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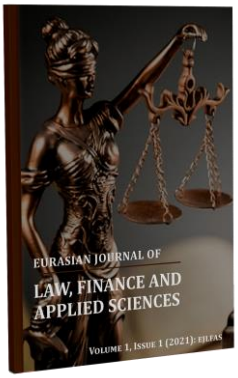

PRIORITIES AND FORECASTING SUSTAINABLE DEVELOPMENT OF THE ECONOMY OF KHOREZM REGION

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ABSTRACT

In this article, a descriptive analysis of the system of statistical indicators that characterize the sustainable development of the regions, econometric models of the transformation of the sustainable development of the regions into the standard of living of the population, statistical evaluation of the sustainable development of the Khorezm region's economy are studied.

Introduction. In 2020, Khorezm region will receive 585.2 billion soums from 712 enterprises in the field of construction materials. In 2021, a total of 791 enterprises are expected to produce goods worth 670.8 billion soums, while the growth rate was 103.4%. As a result of the study, it was revealed that the region produces specialized construction materials, mainly in 2 districts: Tpaqrqala and Khazarasp. It was found that the development of this sector has a high impact on the sustainable development indicators of the region.

In addition, the study of Khorezm region identified changes in the demographic situation in the region as priority areas for sustainable development, increasing employment by creating new jobs in the region, thereby reducing unemployment and increasing the share of small business and private entrepreneurship in the region's economy.

It is necessary to encourage the implementation of "digital" projects in the industrial, agricultural and service sectors of the region, including the digitization of production processes in the private sector. As part of the implementation of the Strategy "Digital Uzbekistan - 2030" it is necessary to take measures to ensure the sustainable development of all khokimiyats, ministries and departments in the Khorezm region through the full introduction of the digital economy.

of the economy of Khorezm region and the changes in the poor in the region. Different ways of forecasting can be applied based on statistical data. The data types we use are forecast types developed on the basis of time series.

Several forecasting methods are used in time series. There are MAPE, MAD, and MSD indicators that represent error quality in determining the optimal type of forecasting methods. These indicators measure the error between the values of the forecasting methods and the data provided.

$$MAPE = \frac{\sum \frac{|e_t|}{Y_t}}{n} \quad (1)$$

MAPE to the results of the forecasting method is the average of the sum:

MAD represents the average of absolute errors:

$$MAD = \frac{\sum |e_t|}{n} \quad (2)$$

MSD absolute errors squares represents the average:

$$MAD = \frac{\sum |e_t^2|}{n} \quad (3)$$

In the forecasting methods used, the method with the lowest results, which explains their reliability, is the most optimal forecasting method, and the forecast indicators calculated on the basis of this optimal method are more accurate.

For our study, we use three trend methods and one grinding method to determine the forecast values. The main reason for this is that the indicators are non-stationary and there is a trend factor in their change. Of the trend methods, linear, quadratic, and exponential are acceptable. Holt Winter seasonal , one of the grinding methods , covers the trend, seasonality and level of grinding, which means that this method is one of the advantages.

Grinding methods are determined on the basis of levels, the degree is from 0 to 1. Three types of grinding are widely used in scientific research, including exponential grinding, Double exponential grinding , and Holt Winter seasonal grinding.

only in the exponential grinding method αdetermines the degree of grinding of the method, which is described as follows:

$$\hat{x} = \alpha x_t + \alpha(1-\alpha)x_{t-1} + \alpha(1-\alpha)^2 x_{t-2} + .. (2)$$

Double exponential grinding , Holt Winter seasonal grinding types are represented in the same way.

equation (2) with (t-1) and multiplying both sides by (1- α) gives the following equation:

$$\widehat{(1-\alpha)}x_{t-1} = \alpha(1-\alpha)x_{t-1} + \alpha(1-\alpha)^2 x_{t-2} + \alpha(1-\alpha)^3 x_{t-3} + .. (3)$$

Substituting the second equation from equation (3), we obtain the following equation:

