ISSN: 2582-4686 SJIF 2021-3.261,SJIF 2022-2.889,
2023-5.384 ResearchBib IF: 8.848 / 2023

THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

VOLUME-4, ISSUE-2

STOCK QUOTES FOR US TECHNOLOGY COMPANIES AS A TOOL FOR SELECTING POTENTIAL AREAS FOR STARTUP IMPLEMENTATION

Iryna Pyvavar[1], Pavlo Samus[2], Samer Mehyar[3]

[1]Department of Public Administration and Economic Policy, Simon Kuznets Kharkiv National University of Economics, Ukraine

[2]Department of Business, Trade and Logistics, National Technical University «Kharkiv Polytechnic Institute», Ukraine

[3]Head of project and assets accounts at the Jordan Petroleum Refinery, Amman, Jordan

Abstract: Increasingly, economic research is paying attention to the technological development of various economic entities. In this case, special attention is paid to the implementation of some business ideas based on startups. This attention to certain areas of economic research is based both on their importance from the point of view of economic development, and on the possibility of introducing innovative solutions in the shortest possible time. The main problem in this aspect is attracting a sufficient amount of financial resources in the shortest possible time. Based on this, the paper examines the dynamics of quotes for shares of technology companies. To solve the problem, the absolute values of such quotes were considered and the corresponding statistical analysis was carried out. As a result, the potential time periods for entering the corresponding segment of the stock market were substantiated.

Key words: Shares, Quotes, Dynamics, Startup, Stock market, Technology companies, Business idea, Statistical analysis

Introduction The stock market plays an important role in creating conditions and implementing further sustainable economic development in many areas of activity of various business entities [1], [2]. This is achieved through the ability to attract the necessary resources for the development of various economic resources. It is also possible to form potential sources for attracting additional resources. For these purposes, various financial instruments are used that form the basis for the functioning of the stock market: stocks, bonds, futures, and the like. Therefore, interest in the dynamics of quotes of such securities is constantly in the focus of attention of researchers and practitioners [2]-[6].

One of the promising areas in the study of stock market dynamics is the market for shares of technology companies. Such attention to this market segment is due to the fact that technological development determines the main paths of economic growth and the stability of the functioning of various sectors and business entities. At the same time, technology companies can be considered as an object and a tool for selecting potential directions for the development of relevant startups [7], [8]. Thus, technology companies are of high interest for various areas of research, implementation of advanced technologies to improve the implementation of business ideas.

For the purpose of studying the development of individual segments of the stock market, various companies and the possibility of implementing business ideas in the form of startups, it is advisable to consider the quotation of the relevant securities. This allows us to generalize trends between supply and demand for individual business areas and determine the feasibility of entering

ISSN: 2582-4686 SJIF 2021-3.261,SJIF 2022-2.889,
2023-5.384 ResearchBib IF: 8.848 / 2023

THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

VOLUME-4, ISSUE-2

a given segment of the stock market. It is also important to study the mutual dynamics of such securities for the purpose of identifying potential sources of financing for startups. For these purposes, you can use various methods and approaches, both classical [9]-[17] and special ones, which allow the use of non-standard tools for analysis and conclusions [18]-[26].

Thus, the main goal of this work is to analyze the dynamics of stock quotes of technology companies as a tool for choosing directions for the implementation of startups. This goal also involves reviewing literary sources on the research topic and selecting objects for direct analysis.

Related work: To reveal the goal of this work, it is important to consider various areas where various directions for using shares of technology companies and their problems in the context of startups are being explored.

For example, A. Kousari, in his study, analyzes the features of financing technology companies [27]. For these purposes, new models based on smaller investments and collective action are being considered. The work examines the advantages and disadvantages of different startup financing models. The author also proposes a new approach as a means of attracting investors to teams. This allows you to reduce the risk of investing in startups and get an acceptable profit. Then the key question is how to hedge risks and when to enter the stock market.

M. Klačmer Čalopa, J. Horvat and M. Lalić conduct a comprehensive analysis of the possibilities of financing start-up companies [28]. Particular attention is paid to the development of start-up companies, their types and potential sources of financing for technology companies. All data is presented for business entities from Croatia. The authors compare traditional financing methods and new methods for developing startups. This allows us to better understand the choice of financing strategy for high-tech entrepreneurial ventures.

