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THE STOCK MARKET IN THE CONDITIONS OF THE DIGITAL ECONOMY

Digital technologies are making stock markets more accessible to a wider range of investors through electronic trading platforms and mobile applications. Electronicization and automation of processes contribute to fast and efficient conclusion of agreements. The development of digital technologies opens the way to new financial instruments, such as digital assets, tokenization and smart contracts on the blockchain. The emergence of fintech companies and startups in the field of finance stimulates competition and accelerates innovative development in the stock market. Digital technologies reduce geographical barriers and allow investors from all over the world to easily participate in trading in various stock markets. Access to advanced analytics and real-time information makes the market more transparent and informed for investors. Along with the benefits come challenges, such as cybersecurity and the volatility associated with high-frequency trading. Security and settlement are important aspects of this process. The use of artificial intelligence and big data analysis in asset management allows you to create more accurate strategies and forecast market trends. The use of blockchain technology allows for the creation of decentralized systems of asset distribution and transactions without intermediaries. Big data analytics and artificial intelligence contribute to the development of new approaches to data processing and analysis, which allows a better understanding of market trends and more informed decisions. Fintech innovation and digital technologies are creating a new ecosystem where financial institutions, technology companies and startups collaborate to create and implement innovative solutions. There is growing attention to ethical issues related to the storage and use of personal financial data, as well as the responsible implementation of technologies in the market. In general, the impact of the digital economy on the stock market is significant and leads to changes in the structure and functioning of financial markets, creating new opportunities and posing new challenges for investors and market participants. The findings indicate that the digital economy not only changes the way stock markets operate, but also creates unique opportunities and challenges for participants in this environment. Innovations in technology and approaches to financial management set new standards for efficiency and competitiveness in the stock market.

Keywords: *digital economy; digital technologies; digital platform; digitalization; stock market; stock index; development; risks and threats; globalization; blockchain technologies; digital business; financial instruments; stock market activity.*

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ФОНДОВИЙ РИНОК В УМОВАХ ЦИФРОВОЇ ЕКОНОМІКИ

В представленій роботі розглянуто основні особливості впливу цифрової економіки на фондовий ринок. Цифрові технології роблять фондові ринки більш доступними для широкого кола інвесторів через електронні торговельні платформи та мобільні додатки. Електронізація та автоматизація процесів сприяють швидкому та ефективному укладанню угод. Розвиток цифрових технологій відкриває шлях до нових фінансових інструментів, таких як цифрові активи, токенизація та смарт-контракти на блокчейні.

Поява фінтех-компаній та стартапів у сфері фінансів стимулює конкуренцію та прискорює інноваційний розвиток на фондовому ринку. Цифрові технології зменшують географічні бар'єри та дозволяють інвесторам з усього світу легко участь у торгівлі на різних фондових ринках. Доступ до розширеної аналітики та інформації в реальному часі робить ринок більш прозорим та інформованим для інвесторів. Разом з перевагами приходять і виклики, такі як кібербезпека та нестабільність, пов'язана з високочастотним трейдингом. Забезпечення безпеки та врегулювання є важливими аспектами цього процесу. Використання штучного інтелекту та аналізу великих даних в управлінні активами дозволяє створювати більш точні стратегії та прогнозувати ринкові тенденції. Використання технології блокчейн дозволяє створювати децентралізовані системи розподілу активів та здійснення транзакцій без посередників. Аналітика великих даних і штучний інтелект сприяють розвитку нових підходів до обробки та аналізу даних, що дозволяє краще розуміти ринкові тенденції та приймати більш обґрунтовані рішення. Фінтех-інновації та цифрові технології створюють нову екосистему, де фінансові установи, технологічні компанії та стартапи співпрацюють для створення та впровадження новаторських рішень. Зростає увага до етичних питань, пов'язаних із зберіганням та використанням особистих фінансових даних, а також відповідального впровадження технологій на ринку. Загалом, вплив цифрової економіки на фондовий ринок є суттєвим і призводить до змін в структурі та функціонуванні фінансових ринків, створюючи нові можливості та висувуючи нові виклики для інвесторів та учасників ринку. Висновки вказують на те, що цифрова економіка не тільки змінює спосіб функціонування фондових ринків, а й створює унікальні можливості та завдання для учасників цього середовища. Інновації в технологіях та підходах до фінансового управління визначають нові стандарти для ефективності та конкурентоспроможності на фондовому ринку.

Ключові слова: цифрова економіка; цифрові технології; цифрова платформа; цифровізація; фондовий ринок; фондовий індекс; розвиток; ризики та загрози; глобалізація; блокчейн-технології; цифровий бізнес; фінансовий інструментарій; біржова діяльність.