$\widehat{x_t} = \widehat{(1-\alpha)}x_{t-1} + \alpha x_t 0 << \alpha 1$

This equation is the final equation of exponential grinding and is the $\widehat{x_t}$actual level of the forecast values .x_t

Double exponential grinding the trend level is added along with the grinding rate in the method. It is advisable to use the Double exponential grinding method when the forecast indicator is trending

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$$\bar{x}_t = (1-\alpha)(\bar{x}_{t-1} + T_{t-1}) + \alpha x_t \quad (0 < \alpha < 1)$$

$$T_t = (1-\beta)T_{t-1} + \beta(\hat{x}_t - \hat{x}_{t-1}) \quad (0 < \beta < 1)$$

Holt Winter seasonal grinding method is defined as follows.

$$\hat{x}_t = (1-\alpha)(\hat{x}_{t-1} + T_{t-1}) + \alpha \frac{x_t}{F_{t-x}} \quad (0 < \alpha < 1)$$

$$T_t = (1-\beta)T_{t-1} + \beta(\hat{x}_t - \hat{x}_{t-1}) \quad (0 < \beta < 1)$$

$$F_t = (1-\gamma)F_{t-x} + \gamma \frac{x_t}{\hat{x}_t} \quad (0 < \gamma < 1)$$

Bundaα trend level , βtrend level, γseasonality level. If there is a trend, seasonality in the study, the Holt Winter seasonal grinding method is the most optimal, however, as we mentioned earlier, using three trend methods and one grinding method, we select their optimal model by comparing their errors using MAPE, MAD and MSD. based on forecast values.

Factors such as population growth rate, employment rate, unemployment rate and the share of small business and private entrepreneurship in GDP were selected in Khorezm region, so we will develop factor indicators using the STATA program using an algorithm that highlights forecast options (Table 1).

Table 1

Forecasting methods for factor characteristics of Khorezm region

№	Types of forecast models	MAPE	MAD	MSD
Population growth rate,% (PGR $_R$) - X $_2$				
1	Y_t = 101,694 + 0,00402597 * t	0.15	0.16	0.04
2	Y_t = 101,594 + 0,0301456 * t - 0,00118726 * t^2	0.14	0.15	0.04
3	Y_t = 101,594 + 0,0301456 * t - 0,00118726 * t^2	0.15	0.16	0.04
4	Smoothing Constants Alpha (level) 0.5 Gamma (trend) 0.3 Delta (seasonal) 0.4	0.19	0.19	0.07
Employment rate,% (ER $_R$) - X $_5$				
1	Y_t = 62,7886 + 0,116623 * t	1.4	0.9	1,2
2	Y_t = 64.0442 - 0.210935 * t + 0.0148890 * t^2	1,2	0.7	1.0
3	Y_t = 62.7956 * (1.00181 ^{t})	1.4	0.9	1,2
4	Smoothing Constants Alpha (level) 0.5 Gamma (trend) 0.3 Delta (seasonal) 0.4	1.1	0.7	1.0
Unemployment rate,% (U R $_R$) - X $_6$				
1	Y_t = -0.448095 + 0.448961 * t	44.1	0.9	1.3
2	Y_t = 0,120451 + 0,300645 * t + 0,00674166 * t^2	37.3	0.9	1,2
3	Y_t = 0.692725 * (1.14882 ^{t})	36.8	1.1	2.3

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4	Smoothing Constants Alpha (level) 0.5 Gamma (trend) 0.3 Delta (seasonal) 0.4	27.9	0.8	1.8
Share of small business and private entrepreneurship in GRP,% (SBPE $_{GRP}$) - X $_9$				
1	$Y_t = 49.8357 + 1.47857 * t$	2.3	1.6	5.0
2	$Y_t = 47,1556 + 2,17772 * t - 0,0317795 * t^2$	1.7	1,2	3.9
3	$Y_t = 50,8894 * (1,02312^t)$	2.9	1.9	6.5
4	Smoothing Constants Alpha (level) 0.5 Gamma (trend) 0.3 Delta (seasonal) 0.4	2.1	1.5	8.0

If we analyze the table above carefully, all the factor characters The Holt Winter seasonal grinding method is the most optimal because the MAPE, MAD, and MSD quality indicators indicate that there is less error than other forecasting options.

