherently unpredictable, as new information arrives randomly (Fama, 1970) [3]. In contrast, the Random Walk theory proposes that stock prices follow a «random walk», implying that future prices do not adhere to any identifiable trends or patterns. Instead, they

deviate spontaneously from past prices, making it impossible for investors to reliably predict market behavior (Cheng and Deets, 1971) [4].

The main advantages of using computational approaches to automate the financial investment process include eliminating «momentary irrationality» (i.e., decisions based on emotion), the ability to recognize and explore patterns that people perceive, and the real-time consumption of information. This area of expertise has become known as computational finance. Recently, computational finance has increasingly employed and studied methods for financial investments. Although computers execute the vast majority of hedge fund transactions automatically, 90% of these transactions are still performed using a hard-coded procedure.

The application of AI to financial investments has attracted widespread attention since the 1990s, when rapid technological development and the widespread adoption of personal computers were observed. Since then, countless approaches have been proposed to solve the problem of forecasting stock market prices. Since the 1990s, with the introduction of computational methods in finance, much research has focused on applying AI to stock market investments. Thus, the ever-growing application of artificial intelligence remains highly promising for future development.

Digitalization is a technological innovation that combines modern technology with the financial industry. With the rapid development of digitalization, the development and rise of digitalization in the financial field, with the use of big data, cloud computing, block chain, artificial intelligence, and Internet banking technology, the business model and operation mode of the traditional financial industry have undergone radical changes, and the use of artificial intelligence technology in the financial field has become more and more extensive, covering risk management, intelligent investment, customer service, anti-fraud and other many fields.

In this context, studying the impact of digitalization on stock volatility in the artificial intelligence industry can provide the stock market with a more reliable reference for decision-making. The rise of digitalization has altered the risk characteristics of the financial market.

Understanding the mechanism of fin tech's effect on the volatility of stocks in the AI industry enables investors to more accurately assess the risk and reward, and thus make more informed investment decisions; helps financial institutions to efficiently identify and control the possible risks and maintain the stability of the stock price; and helps to promote the sustainable growth of the digitalization and AI industries. At the same time, it ensures market fairness and transparency; the government and regulatory authorities can formulate policies and regulations that are better aligned with current needs, informed by these research results.

The vast majority of existing market participants are only beginning to show interest in sustainable development; issuers are revising their goals to incorporate sustainability considerations; and investors are shifting their focus toward responsible investing. The Kazakh financial market has already actively applied machine learning and advanced modeling technologies across a wide range of applications, from credit scoring to computer vision for identification.

According to research results, Kazakhstan is one of the three leading countries in the innovation region in the global index and ranks 81st out of 132 countries, leading in terms of Infrastructure (59th place), due to high results in areas such as Government Online Services (8th place) and Internet Penetration (15th place) (WIPO, 2023). In the IMD World Digital Competitiveness Ranking (2023), which assesses the ability and willingness to implement and use digital technologies, Kazakhstan ranked 34th among 64 countries.

Moreover, stock market forecasting techniques are crucial for stock traders, investment banks, and hedge funds; however, the most accurate predictions are short-term. This is because forecast precision declines over the long term as risks and uncertainties increase. Furthermore, it is interconnected with the observation that stocks reflect the stability and health of the companies to which they belong. This means that, for a precise forecast, the company's future position is a fundamental factor to analyse and consider. Consequently, the financial health of companies is the root of the question and the starting point for the analysis of stock price movements.

The rise of artificial intelligence (AI) as a technology to promote economic growth and social empowerment has prompted researchers to systematically study current problems and report on related opportunities (Duan et.al, 2019;) [6].

A.G. Rita, M.B. Amanda, S. Saleh (2023) analyze consumer decision-making on artificial intelligence's reactions and found that for personal loans, consumers are more satisfied with the rejection of AI providers compared to credit analysts [7].

F.S. Rasiwala and B. Kohli (2021) believe that the traditional financial industry is facing digital disruption brought by the application of artificial intelligence [8].