Introduction. In recent years, there has been a rapidly growing demand for the development of the digital economy as a powerful tool that ensures sustainable development. The development of the digital economy is directly related to the COVID-19 pandemic. However, the growth rates and scale of development of the digital economy differ in different regions and countries. If developed countries are traditionally leaders in development, in countries with developing economies, the process of digitalization of the economy is still ongoing. The best way to promote growth and overcome the gap in the digital economy, according to the authors, is to study the factors that contribute to development.

That is why it is expedient to consider the essence of the stock market in today's transformational conditions and the formation of the digital economy. The stock market in the digital economy is undergoing significant transformations thanks to the introduction of technologies, digital tools and innovations. Key aspects of the digital transformation of the stock market are presented below [1–10]:

the increase in the volume of electronic trading and the transition to fully digital exchanges, where trading takes place electronically, contributes to the speed and ease of execution of transactions;

implementation of blockchain technology for the issuance and circulation of digital assets, such as cryptocurrencies and tokens, which can represent ownership or participation in companies;

the development of decentralized financial services based on the blockchain, providing transparent and efficient financial instruments;

using data analytics and artificial intelligence algorithms to predict market movements and make investment decisions;

introduction of robotic advisors and systems that use artificial intelligence to optimize portfolio management;

application of tokenization technology to convert real assets (for example, real estate or artistic values) into digital tokens that can be traded on blockchain platforms;

growing popularity of digital platforms for attracting investments from the public (crowdfunding) and large investors (crowdinvestment);

expanding market access through mobile apps and other digital tools that allow investors to trade and manage portfolios from any device;

developing and implementing effective cybersecurity measures to protect digital assets and investor data.

introduction of electronic systems for voting and management of shareholders, which simplifies interaction between shareholders and companies;

increasing global access to stock markets thanks to digital technologies, allowing investors from around the world to trade stocks and other securities;

ensuring reliable storage and processing of financial information on digital platforms and blockchain technologies.

The digital transformation of the stock market creates new opportunities for investors, develops competition and facilitates access to financial instruments. However, it also requires careful attention to cyber security, regulation and ethical standards to ensure stability and confidence in the stock market. That is why it is appropriate to consider the features of the stock market under the influence of the digital economy.

Analysis of literary sources. The study of the development of the stock market in the conditions of the digital economy is a relevant direction, since these technologies and innovations significantly affect the functioning of financial markets. Some of the leading researchers and groups working in this area include: International Monetary Fund, FINTECH, World Bank, IOSCO, Organization for Economic Co-operation and Development, IBM Research, Microsoft Research, Google Research, Cambridge Center for Alternative Finance, Accenture, Deloitte, PwC . These research groups and organizations play an important role in shaping strategies for the development of stock markets in the digital economy. Their research helps identify key trends, challenges and opportunities to further improve financial instruments and markets in the digital environment.

Among the scientists and economists who study the development of the digital economy, financial sphere, exchange activity and stock markets, it is possible to single out the following: P.B. Chad, C.M. Petros, M.K. Pratt, O. Desyatnyuk, M. Korotun, A. Krysovaty, O. Lysak, I. Mazur, O. Sokhatska, N. Reznikova, O. Ivashchenko, V. Melnyk, I. Khadzhinov, O. Ptashchenko, I. Shevchenko, A. Zalievska-Shyshak and others.

Therefore, paying attention to the dynamic development of modern economic processes and digitalization, the issue of the development of the stock market becomes even more relevant and timely and requires constant, thorough research due to its variability.

Aims. Thus, in the current study, the authors propose to consider the topical issue of the development of stock markets and the possible impact on their development of digitalization and the digital economy as a whole.

Research results. Based on theoretical studies [2, 3, 7–9], it is possible to note that the stock market is a kind of part of the financial market, where securities such as stocks and bonds are bought and sold. The stock market plays a key role in the financial system, providing companies with an opportunity to raise capital for growth and investors with a means to invest and earn a profit.

The stock market acts as a meeting place for capital needs of companies and investors looking for opportunities to invest their funds. It is important for the functioning of the economy, ensuring the development of enterprises and the possibility of forming an investment portfolio for investors.

The digital economy has a significant impact on the stock market, providing it with new opportunities and posing new challenges. These trends are causing changes in the operation of stock markets, expanding opportunities and introducing new challenges, such as the need to adapt to new technologies, ensuring cyber security and changing the regulatory environment.

The unbalanced development of the digital economy risks increasing the imbalance in global economic development, contributing to the digital divide.

The authors consider it appropriate to consider the impact of global financial crises on the world economic system, namely the impact on ultra-large investment companies; the financial crisis is the detonator of the global crisis. Table 1 is devoted to trends in stock indices in in 2020–2022.