Therefore, to better understand this situation, we develop graphs of Holt Winter seasonal grinding method (Figure 1), it should be noted that the trend level, βtrend level, seasonality level in γHolt Winter seasonal grinding method αdiffer in factors.

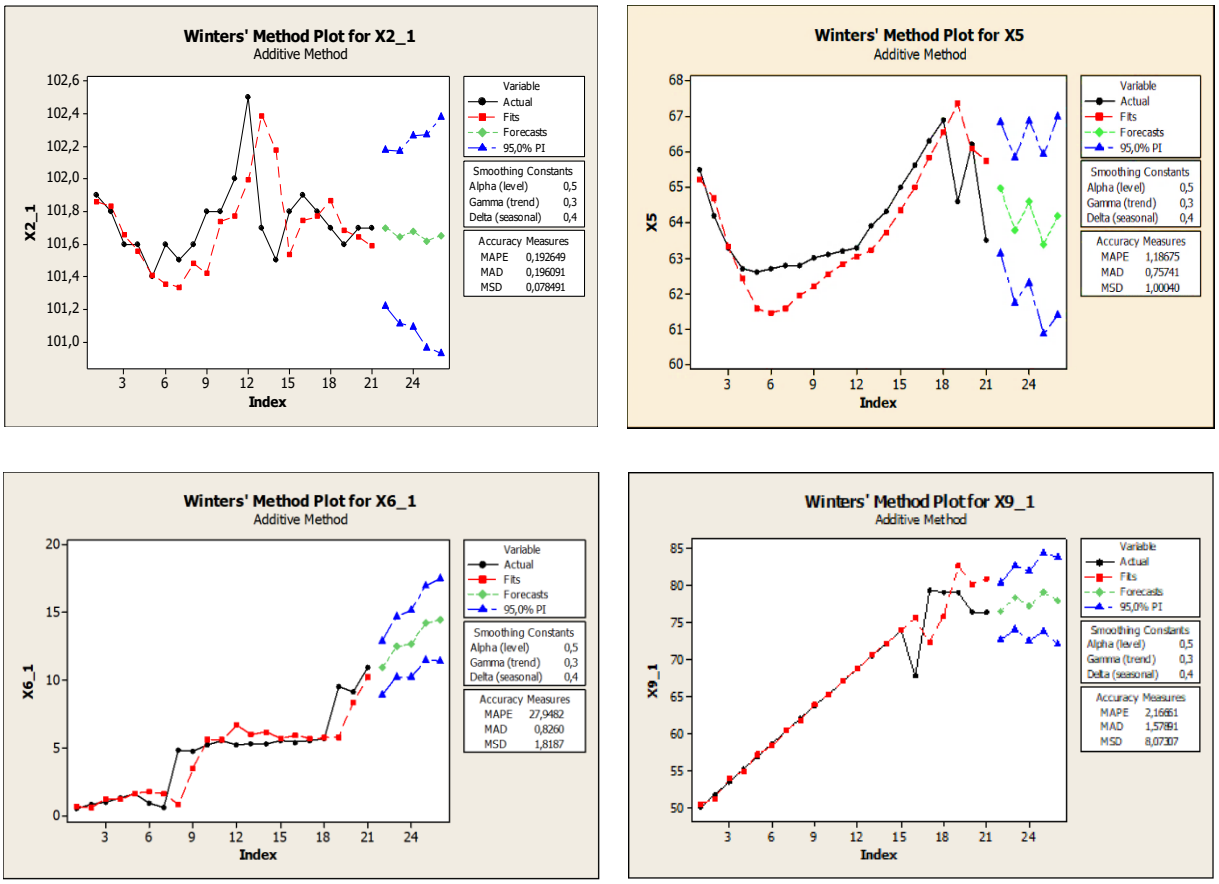

Figure 1 Diagrams of factor characters based on the Holt Winter seasonal method

If we look at the diagrams in the figure, the changes of each factor over time, their corresponding values, their forecasts and their state of 95% reliability are shown in the graph.