Intelligent decision support systems, specifically those focusing on the role of intelligent software agents in data analysis within knowledge-based systems, are debated in the paper of Popîrlan and Stefănescu (2011). By leveraging advanced technologies, these intelligent software agents provide significant support by processing and analyzing complex data, generating insights, and facilitating informed decision-making for transaction managers.

Digitalization encompasses the automation of trading, the proliferation of API-based platforms, digital brokers, the use of Big Data, and blockchain. As Duan and Edwards (2019) point out, digital transformation affects market participants' behavior by reducing barriers to entry and increasing trading frequency. However, this also increases short-term volatility, as algorithms respond to news and signals more quickly than humans.

Materials and methods

Digitalization has sometimes been conflated with digitization, which is generally understood as a process of transformation from one form to another, such as converting an analog music format into a digital file (Frenzel et al., 2021). Clerck (2017) defines digitalization as the use of digital technologies and data to generate revenue, improve business, replace/transform business processes, and create an environment for digital business, with digital information at the core.

Thus, unlike digitalization, digitization has a narrower scope and purpose, and as technologies evolve, this term is less visible in the literature. By contrast, digitalization has gained popularity and refers to processes of data collection, generation, and analysis to create value and enable new innovation; the pursuit of digital innovation, creation of novel digital products; and the use of digital technology as part of the innovation process in both B2B and B2c context (Lanzolla et al., 2021; Cappa et al., 2021).

The term "Artificial Intelligence" was first introduced by John McCarthy in 1956 (Andresen, 2002) and is defined as the emulation of human intelligence in machines, enabling them to perform complex tasks and even predict outcomes (Tripathi, 2021). Reis et al. (202) argued that the development of digital technologies, alongside advances in AI and automation, is enabling a new wave of service delivery systems, and many countries consider these developments significant and key to socio-economic development. Additionally, to avoid falling behind in the development and adoption of AI technologies, President Kassym-Jomart Tokayev has set a priority of making Kazakhstan a leader in AI. In February 2024, the Ministry of Digital Development, Innovation, and the Aerospace Industry presented draft concepts for the development of AI for 2024–2029 and an Action Plan for its implementation. These documents analyze in detail the current state of AI technology integration in Kazakhstan and outline directions for its future national development [5].

Results and discussion

This research employed a qualitative comparative analysis of the introduction of AI into Kazakhstan's stock market, drawing on international examples. Correlation analysis to identify relationships among financial indicators, including market capitalization, trading volume, free-float shares, and index shares. These methods provide a comprehensive understanding of the impact of digitalization on the securities market of the Republic of Kazakhstan. The research is based on the following analytical approaches:

Qualitative comparative analysis is used to study the degree of development and integration of AI systems into the stock market of Kazakhstan and compare them with their international counterparts.

Correlation analysis is used to assess the relationships among key financial and market indicators (market capitalization, trading volume, free float, and index weight).

Table 1 – Application of AI in global stock markets

Country	System Name	Data Source	Model Type	Functionality	Automation Level
AI on the Stock Markets of Developed Countries					
USA	Bloomberg Terminal	Financial markets, news feeds, macro data	News analytics, forecasting algorithms	Data integration, forecasts, scenario analysis	High (interactive dashboards and notifications)
USA	IBM Watson	Big Data, market, macro, and non-financial data	Neural networks, machine learning	Relationship discovery, analytics, and recommendations	High (integration with decision systems)
China	iFinD	Financial databases, market information	Econometric and AI models	Financial statements, statistics, and forecasting	Medium
China	Tencent AI Lab	Social media, behavioral data, market signals	Hybrid models with NLP and behavioral analysis	Sentiment analysis, short-term market forecasts	High (real-time)
AI on the Stock Markets of developing countries					
Russia	FinGPT	Historical data from the Moscow Exchange since 1992	NLP, Machine Learning	Term explanations, news analysis, investment advice	Medium (asynchronous response on request)
Kazakhstan	KASE Digital (in development)	KASE financial data, tokenization projects	Digital platforms, possible AI integration	Asset tokenization, digital trading, automation	Medium (platform and IT infrastructure in progress)
Kazakhstan	NBK SupTech Platform	Regulatory reports, market data	Supervisory analytics automation	Risk analysis, monitoring, supervision	High (automated real-time data analysis)
Note: Compiled by the authors based on sources [9].					

