JOURNAL OF INTERNATIONAL SCIENTIFIC RESEARCH
Volume 4, Issue 6, July- August 2026 Online ISSN: 3030-3508
https://spaceknowladge.com

MODELING AND FORECASTING THE SUSTAINABLE DEVELOPMENT INDICATORS OF UZBEKISTAN'S TEXTILE INDUSTRY

Madrakhimova Gulasal Ruzimboy qizi
Dean of the Faculty of Economics,
Tashkent Institute of Textile and Light Industry (TTYSI),
Doctor of Economics (DSc), Associate Professor

MAQOLA MALUMOTI

MAQOLA TARIXI:

Received:20.07.2026
Revised: 21.07.2026
Accepted:22.07.2026

KALIT SO'ZLAR:

textile industry; econometric modeling; ARIMA; forecasting; investments; regression analysis; Uzbekistan.

ANNOTATSIYA:

The textile industry is one of the strategic sectors of Uzbekistan's economy, contributing significantly to industrial output, employment generation, export revenues, and economic diversification. This study aims to model and forecast the main indicators of the textile industry using econometric methods based on official statistical data for 2010–2023. A multifactor econometric regression model was developed to determine the impact of investments, fixed assets, and employment on textile production volume. Correlation analysis, multiple regression analysis, exponential trend models, and ARIMA models were applied to analyze relationships among variables and forecast future trends. The empirical findings indicate that investments, fixed assets, and labor resources significantly affect textile industry output. Forecast results show that by 2030 textile production volume may reach 9,874.7 million USD, investments 2,941.7 million USD, fixed assets 8,661.3 million USD, and employment 415.9 thousand people. The study concludes that sustainable development of the textile industry requires increasing investment efficiency, improving technological integration, modernizing industrial infrastructure, and enhancing production capacities. The findings can serve as an analytical basis for strategic industrial policy and investment decision-making in Uzbekistan.

1. Introduction

The textile industry occupies an important place in the economy of Uzbekistan and serves as one of the key sectors ensuring industrial growth, export expansion, and employment generation. In recent years, comprehensive reforms aimed at modernization, diversification, localization of production, and attraction of foreign direct investment have accelerated the development of the textile sector.

The transformation of the textile industry has increased the importance of scientific forecasting and econometric analysis. Accurate forecasting of industrial indicators enables policymakers and investors to assess future trends, minimize economic risks, optimize resource allocation, and improve strategic planning processes.

Econometric modeling allows identifying quantitative relationships between production indicators and influencing factors such as investments, fixed assets, labor resources, and enterprise activity. In this regard, forecasting methods based on time-series analysis are particularly important for evaluating long-term industrial development scenarios.

The purpose of this study is to model and forecast the main indicators of Uzbekistan's textile industry using econometric approaches and modern forecasting techniques.

2. Literature Review

Econometric modeling and forecasting methods are widely used in industrial economics to analyze production dynamics and determine future development trends. According to Gujarati (2004), multiple regression analysis is one of the most effective tools for evaluating the influence of economic factors on output indicators.

Box and Jenkins (2015) emphasized the effectiveness of ARIMA models in forecasting economic time series characterized by trends, randomness, and cyclical fluctuations. ARIMA models are especially useful in industrial forecasting because they account for autoregressive and moving average components simultaneously.

Studies on textile industry development indicate that investments, technological modernization, labor productivity, and fixed assets are among the main determinants of industrial competitiveness. In developing economies, the textile sector often becomes a driver of export-oriented industrialization and structural transformation.

Previous empirical research also demonstrates that modernization of production capacities and integration into global value chains contribute significantly to productivity growth and export expansion.

3. Materials and Methods

3.1 Data Collection

The study uses official statistical data of Uzbekistan's textile industry covering the period from 2010 to 2023.

The dependent variable is:

- **Y** – Textile industry production volume (million USD).