B. L. Dos Santos, P. C. Patel and R. R. D'Souza pay attention to business financing in the field of information technology [29]. The authors emphasize that the success of many information technology enterprises depended on effective financing. For these purposes, as a rule, venture financing was used. Therefore, the work focuses on identifying factors that play an important role in making decisions about financing IT projects. The authors propose their model based on work in the field of finance and entrepreneurship [29]. This model was tested on 139 business plans of IT startups. Various types of analysis are also used here, in particular tetrad analysis, which allows checking the compliance of the model with alternative approaches.

G. B. Halt Jr, J. C. Donch Jr, A. R. Stiles and R. Fesnak pay detailed attention to the consideration of financing strategies for technology startups [30]. At the same time, the authors explain the relevance of intellectual property for technology startups. This greatly affects the individual stages of their financing. Therefore, the work also examines the role of intellectual property in attracting financial capital. Hence, it is necessary to have a continuous financial support process for such startups. As a result, it is important to know potential sources for financing and the possibility of attracting resources from such sources.

I. Savin, K. Chukavina and A. Pushkarev conduct a comprehensive study of startup development [31]. The authors classify and analyze global trends for technology startup companies. The article examined more than 250 thousand startups from the Crunchbase database [31]. Topic modeling is used for these purposes. As a result, it was revealed that the share of startups focused on data analysis, social platforms, financial transfers and time management has increased

ISSN: 2582-4686 SJIF 2021-3.261,SJIF 2022-2.889,
2023-5.384 ResearchBib IF: 8.848 / 2023

THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

VOLUME-4, ISSUE-2

significantly. It is also shown that strong regional differences in distribution suggest a certain concentration of startups [31].

The study by P. Vandenberg, A. Hampel-Milagrosa and M. Helble is devoted to the issues of financing technology startups for selected Asian countries [32]. The authors especially note that turning an innovative idea into a successful business is not easy and is hampered by limited access to finance. Therefore, it is important to know the sources of investment and the possibility of attracting sufficient funds from such sources. The continuity of such attraction is also important. However, tech startups rely on multiple sources of funding. This should be taken into account.

Thus, financing startups is the main task in this process of implementing and promoting business ideas. At the same time, it is necessary not only to identify potential sources of appropriate financing. It is important to find sources that would ensure continuity of financing for individual stages of startup operation. It is also necessary to minimize the risks of such financing. This is especially important for technology startups. Therefore, next we will consider the possibilities of financing startups through the opportunities of the stock market, where we will analyze the dynamics of shares of US companies involved in the integration of equipment and software. This will allow us to consider various problematic aspects in such a study.

Dynamics of stock prices of selected US companies involved in the integration of hardware and software

For analysis, let's look at some data from investing.com. Here, in particular, there is data on stock prices of US companies involved in the integration of equipment and software. This choice is due to the fact that these companies are representatives of startups in the field of high technology.

In Fig. 1 stock quotes provided for PC Connection Inc (CNXN) and Climb Global Solutions Inc (CLMB) for the period 01.03.21-02.11.24.

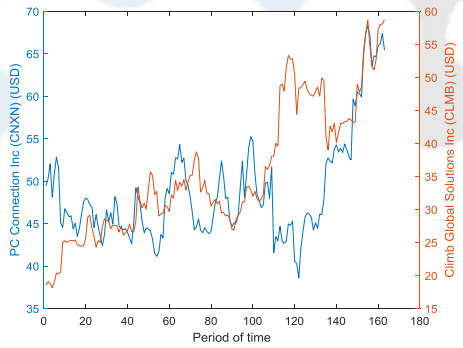

Figure 1: Stock prices for PC Connection Inc (CNXN) and Climb Glo
ons Inc (CLMB)

In Fig. 1 blue color and the left scale display quotes for shares of PC Connection Inc (CNXN), red color and the left scale – for shares of Climb Global Solutions Inc (CLMB).

First of all, it is worth noting the general increase in quotes for both PC Connection Inc (CNXN) and Climb Global Solutions Inc (CLMB) shares over the entire study period. Also, the value of stock quotes for the high-tech companies under consideration is approximately the same.

At the same time, the share price of PC Connection Inc (CNXN) is extremely volatile. In the period 01.03.21-11.27.22, quotes are around $45 per share. Then there is a significant decrease to $38.59 per share (12.04.22-04.30.23). Then there is the constant growth of shares of PC Connection Inc (CNXN), which as of 02.11.2024 is $65.4 per share. Then it can be noted that the dynamics of PC Connection Inc (CNXN) shares do not reflect significant problems for this company.