The mathematical expressions shown in the table above were evaluated for statistical significance. Based on these econometric models, we propose multivariate forecasts below (Table 2).

Table 2

Medium-term forecast options for sustainable development indicators of Khorezm region

Years	Forecast	Optimistic	Pessimistic
Population growth rate,%			
202 2	101, 62 1	102,173	100,929
202 3	101,644	102,181	100,966
202 4	101.6 55	102,266	101,089
202 5	101.6 78	102,275	101,114
202 6	101, 701	102,381	101,220
Employment rate,%			
202 2	63,3837	65,8244	60,8549
202 3	63,7796	65.9125	61,3788
202 4	64,1842	66,8317	61,7349
202 5	64,5801	66,8528	62.3075
202 6	64.9761	66.9896	63,1205
Unemployment rate,%			
202 2	14,4495	17.5090	11,4828
202 3	14,2406	16.9985	11,3899
202 4	12,4654	15,1528	10.2354
202 5	12,6743	14,6954	10,1957
202 6	10,8990	12,9228	8,8753
Share of small business and private entrepreneurship in GRP,%			
202 2	76,5338	80.4021	72,0087
202 3	77,1954	81,9330	72,4578
202 4	77,8570	82,6114	72,6656
202 5	78,3488	83,7052	73,7388
202 6	79,0104	84,2819	74.0862
Poverty rate,%			
202 2	11.7	5.3	19.4
202 3	10.9	3.9	18.7
202 4	10.7	2.9	18.6
202 5	10.0	1,2	18.1
202 6	9.8	0.1	18.0

As can be seen from the table above, one of the indicators of sustainable development of Khorezm region, ie the goal of our study, is to reduce the level of poverty from 13.0% in 2020 to 9.8% in 2026. To do this, it is necessary to ensure a stable population growth rate, increase employment, reduce unemployment and increase the share of small business and

private entrepreneurship in the economic growth of the region.

Forecast options for sustainable development indicators of the republic have also been developed. They were proposed on the basis of the following econometric models (Table 3).

Table 3

Forecasting methods for factor characteristics of the Republic of Uzbekistan

№	Types of forecast models	MAPE	MAD	MSD
GRP growth rate per capita,%				
1	$Y_t = 105,142 - 0,0579221 * t$	1.44	1.50	3.32
2	$Y_t = 101,282 + 0,949139 * t - 0,0457755 * t^2$	0.78	0.8 2	1.08
3	$Y_t = 105,133 * (0,999441^t)$	1.44	1.5 1	3.32
4	Smoothing Constants Alpha (level) 0.3 Gamma (trend) 0, 5 Delta (seasonal) 0, 6	1.17	1, 2 2	2.69
Growth rate of gross income per capita,%				
1	$Y_t = 142,010 - 1,40312 * t$	4 , 9	6 , 2	61 , 17
2	$Y_t = 148,983 - 3,22208 * t + 0,0826800 * t^2$	4 , 5	5 , 7	53 , 8
3	$Y_t = 141,885 * (0.989318^t)$	4 , 8	6 , 2	60 , 06
4	Smoothing Constants Alpha (level) 0.37 Gamma (trend) 0.27 Delta (seasonal) 0.50	4, 2	4, 9	51, 03
Unemployment rate,%				
1	$Y_t = -0.981429 + 0.468442 * t$	125 , 6	1 , 12	1 , 6
2	$Yt = -0.525414 + 0.349481 * t + 0.00540729 * t^2$	117 , 8	1 , 08	1 , 59
3	$Yt = 0.267624 * (1.21373^t)$	66 , 08	1 , 73	5 , 29
4	Smoothing Constants Alpha (level) 0.5 Gamma (trend) 0.8 Delta (seasonal) 0.4	22 , 53	0 , 8	2 , 1
Share of small business and private entrepreneurship in GRP,%				
1	$Y_t = 31.4748 + 1.58455 * t$	6 , 76	3 , 37	18 , 14
2	$Y_t = 23.9877 + 3.53770 * t - 0.0887798 * t^2$	5 , 14	2 , 4	9 , 7
3	$Y_t = 32,6365 * (1,03510^t)$	7 , 8	3 , 9	25 , 02
4	Smoothing Constants Alpha (level) 0.5 Gamma (trend) 0.3 Delta (seasonal) 0.4	4 , 6	2 , 4	11 , 2