In the context of the development of artificial intelligence in the financial sector, localized solutions adapted to the specifics of national markets are playing an increasingly prominent role. An example of this approach in Russia is FinGPT, an intelligent investment assistant developed by Finuslugi. This system is based on artificial intelligence models and has been trained on extensive historical data from the Moscow Stock Exchange dating back to 1992. This depth and localization of data enable consideration of the unique characteristics of the domestic stock market, including its responses to macroeconomic and geopolitical events [10]. The Russian FinGPT focuses on basic functions, such as explaining terms and providing personalized investment tips, which makes it convenient for novice investors but limits its use in institutional environments.

American and Chinese platforms demonstrate a higher level of automation and a variety of tools, ranging from scenario analysis to the processing of investor emotions. Tencent AI Lab, for example, actively uses behavioral modeling, which is especially important in short-term trading. An analysis of Kazakhstan's stock market indicates the main trends and the transformation of the securities market. Kazakhstan Stock Exchange JSC (KASE) is the only multifunctional exchange platform in the Republic of Kazakhstan for trading stocks, bonds, derivatives, foreign exchange, and money market instruments. In 2019–2021, the Kazakhstan Stock Exchange (KASE) implemented a large-scale digitalization and technological modernization program to enhance the efficiency and transparency of exchange operations.

Table 2 – The main trends of KASE's digital transformation

Category and main directions	
Infrastructural transformation	Digitalization of services
Full integration of internal systems (back office, website, IRIS) with trading modules	Translation of listing and disclosure of information into an electronic format
Automation of post-trading procedures: clearing, settlements, CC sections in the depository	Development of the IS2IN system using EDS
Modernization of the business processes of bidders	launch of the web version of IRIS and expansion of the Telegram bot @KASE InfoBot Online
	payment for access to trades via the KASE website (acquiring)
Note: Compiled by the authors based on sources [11].	

KASE has entered a new level of technological maturity. Centralization of clearing operations, expansion of online services, and user orientation have made the exchange more flexible, modern, and accessible. It served as the foundation for the further implementation of AI and digital platforms (including KASE Digital) within market infrastructure.

In 2024, the Kazakhstan Stock Exchange (KASE) implemented several digitalization and innovation initiatives to enhance efficiency, transparency, and investor engagement. The main directions and projects include:

The KASE Digital platform and asset tokenization. The exchange announced plans to launch its own digital platform, «KASE Digital», for trading tokenized assets. This will enable the introduction of new financial instruments based on blockchain technologies to the market. In 2023, KASE studied the feasibility of blockchain-based pilot projects and the listing of exchange-traded funds (ETFs) for cryptocurrencies; in 2024, this work culminated in preparations for the launch of trading in digital (tokenized) assets. The National Bank, for its part, is preparing the settlement infrastructure for the exchange's tokenization platform [12], which will ensure the safe conduct of transactions with digital instruments.

Table 3 – Main trends of digital transformation of the stock market in Kazakhstan

Key trends	Description of the trend
Tokenization and digital assets	Pilots on ETFs for crypto assets, preparation for the launch of digital tokens
Digitalization of trading and clearing systems	Introduction of a Central Counterparty, automation of settlements, integration with a Central Depository
RegTech and SupTech – digital regulation	Supervisory digital systems, automated reporting, risk control
Development of digital platforms and services	KASE Digital, IS2IN with EDS, web-based IRIS, Telegram bots, and online access to trades
Application of artificial intelligence	AI in volatility forecasting, NLP, and clustering of companies
Note: Compiled by the authors based on sources [13].	

Development of Market Data and analytical products. KASE is developing the Market Data area and its own information and analytical services. New digital services for providing market data enhance trading transparency and provide investors and other market participants with convenient access to up-to-date information. The expansion of the exchange's online analytical tools helps investors make more informed decisions, thereby increasing their involvement in the market.

