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**Shabatin Pavlo**

*Student of the*

*Taras Shevchenko National University of Kyiv*

**Khlevnyi Andrii**

*Candidate of Technical Sciences,*

*Associate Professor of the Department of Intellectual Technologies*

*Taras Shevchenko National University of Kyiv*

## **STUDY OF THE IMPACT OF SARS-COV-2 ON SOCIO-ECONOMIC INDICATORS USING DATA SCIENCE METHODS**

**Summary.** *The SARS-CoV-2 pandemic showed society how vulnerable the global economy and public health are. The losses caused by this crisis were large, unpredictable and inevitable. However, by using information about the damage caused by the pandemic, humanity can learn to better respond to and withstand similar threats in the future. Using data science methods, this study seeks to uncover and understand the impact of such crises on indicators such as gross domestic product (GDP), unemployment, and the consumer price index (CPI), providing an opportunity to determine the extent of the pandemic's impact on the studied indicators.*

**Key words:** *SARS-CoV-2, pandemic, socioeconomic indicators, Data Science, forecasting, data analysis.*

The significance of the study in the context of this paper is extremely high, as the global economy has faced unprecedented challenges as a result of the SARS-CoV-2 pandemic. The huge economic losses caused by sharp drops in

GDP in many countries, a significant increase in unemployment, and fluctuations in the consumer price index require detailed analysis and understanding [1]. The importance of this study lies in its ability to identify the deeper implications of these changes and provide evidence for informed policy making.

Adequate responses by governments and civil society organizations to such crises can significantly reduce their destructive impact. The analysis in this paper not only identifies potential growth points and weaknesses in the response to the pandemic, but also suggests methods for improving recovery strategies. Taking into account the harmful effects of the pandemic allows for more flexible and effective approaches to crisis management, which is crucial for ensuring the stability and prosperity of the global economy in the future.

Forecasting key socio-economic indices such as GDP, unemployment, and the CPI is a key element of this study. This process involves using pre-pandemic data to create a system that could illustrate the potential development of the economy without the impact of COVID-19. Through the use of statistical and machine learning methods, including time series and regression analysis, it is possible to identify the main trends and dynamics of the indices, which serves as the basis for scenario modeling [2].

This approach allows us to assess the deviation of actual indicators from potential indicators if the pandemic had not occurred. This comparison is extremely useful for understanding the full impact of COVID-19 on the global economy. It helps to determine how changes in GDP, unemployment, and CPI were directly caused by the pandemic and not by other factors. This information is crucial for governments and international organizations to formulate policies for economic recovery and social stability.

Thanks to detailed analysis and forecasting of possible development without the pandemic, it is also possible to better plan strategies to minimize similar losses in the future, making this approach not only scientifically significant but also practically necessary.

The study used a wide range of methods to analyze and model the data. Statistical analysis was used for the initial evaluation of the data, to determine the main characteristics of the data sets and to test hypotheses about the relationships between different indicators. Machine learning techniques, including linear regression, ARIMA (autoregressive integrated moving average models), Random Forest, and LSTM (long short-term memory), were used to gain a deeper understanding of time series dynamics and predict future values [3].

Model training included the automated determination of optimal hyperparameters for each model and separately for each country's data, thereby ensuring maximum accuracy and adaptability of forecasts. The best modeling result was determined by a set of parameters, such as RMSE, MAE, and R<sup>2</sup>, which allowed to assess the accuracy, stability, and adequacy of the models. This approach allowed not only to ensure accurate modeling under the influence of the pandemic, but also contributed to the formation of the best forecasting results for analyzing changes in socio-economic indices during the pandemic.

The impact of the SARS-CoV-2 pandemic on socioeconomic indicators was analyzed by comparing actual data with modeled forecasts based on historical data before the pandemic. According to the research findings, the pandemic led to a 12% drop in GDP, a 5.7% increase in unemployment rates, and a 2% rise in the CPI compared to what might have been expected without the crisis. The use of mathematical analysis methods made it possible to identify in detail changes in the dynamics of indicators such as GDP, unemployment, and the consumer price index. Graphical visualizations were used to illustrate the results of the study, presenting a comparative analysis between the predicted and actual values. This approach enhanced the clarity of the changes caused by the pandemic and provided an easy-to-understand visualization of complex data, which greatly facilitated the assessment of the scale of economic and social impact.

In conclusion, this thesis has demonstrated the substantial impact of the SARS-CoV-2 pandemic on socio-economic indicators such as GDP,

unemployment rates, and consumer price indices. By comparing actual data with forecasts generated through various predictive models, the study highlights how significantly these indicators have deviated due to the pandemic. Although the predictive models provided robust insights into potential economic trajectories, their accuracy in capturing complex phenomena like a global health crisis could still be improved. This suggests a continuous need for refining these models to better understand and anticipate the dynamics of such unprecedented events, ensuring that future responses to similar global challenges are more informed and effective.

### References

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