TASHKENT STATE UNIVERSITY OF ECONOMICS

International journal of topics

INNOVATION SCIENCE AND TECHNOLOGY

Scopus || Electronic journal specializing in Scopus

ISSUE 11

Acceptance of papers **November, 2025**

Acceptance of papers

Published monthly

Topics

economics, technology, social sciences

ISSN 3060-5229

THE SCIENTIFIC-POPULAR ELECTRONIC JOURNAL **"INNOVATION SCIENCE AND TECHNOLOGY"** HAS BEEN REGISTERED UNDER THE NUMBER **C-5669633** BY THE AGENCY FOR INFORMATION AND MASS COMMUNICATIONS (AOKA) OF THE REPUBLIC OF UZBEKISTAN, EFFECTIVE FROM OCTOBER 9, 2024.

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The scientific electronic journal “Innovation Science and Technology” has been included in the list of scientific publications recommended for the publication of main scientific results of dissertations for the award of PhD and DSc degrees in economics and technical sciences, in accordance with the Resolution No. 370 of the Presidium of the Higher Attestation Commission of the Republic of Uzbekistan, dated May 8, 2025.

Electronic publication, Issue 11. 307 pages.
Approved for publication on November, 2025.

Editorial board:

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PROSPECTS FOR ENSURING BALANCE BETWEEN INDUSTRIAL SECTORS IN THE TERRITORIES OF THE ZARAFSHAN REGION

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Abstract: It is well known that econometric knowledge emerged and developed as a result of the interconnection and advancement of such disciplines as economic theory, economic mathematics, economic statistics, probability theory, and mathematical statistics. With the help of econometric models, economic processes can not only be thoroughly analyzed, but also their newly unexplored patterns can be revealed.

Key words: econometric model, econometric forecast, volume of industrial production, ARIMA model.

Annotatsiya: Ma'lumki, ekonometrik bilimlar iqtisodiy nazariya, iqtisodiy matematika, iqtisodiy statistika, ehtimollar nazariyasi va matematik statistika kabi fanlarning o'zaro bog'liqligi va rivojlanishi natijasi sifatida ajralib chiqqan va shakllangan. Ekonometrik modellar yordamida iqtisodiy jarayonlarni faqat chuqur tahlil qilibgina qolmasdan, balki ularning yangi o'rganilmagan qonuniyatlarini ham ochishga imkon yaratiladi.

Kalit so'zlar: ekonometrik model, ekonometrik prognoz, sanoat mahsulotlari ishlab chiqarish hajmi, ARIMA modeli.

Аннотация: Как известно, эконометрические знания сформировались и выделились в результате взаимосвязи и развития таких наук, как экономическая теория, экономическая математика, экономическая статистика, теория вероятностей и математическая статистика. С помощью эконометрических моделей не только проводится глубокий анализ экономических процессов, но и создаются возможности для выявления их новых, ранее не изученных закономерностей.

Ключевые слова: эконометрическая модель, эконометрический прогноз, объём производства промышленной продукции, модель ARIMA.

INTRODUCTION

In global practice, countries are conducting extensive scientific research aimed at studying existing local problems and addressing them in a targeted manner to ensure the economic development of their regions. In particular, special attention is being paid to research focused on reducing socio-economic disparities between regions, improving methods for assessing qualitative indicators of regional economic development, developing market infrastructure based on digital technologies, establishing new export lines in technopolises and free economic zones, stimulating import-substituting production, and optimizing the territorial structure of industry, agriculture, and services through diversification of regional economies. This article highlights the prospects for ensuring balance between industrial sectors in the territories of the Zarafshan region.

LITERATURE REVIEW

The scientific and theoretical aspects of the balanced development of the regional economy, improvement of its sectoral and territorial structure were studied in the scientific research of foreign scientists, including the founders of the theory of regional economics V. Isard, A. Lyosh, I. Thunen, A. Weber, the modern regional economy and the priority areas of innovative development P. Krugman, F. Masaxisa, M. Porter, R. Florida, A. Rodrigues-Pos, F. Agxion, R. Camagini, innovative regions and clusters, and the problems of regional stability R. Martin, P. Sunley, R. Sternberg, K. Hook.

M. Porter [3], in his article, substantiates the role of regional clustering, balanced resource allocation, and specialization in ensuring competitive development of industrial sectors. His model emphasizes that linking value-added chains between sectors increases economic efficiency. The complementary integration of industrial branches in the Zarafshan region can be evaluated precisely through Porter's conceptual framework.

F. Perroux [4], in his research on growth poles theory, argues that inter-sectoral interaction, regional equality, and industrial balance are key conditions for economic development. According to him, major industrial hubs stimulate the growth of smaller sectors, reducing interregional disparities. In Zarafshan, the mining-metallurgy and chemical industries can be viewed as growth poles that drive other sectors.

P. Krugman [5], in his scholarly work, explains the impact of regional industrial location on economic stability and sectoral equilibrium based on the principles of New Economic Geography. He highlights agglomeration, transportation costs, and labor intensity as determining factors in resource distribution. If the spatial concentration of industrial hubs in the Zarafshan region is managed effectively, economic balance and production efficiency will grow sustainably.