Automation of trading and clearing. The exchange prioritizes the modernization of its technological infrastructure, including the introduction of high-speed trading and clearing systems. These solutions

increase operational efficiency by accelerating transaction and settlement execution and reducing operational risks. Fast trading and clearing systems and convenient digital technologies are part of KASE's vision for the future, ensuring the reliability and flexibility of exchange processes.

One of the key stages of the technological modernization of the Kazakhstan Stock Exchange was the introduction of new trading and clearing systems and the launch of a Central Counterparty (CC) in all market segments, which significantly increased the reliability and transparency of post-trading operations. The implementation of the CC was made possible by the creation of a specialized structure, KASE Clearing Center JSC, which is part of the KASE Group of companies. The organization conducts clearing activities pursuant to license № 3.1.8.2 dated July 21, 2023, and license for banking operations № 4.3.22 dated August 28, 2023, issued by the Agency of the Republic of Kazakhstan for Regulation and Development of the Financial Market [14].

To date, the KASE Clearing Center is the only participant providing central counterparty services in the stock, currency, and derivatives markets of Kazakhstan. Its activities cover:

- transactions with financial instruments included in the approved List of;
- the stock market;
- clearing of transactions with foreign currencies;
- settlements on futures contracts in the derivatives market.

Therefore, the establishment of the Central Committee, in conjunction with the large-scale digitalization of the exchange infrastructure, has become a basis for enhancing the stability, efficiency, and attractiveness of Kazakhstan's financial market.

The development of AI in the stock market of the Republic of Kazakhstan.

Today, the infrastructure of the Kazakhstan Stock Exchange (KASE) is an integrated, technologically advanced trading system that meets the requirements of both the domestic and international investment communities.

Firstly, a well-established trading, clearing, and settlement system, as well as the presence of a Central Counterparty (CC) with full T+2 mode, indicate the maturity of the market architecture and ensure high operational reliability.

Secondly, the availability of DMA and SMA channels for broker clients and a variety of REPO instruments (including a basket of Government Securities (GS), Bonds for the diversification of government Institutions (CCGs), Corporate Sectoral Conditional (or Universal) Bonds (CCBs), and securities from the T+ list) forms the flexibility and liquidity of the exchange market.

In addition, the use of KASE trading parameters for securities included in the FTSE and MSCI global indexes confirms the site's international recognition.

Finally, interaction with key market information providers – Bloomberg, Refinitiv, etc. – provides a high degree of transparency and accessibility of market data for foreign investors [15].

KASE demonstrates a high degree of digital maturity and international integration, which makes it not only a central element of Kazakhstan's financial system but also a promising platform for the development of AI technologies, tokenization, and global trading infrastructure.

Kazakhstan is a small, open economy vulnerable to external risks due to a weakly diversified export base and significant import dependence. In countries where the financial system is represented not only by the banking sector but also by a developed securities market, central banks can use the stock market as an additional effective transmission channel. This channel is referred to as «asset prices» in the literature and includes not only securities but also real estate (some sources additionally include foreign currency in this channel).

The development of the securities market expands opportunities for a range of market participants: producers of goods and services have an alternative to bank loans, and investors have profitable investment opportunities. In addition, the necessary infrastructure for this interaction is being formed, and the turnover and volume of the entire financial market are growing. At the general economic level, this makes it possible to increase output, increase employment, and tax revenues.

In 2024, Kazakhstan demonstrated the successful implementation of a digital transformation in financial regulation and exchange operations. This was reflected not only in the launch of the KASE Digital platform but also in the creation of SupTech surveillance mechanisms. The KASE index has become a key indicator of these changes, outperforming many international peers in terms of growth.

Figure 1 shows the dynamics of the KASE index in 2024, which outperformed both developed and emerging stock markets. This indicates the high investment attractiveness of the Kazakh stock market and the growing confidence of domestic and international investors.