ISSN: 2582-4686 SJIF 2021-3.261,SJIF 2022-2.889,
2023-5.384 ResearchBib IF: 8.848 / 2023

THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

VOLUME-4, ISSUE-2

The share price of Climb Global Solutions Inc (CLMB) does not have global declines throughout the entire studied interval. Moreover, during the period when the share price of PC Connection Inc (CNXN) was declining, the share price of Climb Global Solutions Inc (CLMB) increased significantly. Overall, the stock price of Climb Global Solutions Inc (CLMB) is $58.7 per share as of 02.11.2024. In this aspect, we should talk about the possibility of hedging prices of shares of such companies with each other. We can also talk about the stability of such companies attracting financial resources, in particular, for the implementation of start-ups.

For a more detailed analysis of the dynamics of the shares of PC Connection Inc (CNXN) and Climb Global Solutions Inc (CLMB) for the purpose of mutual hedging, it is necessary to study the mutual dynamics of their quotes.

The figures below provide other examples of stock quotes for US hardware and software integration companies.

In Fig. 2 shows the price dynamics for the shares of Telos Corp (TLS) and SmartRent Inc (SMRT).

Here, the blue color and left scale display quotes for Telos Corp (TLS) shares, the red color and left scale display quotes for SmartRent Inc (SMRT) shares.

Shown in Fig. 2 dynamics reflects the operating conditions of the corresponding technology companies.

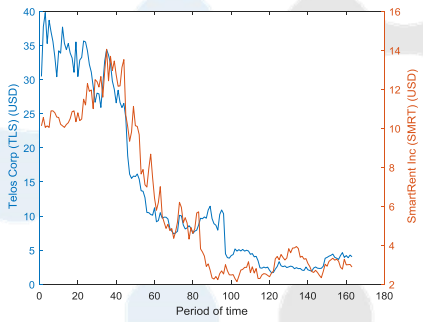

Figure 2: Stock prices for Telos Corp (TLS) and SmartRent Inc (SMRT)

In Fig. 3 shows the price dynamics for the shares of Iveda Solutions Inc (IVDA) and Shapeways Holdings, Inc. (SHPW). Here, the blue color and left scale display quotes for Iveda Solutions Inc (IVDA) shares, the red color and left scale display quotes for Shapeways Holdings, Inc. shares (SHPW).

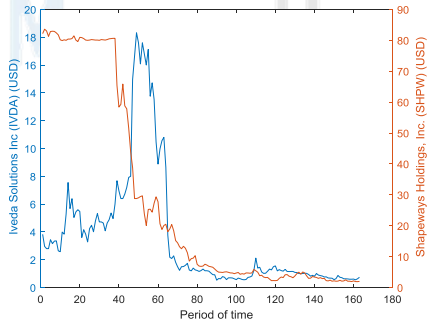

Figure 3: Stock prices for Iveda Solutions Inc (IVDA) and Shapeways Holdings, Inc. (SHPW)

ISSN: 2582-4686 SJIF 2021-3.261,SJIF 2022-2.889,
2023-5.384 ResearchBib IF: 8.848 / 2023

THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

VOLUME-4, ISSUE-2

Analyzing the dynamics of the data, which is shown in Fig. 2 and Fig. 3, it should be noted that:

in general, this dynamics is decreasing over the time interval under study,

at the beginning of the period under study, it should be noted that there are diverse trends in the data under study.

For example, the dynamics of stock quotes for SmartRent Inc (SMRT) at the beginning of the study period is increasing (see Fig. 2). Then there is a constant decline in prices for shares of this company. And although at the end of the period under study there is a periodic increase in quotations, one cannot talk about the sustainability of such dynamics. At the same time, shares of Telos Corp (TLS) are constantly declining. In this regard, the dynamics of stock quotes for these companies should be considered equally directed.

Prices for shares of Iveda Solutions Inc (IVDA) at the beginning of the period under study also have an increasing trend, which is then characterized by a fall in quotations (Fig. 3). Shapeways Holdings, Inc. stock prices (SHPW) are stable at the beginning of the study period then they decrease. Thus, from a certain point in time, the dynamics of quotes for these companies are also co-directed.