Table 1

Trends in stock indices in 2020–2022

Stock indices	2020	2021	2022 (01.01–01.09)
	Years		
1	2	3	4
Dow Jones (USA)	28868,80	30223,89	30 076.68
S&P 500 (USA)	3219,79	4278,91	3757,99
NASDAQ (USA)	10201,21	14371,62	11066,80
Nikkei225 (Japan)	22672,48	28836,54	27161,61
DAX (Germany)	11812	14648	12284,19
PFTS (Ukraine)	509,65	517,28	520

Source: own compilation.

In the table presented for consideration 1, the authors indicated separate indices of developed countries and a stock index of a developing country, which is on the European integration path of development, despite the economically unstable situation and the state of war.

The authors consider it appropriate to consider each stock index separately within the framework of the study. Dow-Johnson index (USA). This is the oldest and most authoritative index of the United States of America. This index covers the thirty largest US companies, such as Apple, Boeing, Coca-Cola, McDonald's, Microsoft, Visa, and Walt Disney. However, this index could be better suited to the role of an index of general stock market activity because it covers only thirty companies, and these companies are almost always successful in their performance. Even if one of the campaigns shows a lower percentage by capitalization than the other, but the share price is higher, this will affect the index. Therefore, very often, the S&P 500 index, USA, is considered for an objective decision on the stock market. This index includes 505 stocks. The difference in this index is that it does not include campaigns that are in private use. This index has been called a barometer of the American economy for many years [1–4].

The following US stock index is the National Association of Securities Dealers Automated Quotation Service Index – NASDAQ. The scheme through which trading is conducted on the NASDAQ exchange differs from the traditional exchange scheme. Several market makers are competing here to execute the client's order [3]. The quotation of the NASDAQ system for this share is the result of a comparison of quotations provided by market makers and alternative trading systems.

As part of the study, it was essential to consider the stock index of Japan, namely the Nikkei225. The most crucial stock index of Japan. The index is calculated as a simple arithmetic average of the share prices of 225 companies that are most actively traded in the first section of the Tokyo Stock Exchange [1–4].

The following European index, DAX (Germany), is Germany's most important stock index. The index is calculated as a capitalization-weighted average of the share prices of Germany's largest joint-stock companies.

The most recent addition to the stock index series is the Ukraine index, representing a nation in the process of development and integration with Europe. PFTS operates as a security trading organizer, holding a license issued by the National Securities and Stock Market Commission of Ukraine.

In light of this, the authors posit a hypothesis that suggests a connection between GDP levels and key indicators related to the export of goods, services, and stock market performance. Specifically, the hypothesis proposes that higher aggregate values of goods and services, along with stock index figures, correspond to elevated levels of a country's exports. GDP serves as the most commonly employed metric for evaluating economic activity. It enables assessments of a nation's economic health, facilitating comparisons between countries' economies and analyses of global economic conditions. Importantly, fluctuations in a country's GDP may be influenced by changes in prices, and thus, may not always reflect shifts in the quantity or quality of goods and services produced.

To substantiate this hypothesis, the authors recommend conducting a correlation and regression analysis using the Statgraphics Plus software, examining the relationships between GDP as the dependent variable (Y) and several independent variables (X_1 , X_2 , X_3):

Y – the GDP indicator;

X_1 – indicator of export of goods and services;

X_2 – indicator of the Dow-Jones stock index (USA);

X_3 – indicator of the S&P 500 stock index (USA).

The analysis will focus on the GDP indicators, exports, and stock indices of the United States of America between 2018 and 2022. To initiate the examination, we will construct a correlation model to reveal the associations between these variables. In order to identify strong connections among the selected indicators, we conducted a correlation analysis, resulting in the creation of a correlation table, often referred to as a Pearson table.

The correlation or Pearson model showed a significant linear relationship between the selected indicators since the correlation coefficients are more significant than $|0.5|$.

The number of observations for calculating each coefficient is also shown in parentheses. The third number in each table position is the p-value level, which should not be more than 0.05. According to the obtained Pearson table, the p-value level is equal to 0, indicating a significant functional dependence between the existing indicators.

In addition, a multivariate regression analysis was conducted to determine the relationship between each pair of indicators.

For the efficiency of the analysis, the dependence between the indicators was determined:

1) (Y and X_1);

2) (Y and X_2);

3) (Y and X_3).

The analysis results established that the proposed options have a linear relationship in the form $Y = a + b \cdot X$. Therefore, it would be appropriate to conduct a regression analysis of each pair of linear dependence, shown in Table 3.

Table 2

Pearson correlation table

	Y	X ₁	X ₂	X ₃
Y	1	0.59400971	0.77372399 (36) 0.0000	0.961233 (36) 0.0000
X ₁	0.59400971	1	-6.446 (36) 0.0000	0.43998957 (36) 0.0000
X ₂	0.77372399 (36) 0.0000	-6.446 (36) 0.0000	1	0.89765376 (36) 0.0000
X ₃	0.961233 (36) 0.0000	0.43998957 (36) 0.0000	0.89765376 (36) 0.0000	1

Source: own compilation.