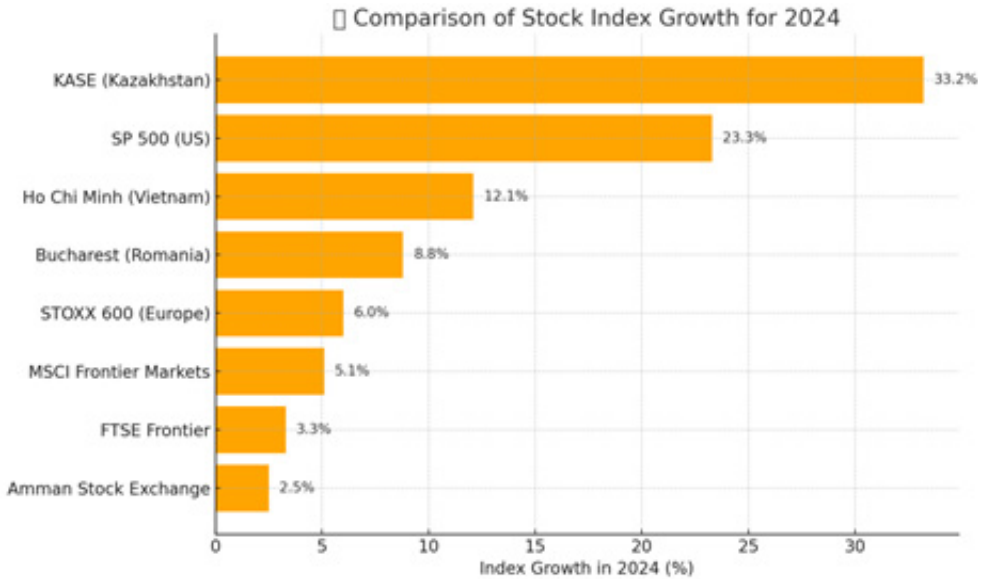

Figure 1 – The KASE index and global stock indexes in 2024

Note: Compiled by the authors based on sources [16].

Figure 1 shows a steady growth rate of 33.2% for the KASE index, the highest among all indexes presented. A steady upward movement from January to December, especially pronounced in July–August. A relatively small drawdown in September, a rapid correction in the fourth quarter of 2024.

The use of artificial intelligence methods to analyze the structure and volatility of the KASE index is a modern trend in the digital transformation of the stock market. Using AI, KASE index analytics enables the prediction of the index's behavior, the analysis of its volatility, liquidity, and sensitivity to events. Let's consider the top 10 companies included in the KASE representative list as of 03/01/2024 in Table 4.

Table 4 shows the 10 largest companies in Kazakhstan by indicators such as the share of freely traded shares (Free Float), share in the KASE index, market capitalization, trading volume, and the «Turnover/ Free Float» ratio, an indicator of liquidity and activity.

This table presents the calculation of the «Turnover» indicator (Free Float), a metric that reflects the liquidity of shares, taking into account the portion of the company available in the market.

Table 4 – Top 10 companies included in the KASE Representative List as of 03/01/2024

№	Company	Free Float (%)	Index Weight (%)	Market Capitalization (bn ₸)	Trading Volume (mln ₸)	Total Capitalization (bn ₸)	Turnover / Free Float
1	Bank Center Credit	40.4	9.9	407.5	9,084.70	408.2	224.87
2	Halyk Bank	30.5	16.4	2,766.80	21,396.70	2,766.80	701.53
3	Kcell	34.1	14	683.2	12,999.10	683.2	381.21
4	KEGOC	15	3.8	420.7	13,265.30	420.7	884.35
5	KazMunayGas	2.5	13.1	8,945.50	19,761.90	8,945.50	7,904.76
6	Kaspi.kz	31	13.5	10,357.60	11,861.60	10,357.60	382.63
7	Kazatomprom	25	14.9	5,234.30	10,651.80	5,234.30	426.07
8	Kazakhtelecom	19.1	5.3	468.3	21,692.70	479.3	1,135.74
9	KazTransOil	10	1.9	314.9	7,943.90	314.9	794.39
10	Air Astana	41.4	7.2	289.4	20,024.10	289.4	483.67
Note: Compiled by the authors based on sources [17].							