The Uzbekistan Industry Development Report [6] provides recommendations for diversifying industrial sectors, increasing the share of raw material processing, and integrating regional production chains. The report evaluates in detail the key sectors of Zarafshan — gold and silver mining, construction materials, chemical production, and energy potential. As a conclusion, it recommends implementing a cluster-based model to ensure inter-sectoral balance.

In his article, S. Rakhimov [7] statistically examines industrial growth dynamics, export structure, and resource allocation issues in the Zarafshan economic zone. The author identifies balancing the industrial structure around metallurgy, energy, and chemical sectors, increasing the share of processing, and expanding small industrial zones as key strategic directions. The study emphasizes that harmonizing regional production chains leads to higher economic efficiency.

RESEARCH METHODOLOGY

The scientific and theoretical aspects of ensuring balanced regional economic development, as well as improving sectoral and territorial structures, have been explored in the works of foreign scholars such as A. Lösch, T. Hägerstrand, M. Porter, W. Rossi, F. Perroux, P. Krugman, and R. Capello. In the analytical process of this research, scientific methods—including observation, generalization, grouping, and comparison—were utilized, while synthesis and analytical methods were widely applied during evaluation and interpretation stages.

ANALYSIS AND RESULTS

Based on an econometric model, we developed forecast indicators for maintaining balance in industrial production in the Zarafshan region for the next five years, covering 2025–2029, using the ARIMA model.

The general form of the ARIMA (p, d, q) model is presented below.

$\phi_p(B)(1-B)^d Y_{t=}\theta_q(B)\varepsilon_t$ (3)

Here, Y_t - represents the time series at time t.

B - is the backward shift operator, where $BY_t=Y_{t-1}$.

d- denotes the order of differencing required to make the series stationary.

$\phi_p(B)=1-\phi_1 B-\phi_2 B_2-\cdots-\phi_p B_p$ - p represents the p-order autoregressive (AR) polynomial.

$\theta_q(B)=1+\theta_1 B+\theta_2 B_2+\cdots+\theta_q B_q$- q represents the q-order moving average (MA) component.

ϵ_i - denotes the error term (white noise) at time i.

In developing the forecast indicators for this research, quarterly data covering 32 observations for the period 2015–2024 were used as the primary source. The resulting dependent variable for the econometric forecast is presented below. The volume of industrial product output — industr_prod — was taken as the dependent variable.

In the initial stage of the econometric forecast, an analytical time-series graphical diagram of industrial production output is presented below (Figure 1).