However, given the price movements for Telos Corp (TLS), SmartRent Inc (SMRT), Iveda Solutions Inc (IVDA) and Shapeways Holdings, Inc. (SHPW) funding startups based on them is problematic. At the same time, it should be noted that these companies themselves require startup ideas to improve trends in their quotes.

Comparative assessment of the mutual dynamics of stock quotes of individual companies

As noted above, the analysis of comparative data dynamics plays an important role in the corresponding study. For these purposes, consider the estimation of wavelet coherence [33]-[35]. This is due to the fact that this approach has found wide application in this type of research [36]-[41]. As an example in Fig. 4 presents the corresponding estimates of wavelet coherence for the data Fig. 1.

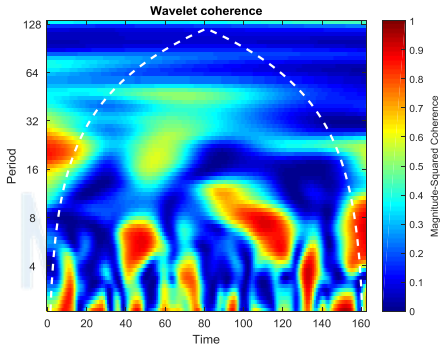

Figure 4: Wavelet coherence estimate for the data Fig. 1

In Fig. 5 presents the corresponding estimates of wavelet coherence for the data Fig. 2.

ISSN: 2582-4686 SJIF 2021-3.261,SJIF 2022-2.889,
2023-5.384 ResearchBib IF: 8.848 / 2023

THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

VOLUME-4, ISSUE-2

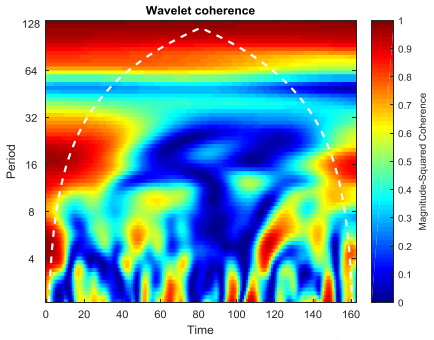

Figure 5: Wavelet coherence estimate for the data Fig. 2

In both cases, there is fragmentary consistency between the data series under study. The fragmentation density of such consistency is different, which corresponds to the dynamics of the data presented in Fig. 1 and Fig. 2. At the same time, the depth of the consistency under consideration is significant. This allows you to develop strategies for entering the corresponding segment of the stock market and identify potential sources of investment in startups.

For the data in Fig. 4, fragmentation in the consistency of estimates is evenly distributed over the entire interval that is being studied. For the data in Fig. 5, such fragmentation is concentrated mainly in the second half of the time period under study. This suggests a shift in factors for Telos Corp (TLS) and SmartRent Inc (SMRT) data that needs to be taken into account when appropriately forecasting and developing strategies for funding startups.

At the same time, it should be noted that wavelet coherence makes it possible to assess the relationship between the data under study in order to determine the possibilities of hedging some securities with others in the process of investing in startups. It also enhances the ability to identify strategies for going public to invest in startups.

Conclusion

The work examines certain aspects of the problem of financial support for startups. For these purposes, technology companies are considered using the example of the United States. The stock quotes of such companies were studied as a tool for selecting potential areas for financial support for startups.

A detailed analysis of the relationship between individual data series was carried out based on wavelet coherence estimates. As a result of this analysis, the dynamics of quotes for individual technology companies was confirmed. The influence of various factors on the dynamics of quotes for different companies was also revealed. Most likely, this is due to their direct activities. In general, this helps to determine the time to enter the stock market for the purpose of possible investment in startups, and to consider the potential source of such investment.

REFERENCES:

1. Bustos, O., & Pomares-Quimbaya, A. (2020). Stock market movement forecast: A systematic review. Expert Systems with Applications, 156, 113464.

2. Nti, I. K., Adekoya, A. F., & Weyori, B. A. (2020). A systematic review of fundamental and technical analysis of stock market predictions. Artificial Intelligence Review, 53(4), 3007-3057.

3. Bhowmik, R., & Wang, S. (2020). Stock market volatility and return analysis: A systematic literature review. Entropy, 22(5), 522.

ISSN: 2582-4686 SJIF 2021-3.261,SJIF 2022-2.889,
2023-5.384 ResearchBib IF: 8.848 / 2023

THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

VOLUME-4, ISSUE-2

4. Baek, S., Mohanty, S. K., & Glambosky, M. (2020). COVID-19 and stock market volatility: An industry level analysis. Finance research letters, 37, 101748.