Turnover: the number of shares of the company traded over a given period (in tenge). Free Float (%) = the share of shares that is actually available for trading (not held by the government, strategic investors, etc.).

Analyzing the data in the table, the 4th leader by the metric is turnover; The Free Float is KazMunayGas JSC. With a Turnover / Free Float indicator of 7,904.76, the company's shares exhibit exceptionally high trading activity despite an extremely limited volume of freely traded shares. Such dynamics may be due to both the speculative interest of market participants and the activity of institutional investors capable of exerting a significant influence on transaction volumes in conditions of low free float.

Companies Kazakhtelecom, KEGOK, and KazTransOil demonstrate high relative liquidity. These issuers exhibit a moderate level of free float, and their shares trade at consistently high volumes. This profile makes them attractive for short-term speculative trading, especially in conditions of low market volatility and a limited range of highly liquid instruments.

Companies Kaspi.kz and Halyk Bank exhibit characteristics of stable market assets, as evidenced by stable liquidity indicators. These companies demonstrate a high but balanced level of trading activity. Their Turnover/Free Float value indicates a significant role in the KASE index structure and stable interest from both institutional and retail investors.

Bank CenterCredit – despite one of the highest free-float rates among the represented companies (40.4%), Its shares exhibit relatively low turnover. The correlation matrix of the top 10 KASE companies is shown in figure 2.

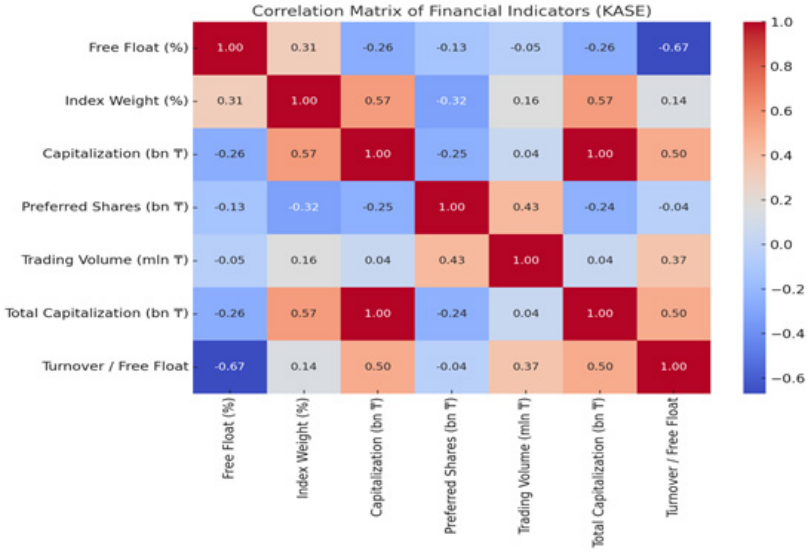

Figure 2 – Correlation matrix of KASE's top 10 companies

Note: Compiled by the authors based on sources [17].

Based on the data in Table 4, we will construct a correlation matrix to assess the direction and strength of the linear relationship between the paired financial indicators of the top 10 KASE companies. That is, to determine the correlation of V trades and capitalization of the top 10 KASE companies. As well as the impact of the free float share on the company's liquidity indicators, identifying the correlation between trading volumes and capitalization, which allows us to assess how much the company's scale affects its market activity, determining the impact of the Free Float share on the company's liquidity, presented through the «Turnover / Free Float» indicator, which reflects the relative trading activity in the context of stock availability.

The analysis of the correlation matrix in figure 2 reveals several statistically significant relationships among key financial metrics of issuers traded on KASE.

1. The relationship between the share in the index and capitalization. The most pronounced positive correlation is observed between the variables. Share in the index (%) and Capitalization (billion ₸): r = 0.57, as well as between total capitalization and share in the index: r = 0.57. This confirms

that the company's weight in the index depends directly on its market capitalization, consistent with the logic of capitalization-weighted market indexes.