Independent variables include:

- **X1** – Volume of investments (million USD);
- **X2** – Annual average value of fixed assets (million USD);
- **X3** – Number of employed persons (thousand people);
- **X4** – Number of textile enterprises.

3.2 Econometric Model Specification

To estimate the quantitative relationship between textile production and explanatory variables, the following multiple linear regression model was constructed:

$$Y = a_0 + a_1X_1 + a_2X_2 + a_3X_3 + \varepsilon$$

where:

- Y— textile industry production volume;
- X_1— investments;
- X_2— fixed assets;
- X_3— employment;
- a_0, a_1, a_2, a_3— unknown parameters;
- ε— random error term.

The parameters were estimated using the Ordinary Least Squares (OLS) method.

3.3 Forecasting Methodology

Depending on the characteristics of the time series, different forecasting approaches were applied:

1. **ARIMA models** for indicators containing trend, cyclical, and random components;
2. **Exponential trend models** for indicators with stable trend dynamics.

The stationarity of time series was tested using the Augmented Dickey–Fuller (ADF) test.

The general ARIMA model can be expressed as:

$$ARIMA(p, d, q)$$

where:

- p— autoregressive order;
- d— differencing order;
- q— moving average order.

4. Results and Discussion

4.1 Descriptive Statistics

Descriptive statistical analysis shows that during 2010–2024:

Variable	Mean	Std. Dev.	Minimum	Maximum
Textile production (Y)	4980.3	1417.7	2820	8200
Investments (X1)	493.6	526.1	119.4	2071.4
Fixed assets (X2)	4329.1	1026.2	3150	6130
Employment (X3)	170.5	50.5	115.5	255
Textile enterprises (X4)	9900	4742.3	5690	18900

The results indicate significant growth in all major indicators during the analyzed period. Between 2010 and 2024:

- textile production increased by 1.95 times;
- investments increased by 17.35 times;
- fixed assets increased by 1.95 times;
- employment increased by 2.21 times.

The sharp increase in investments compared with output growth suggests declining investment efficiency during certain periods.

4.2 Correlation Analysis

The correlation matrix revealed positive relationships between textile production and all explanatory variables. However, strong multicollinearity was detected among fixed assets, employment, and the number of enterprises.

Therefore, the variable representing the number of textile enterprises (X_4) was excluded from the final regression model to improve model reliability.

4.3 Regression Analysis

Regression analysis showed that investments and fixed assets positively influence textile production volume. The model demonstrated high explanatory power according to the coefficient of determination (R^2) and Fisher statistics.

However, some variables exhibited statistical insignificance according to t-statistics due to multicollinearity effects and the limited sample size.

The findings confirm that capital investments and modernization of production capacities play an important role in increasing textile industry output.

4.4 ARIMA Modeling Results

Textile Production Volume

The Augmented Dickey–Fuller test indicated that the textile production series was non-stationary at the level form. After first differencing, the series became stationary.

The optimal forecasting model was identified as:

$$ARIMA(2,1,2)$$

Investments

The investment series became stationary after second differencing. The optimal specification was identified as:

$$ARI(1,1,0)$$

Fixed Assets and Employment

For fixed assets and employment indicators, exponential trend models demonstrated high statistical adequacy according to:

- approximation error;
- standard error;
- t-statistics;
- coefficient of determination;
- Fisher criterion;
- Durbin–Watson statistics.

5. Forecast Results

Based on the constructed econometric models, long-term forecasts for 2024–2030 were developed.

Year	Textile Production	Investments	Fixed Assets	Employment
2025	8465.1	2234.9	6638.6	294.5
2026	8769.4	2374.5	7001.3	315.6
2027	9143.1	2516.5	7383.8	338.1
2028	9456.1	2658.2	7787.2	362.3
2029	9675.6	2799.9	8212.6	388.2
2030	9874.7	2941.7	8661.3	415.9

Forecast results indicate stable long-term growth of the textile industry.

By 2030:

- textile production may increase by 21%;
- investments may grow by 42%;
- fixed assets may increase by 41%;
- employment may rise by 63%.