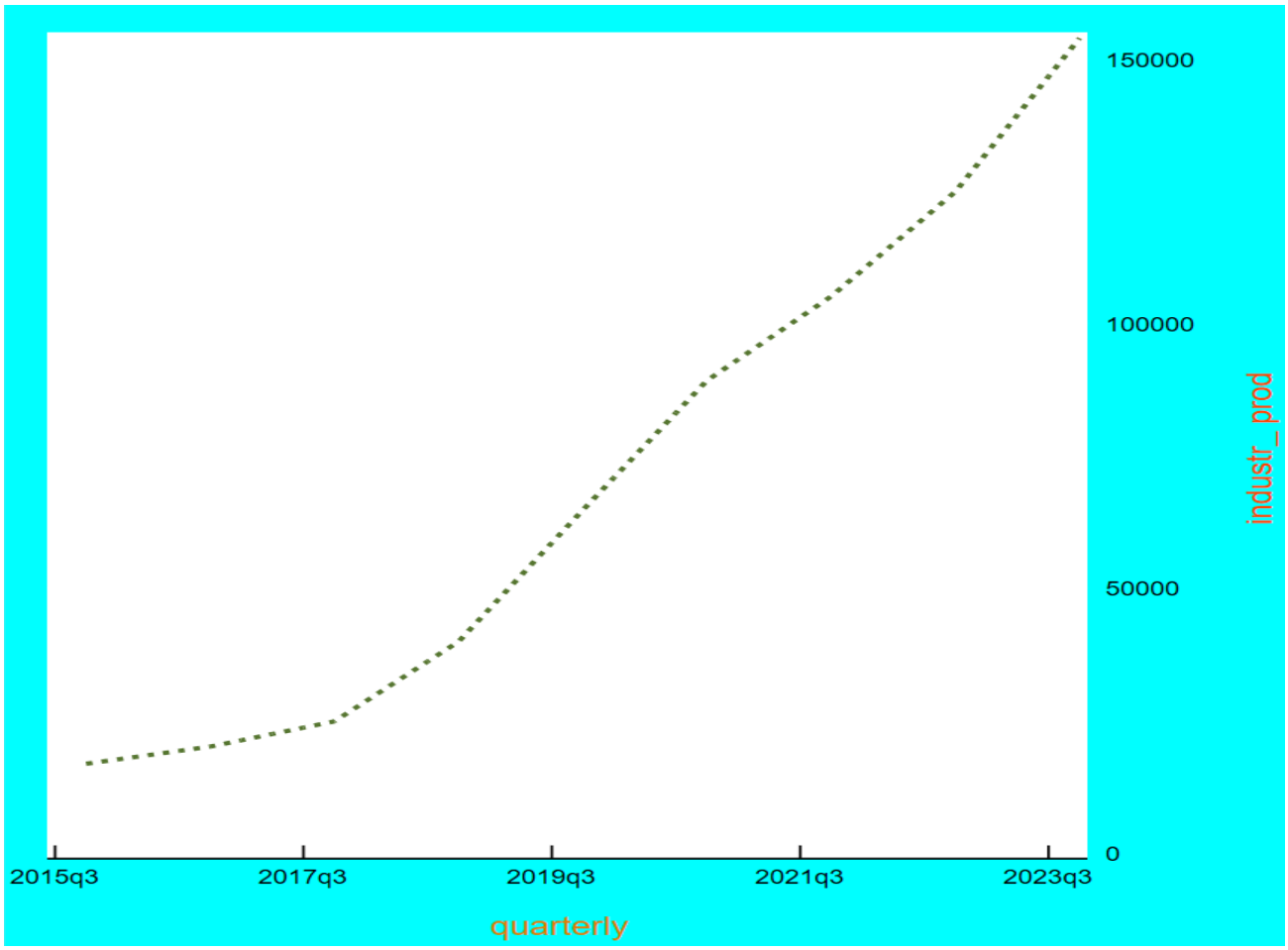

Figure 1. Analytical graphical representation of the cyclical pattern of industrial production output

According to Figure 1, industrial production volume shows a sharp upward trend beginning from the third quarter of 2017, reaching its peak by 2023. This analytical illustration indicates that the overall growth tendency emerged as a result of increasing industrial output and expanding investment in the region. The continued rise in investment inflows suggests a sustained increase in industrial production volume over time. In the next stage of the econometric forecast, the stationarity level of industrial production volume was evaluated using the Unit Root test (Table 1).

Table 1. "Unit Root" Test of Industrial Production Output Volume

economy_cost	***Test Statistic***	***1% Critical Value***	***5% Critical Value***	***10% Critical Value***	***p-value for Z(t)***
	-5,631	-3,716	-2,986	-2,624	0,0000

According to the data in Table 1, the Unit Root test statistic (–5.631) is significantly lower than all critical values (1% –3.716, 5% –2.986, and 10% –2.624). This allows us to reject the null hypothesis of a unit root with a very high level of confidence. Accordingly, the volume of industrial production is not randomly fluctuating, but rather exhibits a stable trend.

The recorded p-value (0.0000) further indicates that the trend in industrial production volume is statistically significant and is unlikely to have occurred due to random fluctuations. This reflects the presence of a stable economic trend that supports systematic forecasting in developing strategies and planning processes within the region.

Since the data is stationary, it enables more reliable forecasting of future industrial production volumes. In the next stage, the value of p, identifying the indirect correlation between time-series lags in the model, is illustrated (Figure 2).

