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Article

Uzbekistan's Export Potential: Forecasting Based on The Arima Model

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Abstract: The article presents a study on forecasting the export volume of Uzbekistan using ARIMA models. The analysis is based on monthly data for the period 2015-2024 and shows that the ARIMA (1.1.1) model provides the best fit. The forecast indicates moderate export growth in 2025 accompanied by increasing uncertainty. The results confirm the applicability of ARIMA for short-term analysis and export policy planning, while also highlighting the importance of external economic factors in shaping export trends.

Keywords: ARIMA, forecasting, export, short-term forecast

1. Introduction

The advantages of ARIMA for Uzbekistan are that an accurate forecast based on ARIMA allows regional administrations (for example, in Andijan or other regions where export activity is growing at double-digit rates) to optimize logistics, distribute quotas, and attract investment.

By 2030, Uzbekistan aims to achieve significant economic growth by increasing its GDP to $200 billion, which may become possible through the continuation of current reforms, particularly by increasing exports to $45 billion, including through membership in the World Trade Organization.[1]

The economy of Uzbekistan, like that of many developing countries, faces numerous challenges, including fluctuations in global energy prices and changes in foreign trade policy. Under these conditions, forecasting processes such as foreign trade activity, particularly such a macroeconomic indicator as exports, plays a critically important role in the development and implementation of economic strategies.[2]

Forecasting foreign trade indicators using the ARIMA model includes several stages: model identification, parameter estimation and model diagnostics. Application of the model for forecasting, particularly presenting the results of applying the ARIMA model to the macroeconomic export data of Uzbekistan.[3]

2. Materials and Method

ARIMA (Auto Regressive Integrated Moving Average) is a model of autoregression integrated with moving average and is considered fundamental in the analysis and forecasting of time series, especially for economic indicators such as exports, imports, and others.[4]

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The meaning of the components is as follows:

1. AR (Autoregression) - dependence of the current value of the series on its previous values;
2. I (Integration) - transformation of the series into a stationary form through differencing;
3. MA (Moving Average) - use of past forecast errors to refine the current value.

The ARIMA model makes it possible to forecast time series values based on their previous values, differences between them, and past forecast errors. [5]

The main components of the ARIMA model include autoregression (AR), integration (I), and moving average (MA).[6]

The ARIMA model is one of the most universal and reliable tools for forecasting economic time series. Its application in the analysis of Uzbekistan's foreign trade activity makes it possible to: objectively assess export trends, identify patterns in export dynamics, obtain forecast values necessary for strategic planning as well as improve the quality of managerial decision-making in the field of foreign economic policy.[7][8]

Literature Review. In the study by Ramlan M.N. (1), the ARIMA model was used to construct a forecast for Malaysia's exports. A comparison of actual and forecasted data confirmed the accuracy of the model, which is also consistent with the assessments of the World Bank.[9]

In another study, Lehmann R. (2) conducted a systematic evaluation of the forecasting potential of several survey-based indicators across different sectors of the economy for predicting export growth in a number of European countries. The study revealed that the four most effective indicators are export climate, expectations of domestic producers, the industrial confidence index, and the economic sentiment index.[10]

The work of Sadulloyevich K.I. and Jobir Ugli A.I. (3) examines methods for assessing and forecasting trends in global markets using indicators such as GDP per employed person, currency devaluation, and others. In addition, the structure of Uzbekistan's foreign trade was analyzed, and recommendations were proposed to enhance the country's export potential.[11]

3. Result and Discussion

The study examines the construction of an ARIMA model for forecasting the export of goods and services in Uzbekistan. The model is based on the idea that future values of a time series can be explained through past values and past forecasting errors. The general form of the model is: **ARIMA(p,d,q)** where: p - the order of autoregression (considering the influence of past values); d - the order of integration (the number of differencing operations used to eliminate the trend); q - the order of the moving average (accounting for random fluctuations). In this study, the ARIMA model was selected as the best model according to the Akaike Information Criterion (AIC = 466.15).