5. Baranova, V., Zeleniy, O., Deineko, Z., & Lyashenko, V. (2019, October). Stochastic Frontier Analysis and Wavelet Ideology in the Study of Emergence of Threats in the Financial Markets. In 2019 IEEE International Scientific-Practical Conference Problems of Infocommunications, Science and Technology (PIC S&T) (pp. 341-344). IEEE.

6. Vasiurenko, O., Lyashenko, V., Baranova, V., & Deineko, Z. (2020). Spatial-Temporal Analysis the Dynamics of Changes on the Foreign Exchange Market: an Empirical Estimates from Ukraine. Journal of Asian Multicultural Research for Economy and Management Study, 1(2), 1-6.

7. Oranburg, S. C. (2020). Start-up financing. In Start-Up Creation (pp. 59-79). Woodhead Publishing.

8. Klein, M., Neitzert, F., Hartmann-Wendels, T., & Kraus, S. (2019). Start-up financing in the digital age: A systematic review and comparison of new forms of financing. The Journal of Entrepreneurial Finance (JEF), 21(2), 46-98.

9. Lyashenko, V. (2014). Efficiency of bank crediting of real sector of economy in the context of separate banking groups: an empirical example from Ukraine. International Journal of Accounting and Economics Studies, 2(2), 74-79.

10. Слюніна, Т. Л., Бережний, Є. Б., & Ляшенко, В. В. (2007). Розвиток вітчизняної мережі банківських установ: особливості та регіональні аспекти. Вісник ХНУ ім. В. Н. Каразіна. Економічна серія, 755. 84–88.

11. Куштим, В. В., & Ляшенко, В. В. (2007). Динаміка розвитку банківського сегмента міжнародного фінансового ринку. Фінанси України, 12, 96-105.

12. Азаренкова, Г., & Ляшенко, В. (2009). Відношення переваг у порівняльній оцінці діяльності банків. Банківська справа, 5, 65-72.

13. Dobrovolskaya, I., & Lyashenko, V. (2013). Interrelations of banking sectors of European economies as reflected in separate indicators of the dynamics of their cash flows influencing the formation of the resource potential of banks. European Applied Sciences, 1-2, 114-118.

14. Kuzemin, A., & Lyashenko, V. (2006). Fuzzy set theory approach as the basis of analysis of financial flows in the economical security system. International Journal Information Theories & Applications, 13(1), 45-51.

15. Babker, A. M., Altoum, A. E. A., Tvoroshenko, I., & Lyashenko, V. (2019). Information technologies of the processing of the spaces of the states of a complex biophysical object in the intellectual medical system health. International Journal of Advanced Trends in Computer Science and Engineering, 8(6), 3221-3227.

16. Matarneh, R., Tvoroshenko, I., & Lyashenko, V. (2019). Improving Fuzzy Network Models For the Analysis of Dynamic Interacting Processes in the State Space. International Journal of Recent Technology and Engineering, 8(4), 1687-1693.

17. Kuzemin, A., & Lyashenko V. (2011). Microsituation Concept in GMES Decision Support Systems. In Intelligent Data Processing in Global Monitoring for Environment and Security, 217–238.

18. Dadkhah, M., Lyashenko, V. V., Deineko, Z. V., Shamshirband, S., & Jazi, M. D. (2019). Methodology of wavelet analysis in research of dynamics of phishing attacks. International Journal of Advanced Intelligence Paradigms, 12(3-4), 220-238.

19. Sotnik, S., Mustafa, S. K., Ahmad, M. A., Lyashenko, V., & Zeleniy, O. (2020). Some features of route planning as the basis in a mobile robot. International Journal of Emerging Trends in Engineering Research, 8(5), 2074-2079.

20. Nevliudov, I., Yevsieiev, V., Lyashenko, V., & Ahmad, M. A. (2021). GUI Elements and Windows Form Formalization Parameters and Events Method to Automate the Process of Additive Cyber-Design CPPS Development. Advances in Dynamical Systems and Applications, 16(2), 441-455.

21. Mustafa, S. K., Yevsieiev, V., Nevliudov, I., & Lyashenko, V. (2022). HMI Development Automation with GUI Elements for Object-Oriented Programming Languages Implementation. SSRG International Journal of Engineering Trends and Technology, 70(1), 139-145.