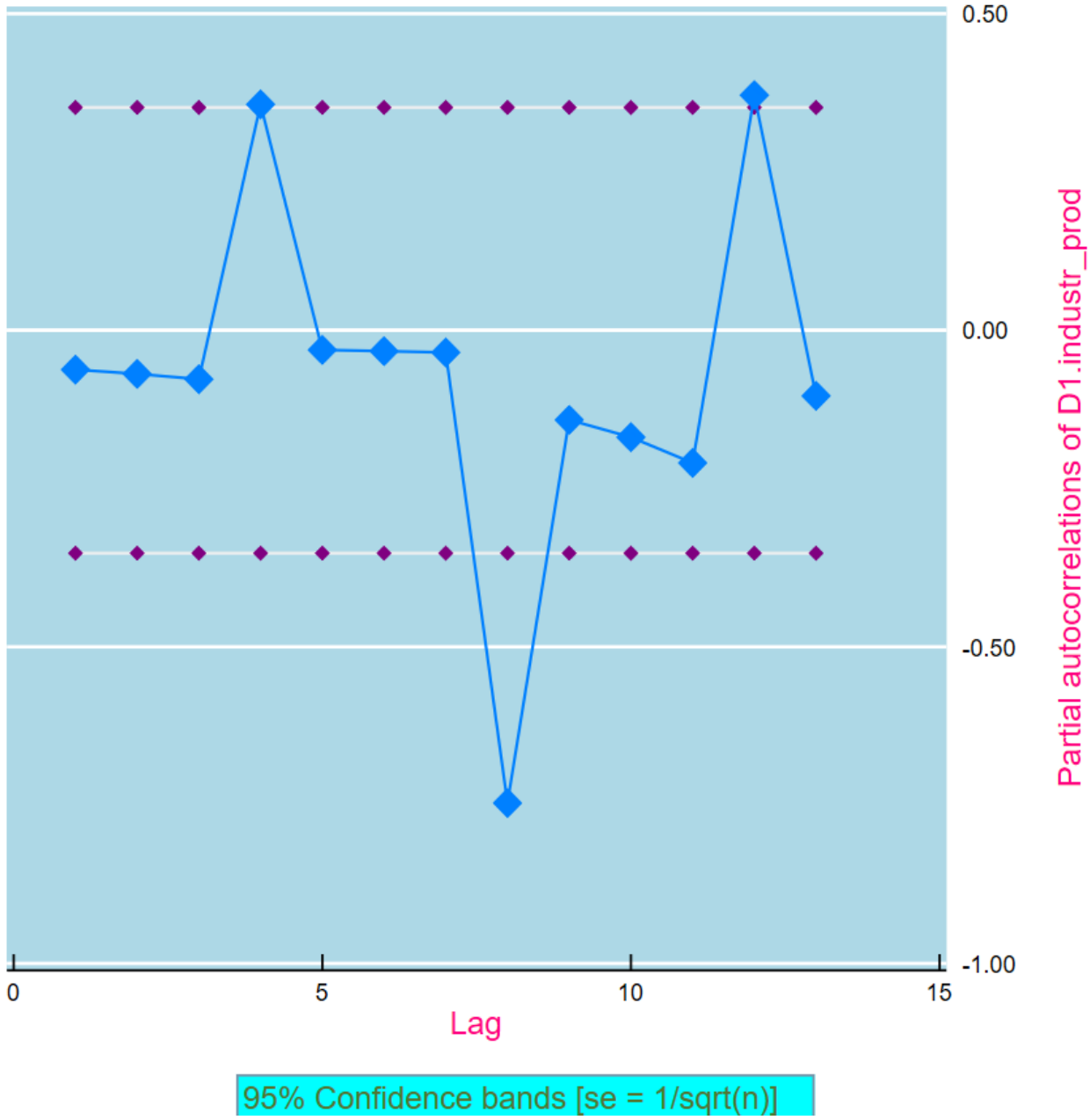

Figure 2. Autocorrelation graph of time-lag relationships in the econometric model of industrial production output.

According to Figure 2, the indirect lag correlation values of the econometric model for industrial production volume fall predominantly within the 95% confidence interval, confirming and reinforcing the results of the previous Unit Root test, which indicates stationarity. At the same time, the first few lags show notable significance, demonstrating that past values have a measurable influence on current industrial production output.

The sharp decline in correlation after the initial lag reflects the suitability of an autoregressive (AR) model, which allows dynamic economic tendencies to be captured effectively. Except for the first two lags, all remaining lag values fall within the confidence boundaries based on the partial correlation analysis. Accordingly, a p-value of 1 or 2 can be selected for the AR parameter in the ARIMA model.

In the next step of ARIMA modeling, the value of q, representing the direct autocorrelation relationships between lags, was determined.

Figure 3 shows that the ARIMA model demonstrates strong correlation between the initial lags, and except for one lag, all others lie within the defined confidence interval.

The pattern of autocorrelations throughout the model indicates a long-term stable tendency, further confirming the stationary nature of industrial production volume (Figure 3).

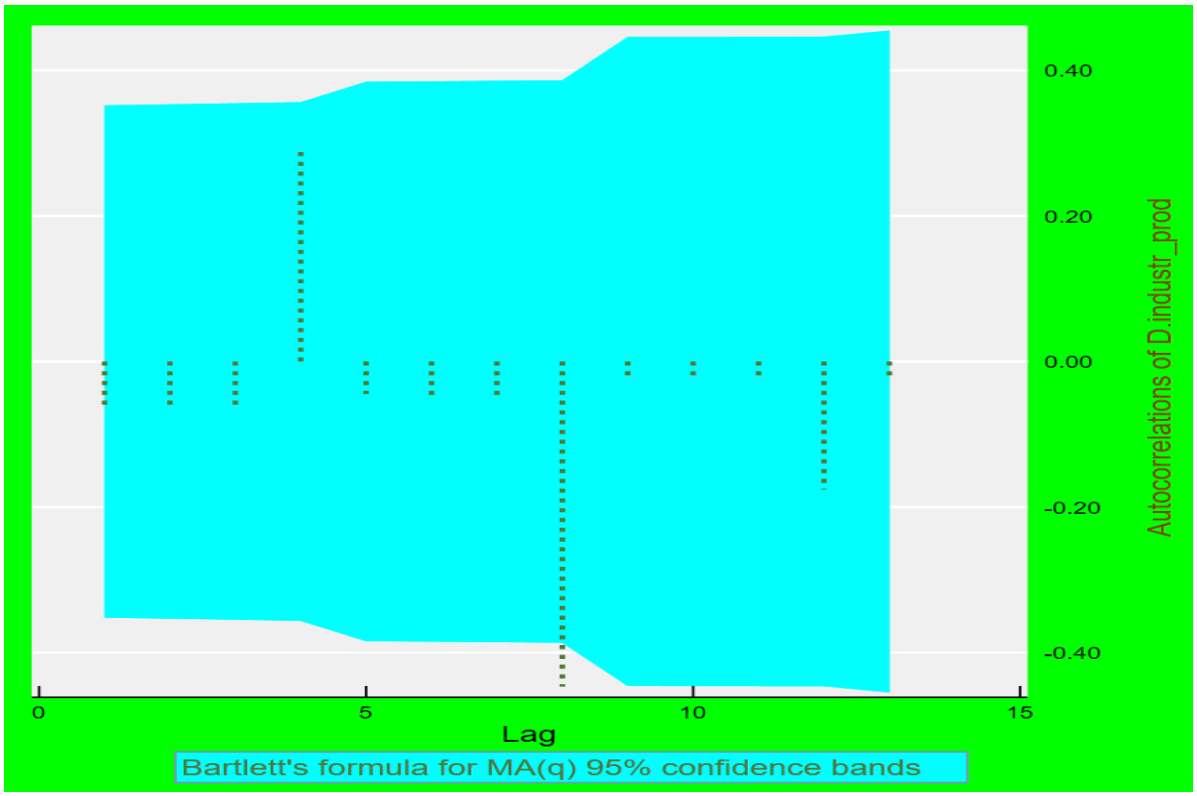

Figure 3. Direct correlation graph between lags of industrial output

Most of the autocorrelation values are within the 95% confidence interval, which does not indicate a preference for random abrupt shocks. At the same time, forecasting based on econometric modeling for industrial production volumes and analyzed trends serves to increase the reliability of the model.