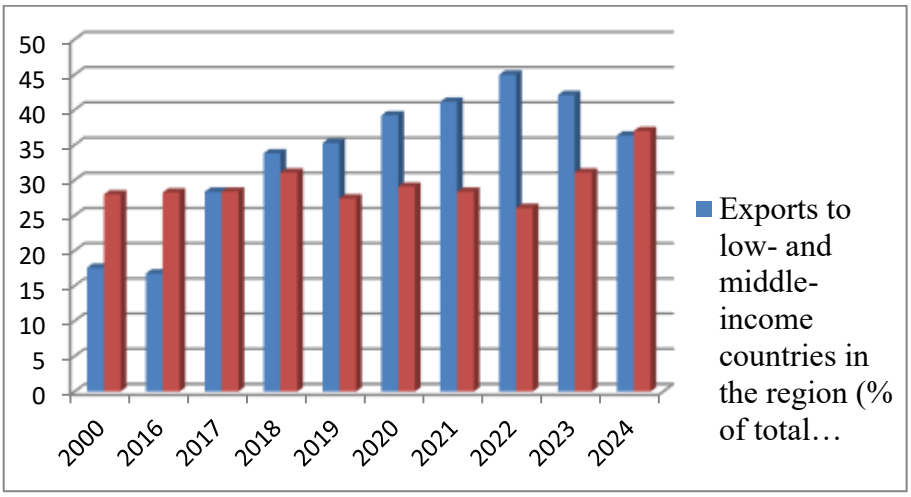

Figure 1. Uzbekistan: Structure of Merchandise Exports by Income Level of Destination Countries (% of Total Exports), 2000–2024

Source: World Bank, World Development Indicators, Last Updated: 10/07/2025

The study begins with an analysis of the current state and structure of Uzbekistan's exports for the period 2000–2024 (Figure 1), since export development is of strategic importance for Uzbekistan because it ensures inflows of foreign currency, contributes to the development of export-oriented industries, enables access to advanced technologies and equipment through imports and strengthens economic relations with partner countries, including Russia, China, Kazakhstan, Turkey, and the countries of the European Union.[12]

To assess the dynamics of Uzbekistan's merchandise exports for 2000–2024, data from the World Bank expressed in billions of U.S. dollars were used. An analysis of the structure of Uzbekistan's merchandise exports by the income level of destination countries (% of total exports) for 2000–2024 (Figure 1) demonstrated a positive trend in the growth of exports to high-income countries.[13]

This conclusion is further supported by the fact that, within the structure of Uzbekistan's merchandise exports by world regions, exports to Europe and Central Asia (% of total merchandise exports) rank third, following exports to East Asia and the Pacific and to the rest of the world (Figure 2).

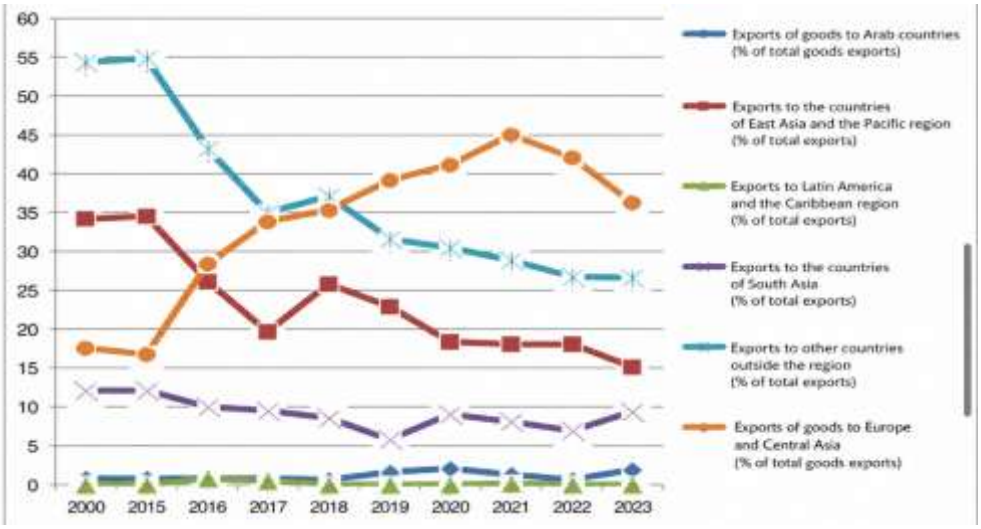

Figure 2. Uzbekistan: Structure of Merchandise Exports to World Regions (% of Total Merchandise Exports), 2000–2023.