2. Capitalization and turnover/free float: moderate connection. Capitalization and Turnover / Free Float: r = 0.50. There is also a moderate correlation between total capitalization and Turnover/ Free Float (r = 0.50). This may indicate that companies with higher market capitalization exhibit more stable trading activity per unit of freely available shares. Trading volume does not correlate directly with capitalization. There is practically no relationship between Capitalization and Trading Volume (r = 0.04). There is also a weak negative correlation between Free Float and Trading Volume (r = -0.05). This indicates that trading volume is influenced by additional factors, such as news background, investor interest, and issuers' marketing activities.

3. Feedback between Free Float and Turnover/Free Float. Free Float (%) and Turnover / Free Float have a pronounced negative correlation (r = -0.67). This confirms the hypothesis that, with a limited free-float volume, even a small trading volume can significantly increase the relative liquidity ratio.

Thus, the correlation analysis revealed several significant patterns among the financial parameters of the top 10 KASE companies. In particular, the share in the index is closely related to capitalization, trading activity measured through Turnover / Free Float is most sensitive to the structure of free circulation, and trading volumes are not directly related to capitalization or free float, which emphasizes the need to take into account behavioral and market factors when assessing liquidity.

Conclusion

This study demonstrates that digitalization and artificial intelligence (AI) technologies play a key role in transforming Kazakhstan's stock market, enabling new approaches to assessing and managing investment risks. A review of leading issuers listed on the Kazakhstan Stock Exchange (KASE) enabled an empirical assessment of the impact of digital innovations on market liquidity, transparency, and volatility.

The use of AI methods such as algorithmic trading, machine learning, and predictive analytics enhances the analytical capabilities of market participants, reduces transaction costs, and accelerates decision-making. The digital transformation of the stock sector is contributing to the proliferation of tokenized assets, trade automation, improved market data quality, and the introduction of intelligent supervisory systems (SupTech), thereby strengthening market infrastructure[18].

Using companies listed on KASE as an example, it was shown that the introduction of AI and digital platforms contributes to greater transparency, lower transaction costs, and higher market liquidity. Correlation and principal component analyses (PCA) revealed patterns in the behavior of key company-level indicators and confirmed the presence of clusters of companies with similar market characteristics.

The correlation analysis confirmed statistically significant associations between the index share and market capitalization, and between the «Turnover/ Free Float» indicator and stock liquidity. At the same time, a limited relationship was observed between trading volume and market capitalization or free float, indicating the dominance of behavioral and speculative factors in the market.

Thus, the integration of AI and digital solutions in the Kazakh stock market offers broad prospects for sustainable development, increased investor confidence, and a stronger national position in the global financial system. In the context of intensifying competition and growing technological dependence, Kazakhstan will need to strategically develop its own digital stock market model, drawing on international practices and local characteristics. Further research in this area should focus on modeling short-term volatility, assessing the behavioral aspects of trading, and the impact of digital initiatives on the inflow of institutional capital.

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ЦИФРЛАНДЫРУ ЖӘНЕ ЖАСАНДЫ ИНТЕЛЛЕКТ ҚАЗАҚСТАННЫҢ ҚОР НАРЫҒЫНДАҒЫ ҚҰБЫЛМАЛЫЛЫҚТЫҢ ДРАЙВЕРЛЕРІ РЕТІНДЕ

Аңдатпа

Экономикалық деңгейдің үздіксіз жақсаруымен қаржы мен ғылым мен техниканың интеграциясы барған сайын кеңейе түсті. Үлкен деректер, бұлтты есептеулер, блокчейн, жасанды интеллект және мобильді банкинг қарқынды дамып, қаржы секторына интеграциялануда. Жасанды Интеллект индустриясының дамуы технологиялық революция мен индустриалды инновацияның жаңа кезеңінің пайда болуын басқаратын маңызды күш болып табылады. Қазақстанда цифрлық экономиканың жедел дамуы, сондай-ақ финтех және жасанды интеллект (ЖИ) технологияларына деген қызығушылықтың артуы аясында қаржы