When selecting the optimal ARIMA variant models for forecasting the model, the following models were developed: ARIMA (0,1,1), ARIMA (1,2,1), ARIMA (2,2,1), ARIMA (2,1,1), ARIMA (2,2,0) and ARIMA (1,1,1). Among these models, the ARIMA (1,1,1) model with the best results was selected (Table 2).

Based on the ARIMA model regression result, the econometric equation for the model is given below.

$D.economy\_cost_t = \beta_0 + \beta_1 D.economy\_cost_{t-1} + \beta_2 D.economy\_cost_{t-2} +$
$+\beta_3 economy\_cost_{t-1} + \epsilon_t$ (3)

Table 2. Econometric equation indicators of the ARIMA (1,1,1) model for industrial production volume.

D.industr_prod	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Constant	4164.13	1884,566	2,21	.027	470.449	7857,811	**
L	.936	.16	5,86	0	.623	1,25	***
L	.039	1,779	0,02	.092	-3.447	3,526	*
Constant	863.91	77,553	11,14	0	711.909	1015,912	***

Mean dependent var	4285,563	SD dependent var	2223,747
Number of obs	32	Chi-square	90,418
Prob > chi2	.	Akaike crit. (AIC)	533,719

*** p<.01, ** p<.05, * p<.1

According to Table 2, the ARIMA (1,1,1) model looks like this:

$D.economy\_cost_t = 659,19 + 1.58 D.economy\_cost_{t-1} - 0,67 D.economy\_cost_{t-2} — 0,69 economy\_cost_{t-1} + \epsilon_t + \varepsilon_t$ (4)

In the next stage, the ARIMA (1,1,1) model was developed, and the analysis was carried out based on the mean values of the dependent variable and the residuals illustrated through graphical representation (Table 3 and Figure 4).