These results confirm the effectiveness of industrial reforms and investment policies implemented in Uzbekistan.

6. Policy Implications

The study identified several challenges hindering sustainable development of the textile industry:

1. Insufficient integration of technological chains for high value-added production;
2. Weak industrial management systems;
3. Inadequate quality-control infrastructure and laboratory capacities;
4. Limited deep-processing capacities for cotton fiber;
5. Dependence on imported machinery and technologies.

To ensure sustainable industrial development, the following policy measures are recommended:

- modernization of technological infrastructure;
- improvement of investment efficiency;
- development of domestic machinery production;
- expansion of quality management systems;
- strengthening of logistics and industrial infrastructure.

7. Conclusion

This study developed econometric and forecasting models for the main indicators of Uzbekistan's textile industry using official data for 2010–2024.

The empirical results demonstrate that investments, fixed assets, and labor resources significantly affect textile production dynamics. ARIMA and exponential trend models provided statistically reliable forecasts for the period 2025–2030.

Forecast results indicate continued growth in textile production, investments, fixed assets, and employment. Nevertheless, sustainable industrial growth requires modernization of production technologies, improvement of management systems, and enhancement of investment efficiency.

The findings of this study can be used by policymakers, researchers, and investors for strategic planning and industrial policy development.

References

1. Gujarati, D. N. (2004). *Basic Econometrics* (4th ed.). McGraw-Hill Education.
2. Box, G. E. P., Jenkins, G. M., Reinsel, G. C., & Ljung, G. M. (2015). *Time Series Analysis: Forecasting and Control* (5th ed.). Wiley.
3. Wooldridge, J. M. (2016). *Introductory Econometrics: A Modern Approach* (6th ed.). Cengage Learning.
4. Enders, W. (2014). *Applied Econometric Time Series* (4th ed.). Wiley.
5. Official Statistics Agency of the Republic of Uzbekistan. Statistical reports on textile industry indicators (2010–2023).
6. Uzbekistan Textile Industry Association. Annual industrial development reports.

7. Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association*, 74(366), 427–431.

8. Engle, R. F., & Granger, C. W. J. (1987). Cointegration and error correction: Representation, estimation, and testing. *Econometrica*, 55(2), 251–276.

9. Madrakhimova G.R Improving The Use of Investment in Improving The Efficiency of Light Industry Enterprises in Uzbekistan. // International Journal of Research in Management & Business Studies (IJRMBS 2019) ISSN:2348-6503. Volume 6, Issue 2 (April-June 2019). Impact Factor (5) GIF – 0.70. 32-35-p. http://ijrmbs.com/vol6issue2/madrahimova.pdf

10. Madraximova G.R. Mamlakatimiz iqtisodiyotida sanoatning o'rni, ahamiyati va rivojlanish yo'nalishlari. // Biznes-Ekspert. – Toshkent, 2020. 2-son. 104-109-b. (08.00.00 №3).

11. Nasimov, B. (2024). SCIENTIFIC-METHODOLOGICAL BASES OF PRODUCTION RESOURCE MANAGEMENT IN COTTON-TEXTILE CLUSTERS. *Академические исследования в современной науке*, *3*(52), 66-71.

12. Nasimov, B. (2024). IMPROVEMENT OF PRODUCTION RESERVE MANAGEMENT MODELS IN COTTON-TEXTILE CLUSTERS: ERP-systems. Решение социальных проблем в управлении и экономике, 3(12), 131-134.

13. Nasimov, B. (2025). Strategic development of global companies in modern conditions. *YASHIL IQTISODIYOT VA TARAQQIYOT*, *3*(4).

14. Madrakhimova G.R Analysis of the current status of the textile industry in the economy of Uzbekistan. // Economics and Innovative Technologies. Vol. 2020, No. 1, January-February, 1/2020 (08.00.00; №10). 1-9-p. https://uzjournals.edu.uz/iqtisodiyot/vol2020/i