Source: World Bank, World Development Indicators, Last Updated: 10/07/2025

A preliminary analysis of Uzbekistan's export time series indicates a moderate upward trend with fluctuations driven by external factors, including the COVID-19 pandemic (2020), rising global commodity prices (2021–2022), and the intensification of export policy in 2024 (Table 1).

Table 1
Uzbekistan's Goods Exports 2015-2024

Years	Uzbekistan's Goods Exports, billion US dollars
2015	9,44
2016	8,97
2017	10,08
2018	10,92
2019	14,93
2020	13,09
2021	14,08
2022	15,28
2023	19,23
2024	19,74

Source: compiled by the author based on data from the World Bank

The process begins with the analysis of the GDP time series and the determination of the initial model parameters (p, d, q). The analysis of the ACF and PACF indicated that one differencing is required to achieve stationarity of the time series (d = 1). Further, based on the autocorrelation and partial autocorrelation analysis, the orders of autoregression and moving average were selected (for example, p = 1 and q = 1).

Formalization of the ARIMA model:

For ARIMA (1,1,1), the standard representation uses lag operators:

$$Y_t = c + \varphi * Y_{t-1} + \theta * \xi_{t-1} + \xi_t$$

where: $\mathbf{Y_t}$ - the forecasted export value at time t;

$\mathbf{Y_{t-1}}$ - the export value in the previous period;

$\boldsymbol{\varepsilon_t}$ - the random forecast error.

Stationarity test results:

ADF (original series): ADF = 0.2501, p-value = 0.9749 → the series is non-stationary (the null hypothesis of a unit root is not rejected).

ADF (differenced series ΔY): ADF = −4.0495, p-value = 0.0012 → the differenced series is stationary (d = 1 is justified).

This is a standard step: if the original series is non-stationary, first differences are taken.

ADF results (original and differenced series).

The choice of d = 1 is confirmed by the ADF test, which shows that the series becomes stationary after first differencing.

The parameters φ (AR) and θ (MA) are estimated using the Maximum Likelihood Estimation (MLE) method.

Export forecasting model of Uzbekistan:

$$Y_t = 30{,}2712 + 0{,}12863 * Y_{t-1} - 0{,}49277 * \xi_{t-1} + \xi_t$$

0.12863 - autoregressive coefficient (AR), reflecting the degree of dependence of current export values on the previous year's level;

1. **−0.49277** - moving average coefficient (MA), indicating the impact of previous random shocks on current dynamics;
2. **30.2712** -constant term representing the mean shift of the series and defining the baseline growth trend.

The value **0.12863** indicates a weak but positive dependence of exports on the previous year, meaning that growth in the previous year tends to slightly stimulate growth in the current year.

The negative value **−0.49277** suggests that external shocks and random fluctuations (such as changes in global prices or trade conditions) have an inverse effect on short-term dynamics.

The resulting model demonstrates a high level of explanatory power and allows forecasting for 2025, which amounts to **USD 20.15 billion**.

This value reflects the continuation of a positive export trend under the assumption of stable global conditions and sustained demand for Uzbekistan's key export commodities (gold, copper, natural gas, textiles). **Forecast for 2025–2029 (Table 2): Point Forecast:** $Y_{(2025)}$ = 20,154,254,025.41 USD

95% confidence interval**:** [16,545,552,323.60; 24,822,955,727.22]

Table 2

Goods Export Forecast (2025–2029) Using the ARIMA(1.1.1) Model

Year	Export forecast, billion US dollars	Expected Change from Previous Year, %
2025	20,15	+2,1%
2026	20,57	+2,1%
2027	20,99	+2,0%
2028	21,42	+2,0%
2029	21,85	+2,0%

Source: compiled by the author based on data from the World Bank and calculations using the ARIMA (1.1.1) model.

According to the forecast, by 2029 the export volume may reach approximately USD 21.85 billion, which is about 10% higher than the 2024 level.

The average annual growth rate of exports is estimated at around **2%**. **Discussion. Limitations of the ARIMA model.** Although ARIMA is a powerful forecasting tool, it has several limitations:

1. It does not account for external factors such as global prices, sanctions, exchange rates, etc. (for this purpose, arimax models with exogenous variables are used).
2. It performs poorly in the presence of structural breaks (e.g., major changes in economic policy).
3. It is not suitable for strongly seasonal data; in such cases, sarima (seasonal ARIMA) models are applied.
4. It requires a relatively large number of observations and data stability. The quality of estimates is also limited: in this study, only 10 annual observations are available, which is insufficient for robust ARIMA estimation.