22. Kuzomin, O., Lyashenko, V., Tkachenko, M., Ahmad, M. A., & Kots, H. (2016). Preventing of technogenic risks in the functioning of an industrial enterprise. International Journal of Civil Engineering and Technology, 7(3), 262-270.

23. Omarov, M., Tikhaya, T., & Lyashenko, V. (2018). Internet marketing technologies in civil engineering. International Journal of Civil Engineering and Technology, 9(7), 1233-1240.

24. Lyashenko, V., Zeleniy, O., Mustafa, S. K., & Ahmad, M. A. (2019). An advanced methodology for visualization of changes in the properties of a dye. International Journal of Engineering and Advanced Technology, 9(1), 711-7114.

25. Vyacheslav, L., Omer, I. A. M., & Asaad, M. A. B. (2020). COVID-19 wavelet coherence data for some Gulf countries. GSC Biological and Pharmaceutical Sciences, 11(2), 166-174.

26. Ahmad, M. A., Kots, G. P., & Lyashenko, V. V. (2016). Statistical Study of Bank Lending Efficiency in the Real Sector of the Economy of Ukraine within the Period of Years 2009 to 2012. Asian Academic Research Journal of Multidisciplinary, 3(2), pp. 104-120.

27. Kousari, A. (2011). New solutions to the funding dilemma of technology startups. Open Source Business Resource, (June 2011).

28. Klačmer Čalopa, M., Horvat, J., & Lalić, M. (2014). Analysis of financing sources for start-up companies. Management: journal of contemporary management issues, 19(2), 19-44.

29. Dos Santos, B. L., Patel, P. C., & D'Souza, R. R. (2011). Venture capital funding for information technology businesses. Journal of the Association for Information Systems, 12(1), 2.

30. Halt Jr, G. B., Donch Jr, J. C., Stiles, A. R., & Fesnak, R. (2016). Intellectual Property and Financing Strategies for Technology Startups. Springer.

31. Savin, I., Chukavina, K., & Pushkarev, A. (2023). Topic-based classification and identification of global trends for startup companies. Small Business Economics, 60(2), 659-689.

32. Vandenberg, P., Hampel-Milagrosa, A., & Helble, M. (2020). Financing of tech startups in selected Asian countries (No. 1115). ADBI Working Paper Series.

33. Torrence, C., & Webster, P. J. (1999). Interdecadal changes in the ENSO–monsoon system. Journal of climate, 12(8), 2679-2690.

ISSN: 2582-4686 SJIF 2021-3.261,SJIF 2022-2.889,
2023-5.384 ResearchBib IF: 8.848 / 2023

THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

VOLUME-4, ISSUE-2

34. Heil, C.E., & Walnut, D.F. (1989). Continuous and discrete wavelet transforms. SIAM review, 31(4), 628- 666.

35. Kingsbury, N. (1999). Image processing with complex wavelets. Philosophical Transactions of the Royal Society of London. Series A: Mathematical, Physical and Engineering Sciences, 357(1760), 2543-2560.

36. Vasiurenko, O., & Lyashenko, V. (2020). Wavelet coherence as a tool for retrospective analysis of bank activities. Economy and Forecasting, (2), 43-60.

37. Baranova, V., Orlenko, O., Vitiuk, A., Yakimenko-Tereschenko, N., & Lyashenko, V. (2020). Information system for decision support in the field of tourism based on the use of spatio-temporal data analysis. International Journal of Advanced Trends in Computer Science and Engineering, 9(4), 6356-6361.

38. Dadkhah, M., Lyashenko, V., & Jazi, M. (2015). Methodology of the Chaos Theory in research of phishing attacks. International Journal of Academic Research, 7(1), 169-175.

39. Orhan, A., Kirikkaleli, D., & Ayhan, F. (2019). Analysis of wavelet coherence: service sector index and economic growth in an emerging market. Sustainability, 11(23), 6684.

40. Kirikkaleli, D., & Gokmenoglu, K. K. (2020). Sovereign credit risk and economic risk in Turkey: empirical evidence from a wavelet coherence approach. Borsa Istanbul Review, 20(2), 144-152.

41. Wang, Y., Wei, M., Bashir, U., & Zhou, C. (2022). Geopolitical risk, economic policy uncertainty and global oil price volatility—an empirical study based on quantile causality nonparametric test and wavelet coherence. Energy Strategy Reviews, 41, 100851.