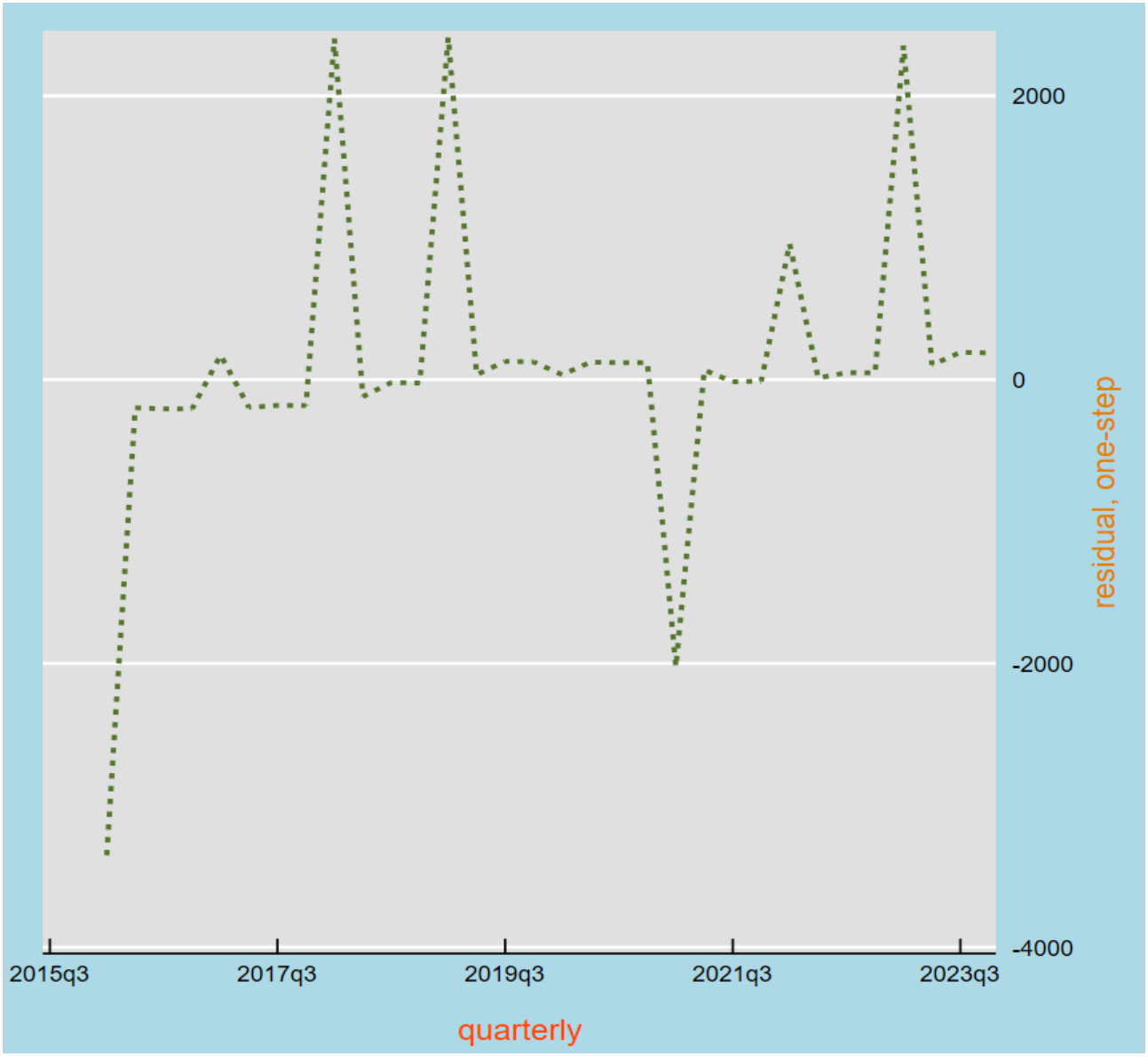

Figure 4. Graph of residual values of the ARIMA (1,1,1) model by industrial production volume

Table 3. ARIMA (1,1,1) model residual values of the resulting factor

Variable	*Obs*	*Mean*	*Std. dev.*	*Min*	*Max*
Residual value	32	91,07802	1040,632	-3352,08	2412,874

According to Table 3 and Figure 4, the ARIMA (1,1,1) model reached stochastic equilibrium, as evidenced by the visual distribution of residuals across the specified time intervals. The graphical representation confirms that the ARIMA model fits the data appropriately and reflects the underlying stochastic relationships within the dataset.

In the subsequent stage, the stationarity of residuals in the ARIMA (1,1,1) model for industrial expenditure volume was examined, including the evaluation of autoregressive (AR) and moving average (MA) residual components.

Additionally, the convergence of the ARIMA model within a unit interval was tested during the forecasting process of the econometric projection (Figure 9).

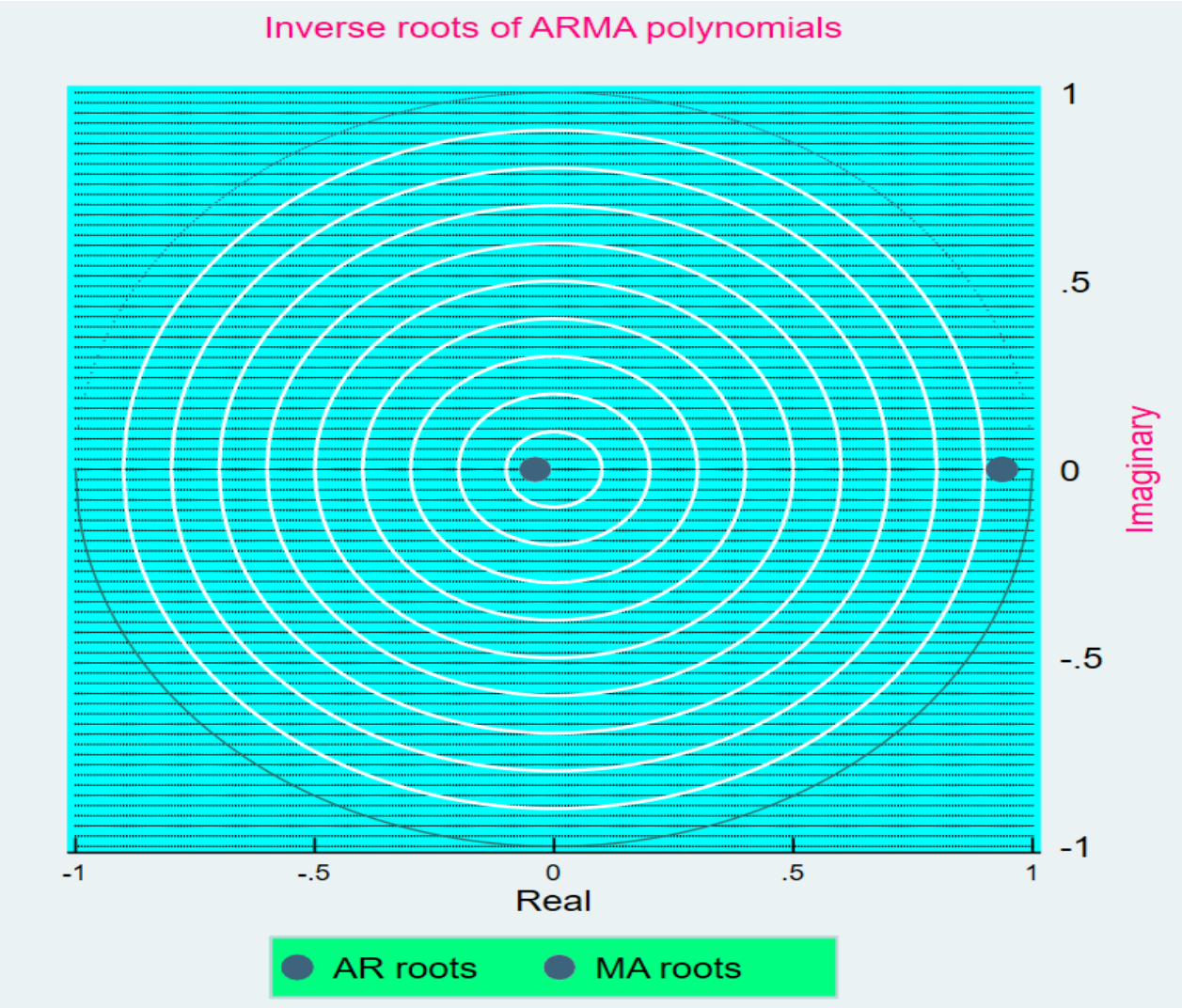

Figure 5. Range of values of industrial production volume according to the ARIMA (2,1,1) model

Using the Stata program, a forecast indicator for industrial production volume from 2025 to 2029 was developed using the ARIMA (1,1,1) model, excluding random factors (Table 4).