As a result, standard errors are unstable and the covariance matrix is close to singular.

Nevertheless, the calculations above demonstrate the underlying logic: the coefficients φ and θ are multiplied by the differenced values and the last residuals respectively, and these determine the direction and magnitude of the forecasted changes.[14][15]

4. Conclusion

Based on stationarity and autocorrelation tests, the ARIMA (1.1.1) model was selected as the best-fitting specification, providing the best approximation to the observed data (with the lowest Akaike and BIC values among the tested combinations).

The application of the ARIMA (1.1.1) model to Uzbekistan's export dynamics allows for estimating future trends based on the underlying time trend.

The results indicate a stable positive growth of exports in the medium term, reflecting the ongoing development of foreign economic activity and the integration of Uzbekistan

into the global economy. The forecast suggests a gradual strengthening of the country's export potential.

The main contributors to export growth include:

a. Increased exports of energy resources and mineral raw materials;
b. Development of industrial processing;
c. Diversification of export markets;
d. Attraction of investments into high-tech sectors.

Thus, the ARIMA (1.1.1) model can be considered an adequate tool for short-term forecasting of foreign trade indicators, and the results of the analysis may be used for shaping state export strategy and evaluating the effectiveness of foreign economic policy.

REFERENCES

[1] M. N. Ramlan, "Evaluating Forecast Performance of Malaysian Goods Export for 2021–2022 with Box-Jenkins Methodology and ARIMA Model," *FORCE: Focus Research in Contemporary Economics*, 2021. [Online]. Available: https://www.forcejournal.org/index.php/force/article/view/39

[2] R. Lehmann, "Forecasting Exports across Europe: What Are the Superior Survey Indicators?," *Empirical Economics*, vol. 61, no. 3, pp. 1201–1225, 2021.

[3] K. I. Sadulloyevich and A. I. Jobir Ugli, "Estimating and Forecasting Trends of Global Export and Import of Goods in International Markets," *Iqtisodiyot va Innovatsion Texnologiyalar Ilmiy Jurnali*, no. 2, 2020.

[4] World Bank, *World Development Indicators*. Washington, DC, USA: World Bank, Jul. 2025.

[5] G. E. P. Box, G. M. Jenkins, G. C. Reinsel, and G. M. Ljung, *Time Series Analysis: Forecasting and Control*, 5th ed. Hoboken, NJ, USA: Wiley, 2015.

[6] Ya. R. Magnus, P. K. Katyshev, and A. A. Peresetsky, *Econometrics: An Introductory Course*. Moscow, Russia: Delo Publishing House, 2021.

[7] S. V. Lukyanenko and L. G. Matveev, *Modeling and Analysis of Financial Time Series*. Moscow, Russia: Yurait Publishing House, 2023.

[8] Arina AI, *Documentation and Technical Descriptions: Agent-Based AI Systems and Vertical AI Architecture*. 2024.

[9] V. N. Volkova et al., *Models for Managing Innovative Activities of Enterprises and Organizations*. Moscow, Russia: Yurait Publishing House, 2022.

[10] V. N. Volkova, G. V. Gorelova, A. A. Efremov, et al., *Modeling of Systems and Processes: Practical Guide*. Moscow, Russia: Yurait Publishing House, 2016.

[11] J. D. Hamilton, *Time Series Analysis*. Princeton, NJ, USA: Princeton University Press, 1994.

[12] R. J. Hyndman and G. Athanasopoulos, *Forecasting: Principles and Practice*, 3rd ed. Melbourne, Australia: Monash University, 2021.

[13] C. W. J. Granger and P. Newbold, *Forecasting Economic Time Series*, 2nd ed. San Diego, CA, USA: Academic Press, 1986.

[14] W. Enders, *Applied Econometric Time Series*, 4th ed. Hoboken, NJ, USA: Wiley, 2015.

[15] Organisation for Economic Co-operation and Development (OECD), *International Trade Outlook 2024*. Paris, France: OECD Publishing, 2024.