нарығын талдаудың дәлірек құралдарына қажеттілік артуда. Құбылмалылықты болжау – инвестициялық тәуекелді бағалаудың маңызды құрамдас бөліктерінің бірі. Қазақстанның дамушы қаржы нарығы жағдайында Жасанды интелект әдістерін ұдайы қолдану жаңа аналитикалық мүмкіндіктерді ашады. Бұл зерттеудің мақсаты – Қазақстан қор нарығындағы құбылмалдылықты цифрландыру мен Жасанды Интелект технологияларының әсерін талдау. Зерттеу объектісі ретінде KASE-де саудаланатын ірі компаниялар (Kaspi.kz, КазМунайГаз, Казахтелеком, Халық банкі және т.б.) алынған. Корреляциялық талдау және «Айналым/Free Float» көрсеткіші арқылы нарықтық белсенділікті зерттеу негізінде технологиялық өзгерістер мен қор нарығындағы мінез-құлық арасындағы байланыстар анықталды. Зерттеу нәтижелері цифрландырудың транзакциялық шығындарды азайтып, нарықтың өтімділігін арттыратынын, ал Жасанды интелект – болжам жасауды және қатысушылардың икемділігін жақсартатынын көрсетеді. Жұмыстың ғылыми құндылығы – жасанды интелектінің дамушы нарықтағы нақты қолданылу үлгісін көрсетуінде. Практикалық маңыздылығы – алынған нәтижелерді цифрлық стратегияларды жасау, инвестициялық шешім қабылдау және қаржы реттеу саясаты үшін қолдану мүмкіндігінде.

Тірек сөздер: жасанды интеллект, цифрландыру, қор нарығы, нарықтық құбылмалылық, инвестициялық тәуекел, қаржылық технологиялар, өтімділік, алгоритмдік сауда.

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ЦИФРОВИЗАЦИЯ И ИСКУССТВЕННЫЙ ИНТЕЛЛЕКТ КАК ДРАЙВЕРЫ ВОЛАТИЛЬНОСТИ НА ФОНДОВОМ РЫНКЕ КАЗАХСТАНА

Аннотация

С постоянным повышением экономического уровня интеграция финансов, науки и технологий становится все более и более масштабной. Технологии больших объемов данных, облачных вычислений, блокчейна, искусственного интеллекта и мобильного банкинга стремительно развиваются и интегрируются в финансовый сектор. Развитие индустрии искусственного интеллекта является важной движущей силой, определяющей наступление нового витка технологической революции и промышленных инноваций. На фоне стремительной цифровизации экономики Казахстана и роста интереса к цифровизации и технологиям искусственного интеллекта (ИИ) значительно возрастает потребность в более точных и адаптивных инструментах анализа фондового рынка. Прогнозирование волатильности фондовых индексов становится ключевым элементом управления инвестиционными рисками, особенно на фоне развивающегося рынка капитала.

Целью данного исследования является изучение влияния цифровизации и ИИ на волатильность фондового рынка Казахстана. В качестве объекта анализа рассматриваются крупнейшие эмитенты, торгующие на Казахстанской фондовой бирже (KASE), включая Kaspi.kz, «КазМунайГаз», «Казахтелеком» и Народный банк. Используя методы корреляционного анализа, анализа главных компонент и показатель «Оборот / Free Float», исследование выявляет связи между технологическими изменениями и рыночной активностью. Результаты показывают, что цифровизация способствует снижению транзакционных издержек и росту ликвидности, а технологии ИИ – повышению точности прогнозов и гибкости поведения инвесторов. Научная значимость работы заключается в практическом применении ИИ-методов в условиях развивающегося рынка. Практическая ценность заключается в использовании результатов для разработки цифровых стратегий, регулирования рынка и совершенствования инвестиционных решений в Казахстане.

Ключевые слова: искусственный интеллект, цифровизация, фондовый рынок, рыночная волатильность, инвестиционный риск, финансовые технологии, ликвидность, алгоритмическая торговля.

Article submission date: 14.10.2025