Table 4. Forecast indicators of industrial production volumes for 2025-2029 (in billion soums)

Years	Pessimistic forecast	Optimistic forecast	Forecast
2025	203 718,26	208 165,74	**205 942,00**
2026	226 599,16	231 046,64	**228 822,90**
2027	248 039,86	252 487,34	**250 263,60**
2028	268 373,56	272 821,04	**270 597,30**
2029	287 856,46	292 303,94	**290 080,20**

According to the results of the study, based on the ARIMA (1,1,1) model—and without accounting for random internal and external factors—the forecasted volume of industrial production for the Zarafshan region is expected to reach 205,942.00 billion UZS in 2025, 228,822.90 billion UZS in 2026, 250,263.60 billion UZS in 2027, 270,597.30 billion UZS in 2028, and 290,080.20 billion UZS in 2029, respectively.

For comparison, Figure 6 illustrates the industrial production volumes recorded by the Statistics Agency under the President of the Republic of Uzbekistan (2015–2024), along with the projected indicators for 2025–2029.

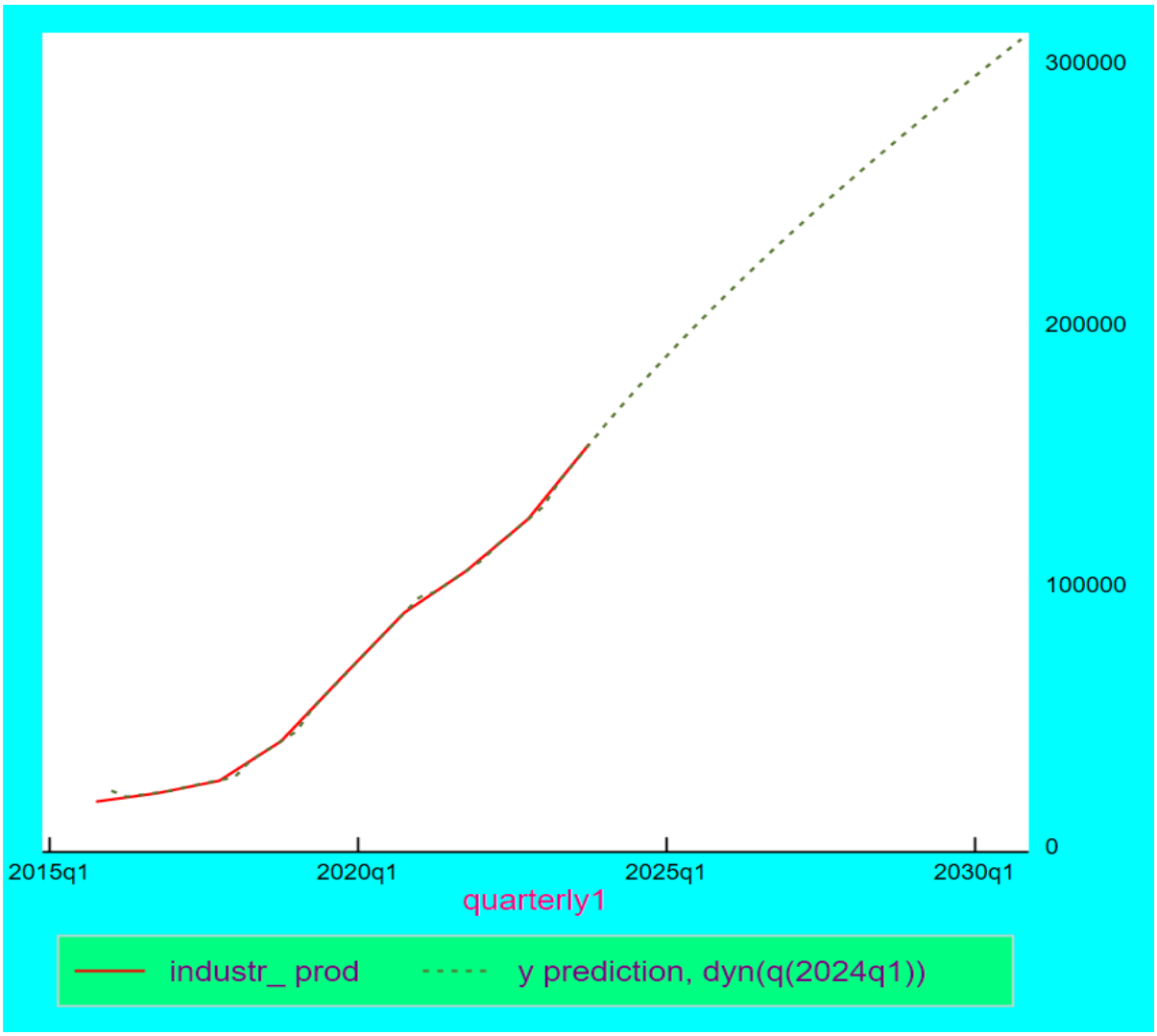

Figure 6. Graph of the resulting variable for 2015-2024 and the forecast for 2025-2029