Table 3

Results of analysis of indicators of linear dependence

Indicator \ Variables	Y and X ₁	Y and X ₂	Y and X ₃
Level of significance (P-Value)	0.0000	0.0000	0.0000
Correlation coefficient	0.594009707	0.77372399	0.961233
R-squared	0.352847532	0.59864881	0.92396887
Normalized R-squared	0.029271298	0.39797322	0.88595331
Standard error	1059.838518	834.63899	363.272155
Observation	4	4	4

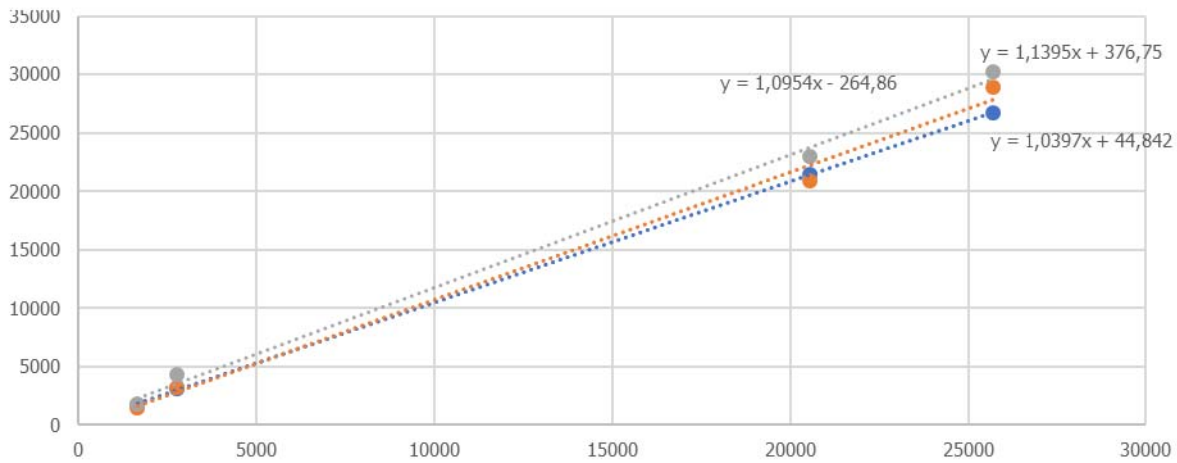
Source: own compilation.

The calculations of indicators presented in Table 3 indicate that the level of significance (P-Value) = 0. That is, this linear dependence is highly significant. The correlation coefficient exceeds 0.8 only in models Y and X₃, which indicates a strong dependence between the variables. The coefficient of determination is close to 1, which confirms the significance and presence of a strong relationship between each pair of linear dependencies.

It may be noted that the standard error of the presented estimate indicates the standard deviation of the residuals, while the absolute error corresponds to the average value of the model variance. The presented results indicate that the obtained values do not exceed the value of the standard error. This result is acceptable. Figure 1 presents the regression model.

The adequacy of the model is confirmed by the correlation coefficient, which is close to 1. In addition, it is also confirmed by the coefficient of determination, which is also close to 1 and indicates the significance of the model and the existence of a close relationship between the indicators.

As shown by the correlation and regression analyses, the proposed hypothesis was confirmed: the GDP level of the leading indicators of the export of goods and services and the stock market indicators. However, it is worth noting that the S&P 500 stock index showed the most significant impact on GDP, which once again confirmed the assumption put forward by the authors that the S&P 500 indicator is more significant than the Dow Johnson index.



Source: calculated by the authors.

Figure 1. Regression model

Conclusions. The impact of the digital economy on the stock market is significant and includes a number of positives and challenges for the financial sector. We present the main conclusions regarding the mentioned issue, which boil down to what is happening:

- the growth of the use of electronic trading systems, which facilitates fast and efficient conclusion of agreements;
- application of algorithms for decision-making and execution of trading strategies in real time;
- the emergence of mobile applications for trading and tracking market events;
- using blockchain to create tokens that represent physical or financial assets;
- implementation of automated conditions and rules in blockchain transactions;
- the emergence of new companies that use technology to provide innovative financial services;
- the emergence of investment products that take digital technologies into account;
- increasing access to stock markets for various classes of investors through online platforms and mobile applications;
- providing investors with quick and convenient access to news, analysis and financial reports;
- developing standards and regulations to ensure security and privacy.

The presented trends indicate that the digital economy is significantly changing the way stock markets operate, making them more accessible, efficient and reportable. However, it is important to consider and address potential risks such as cyber threats and volatility associated with high-frequency trading.

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