Figure 6 illustrates the industrial production volume for 2015–2024, presented by the Statistics Agency under the President of the Republic of Uzbekistan, along with the projected values for 2025–2029. The two lines in the trend graph lie almost parallel and closely adjacent to each other, indicating that the forecast for the next five years—developed without accounting for random external factors—can be considered reliable and consistent with historical dynamics.

CONCLUSION AND RECOMMENDATIONS

In conclusion, the results of the econometric analysis using the multiple linear regression (LS) model reveal a strong and positive relationship between industrial production volume and several key indicators—namely, investment in fixed capital in the industrial sector, the volume of industrial exports, the GDP deflator, and electricity generation. These relationships collectively indicate significant acceleration of macroeconomic processes contributing to industrial growth.

1. Investment drives industrial expansion in the Zarafshan region.

A 1% increase in fixed capital investment leads to a 0.68% rise in industrial production. This highlights the substantial positive impact of capital inflows, demonstrating that encouraging industrial expansion can serve as an effective strategy for stimulating economic growth. Enhanced industrial infrastructure promotes greater investment activity and accelerates production capacity.

2. Export expansion boosts industrial output. A 1% increase in industrial exports results in a 0.36% rise in output. This suggests that the industrial sector in the Zarafshan region is responsive to external demand, underscoring the benefits of export-oriented policies, trade agreements, and international market integration.

3. Energy availability is a fundamental driver. A 1% increase in electricity production leads to a substantial 1.05% growth in industrial output. This highlights the essential role of energy supply in supporting industrial expansion and shows that investment in energy infrastructure yields significant economic returns.

4. Inflation management remains important. Although a 1% increase in the GDP deflator reduces industrial production by 0.13%, this effect is minor relative to the positive influence of investment, exports, and energy output. This indicates the importance of effective monetary policy and price stability in mitigating inflationary pressures.

5. The findings indicate that rising investment expectations, export activity, and energy expansion are the primary drivers of industrial growth in the Zarafshan region. Focus on government programs that stimulate capital inflows, promote exports, and increase electricity generation can ensure sustained industrial and economic development.

Based on the ARIMA (1,1,1) forecast model for industrial output in the Zarafshan region, the following conclusions were drawn:

6. Industrial production is projected to grow steadily from 205,942.00 billion UZS in 2025 to 290,080.20 billion UZS in 2029, reflecting a strong long-term upward trend. This growth supports economic development, job creation, and expansion of industrial capacity.

7. The projected growth follows a consistent upward trajectory, indicating a stable foundation for long-term development in the regional industrial sector. This also highlights the investment attractiveness of the region for both domestic and foreign investors.

8. The upward production trend enhances industrial efficiency, increases demand, and strengthens economic conditions. As the industrial sector continues contributing to regional GDP, it will simultaneously support local entrepreneurship and reinforce overall economic stability.

9. The expected growth demonstrates effective support for industrial expansion through current economic policies, industrial strategies, and market mechanisms. This momentum provides a basis for improving regulatory frameworks, strengthening energy security, and advancing industrial diversification in theX` region.

LIST OF USED LITERATURES:

1. Dougherty, Christopher. Elements of econometrics. Study Guide. University of London. 2011.
2. Dougherty, Christopher. Introduction to Econometrics. Oxford University Press, 2011, 2006 (4th or 3rd edition) (CD). Russiantranslation: Доугерти Кр. Введение в эконометрику. Изд.3. М., ИНФРА-М, 2009.
3. Porter, M. (1990). The Competitive Advantage of Nations. New York: Free Press.
4. Perroux, F. (1955). Note sur la notion de pole de croissance. Economie Appliquée, 8(1), 307–320.
5. Krugman, P. (1991). Geography and Trade. MIT Press.
6. World Bank. (2023). Uzbekistan: Industrial Diversification and Regional Competitiveness Report. Washington, DC.
7. Raximov, S. (2022). Zarafshon sanoat tarmoqlarida strukturaviy diversifikatsiya masalalari. TDIU Ilmiy axboroti, 4(3), 74–85.
8. Shadmanova G., Raxmankulova B.O., Karimova X.X. Ekonometrika: Darslik. - T.: TIQXMMI, 2020.
9. А.Ишназаров, Ш.Нуруллаева, М.Муминова, Н.Рўзметова. Эконометрика асослари. Ўқув қўлланма. –Тошкент: Иқтисодиёт, 2019 йил, 258 бет.
10. Абдуллаев О.М., Жамалов М.С. Эконометрическое моделирование. Учебник. –Т.: Fan va texnologiya. 2010. – 612 с.
11. Шодиев Т.Ш. ва бошқалар. Эконометрика. –Т.: ТДИУ, 2007. –270 б.

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