Based on the econometric models presented in the table above , the following table 4 provides forecast options for factors such as GRP growth rate per capita , gross income growth rate , unemployment

rate and the share of small business and private entrepreneurship in GR

Table 4

Medium-term forecast options for sustainable development indicators of the Republic of Uzbekistan

Years	Forecast	Optimistic	Pessimistic
GRP growth rate per capita,%			
202 2	97,738	102,294	93,183
202 3	98,430	102,644	93,237
202 4	99,221	103,623	95,954
202 5	99,913	103,871	95,798
202 6	101,396	104,377	98,414
Growth rate of gross income per capita,%			
202 2	111,274	134,736	81,7759
202 3	111,346	134,743	84,6201
202 4	113,190	137,216	89,3070
202 5	113,262	137,929	91,6370
202 6	115,177	140,916	95,6183
Unemployment rate,%			
202 2	1 2 , 2075	17.2704	11,1446
202 3	1 1 , 8430	16,6038	11.0821
202 4	1 1 , 4654	14,9466	9.9841
202 5	1 0 , 1008	14,3333	9.8684
202 6	9 , 7232	12,7491	8,6973
Share of small business and private entrepreneurship in GRP,%			
202 2	49.2855	58.2572	40.3138
202 3	50,5169	58,6039	42,4299
202 4	51,5190	58,7869	44,2511
202 5	52,7504	59,2896	46,2112
202 6	53,7526	59,6868	47,8183
Poverty rate,%			
202 2	11.4	12.5	12.2
202 3	11.2	12.1	11.7
202 4	10.8	11.7	11.4
202 5	10.5	11.2	10.9
202 6	9 , 7	1 0 , 7	1 0.6

According to the table, the GDP growth rate per capita in the country from 99.8% in 2020 to 101.4% in 2026, the growth rate of gross income per capita from 112.7% to 115.2 %, respectively, small business and private entrepreneurship in GDP. the share was found to increase from 53.9% to 59.7% (optimistic). Unemployment is projected to decline from 10.5 percent in 2020 to 8.7 percent (pessimistic) by 2026, and the poverty rate from 11.5 percent to 9.7 percent, respectively.

References:

1. [1] .EURASIAN JOURNAL OF LAW, FINANCE AND APPLIED SCIENCES: 2 pp. 60-66 (4). STATISTICAL ANALYSIS OF SUSTAINABLE DEVELOPMENT OF TERRI TORIES IN THE

DIGITAL ECONOMY (ON THE EXAMPLE OF KHOREZM REGION) Urunov Ravshanbek Sadullaevich https://doi.org/10.5281/zenodo.6476182

2. Law of the Republic of Uzbekistan " On Official Statistics ". August 11, 2021, no. ZRU-707.
3. Law of the Republic of Uzbekistan "On transparency of public administration". May 5, 2014, no. ZRU-369.
4. Law of the Republic of Uzbekistan "On Dissemination and Use of Legal Information". September 7, 2017, no. ZRU-443.
5. Law of the Republic of Uzbekistan "On the administrative-territorial structure of the Republic of Uzbekistan". August 29, 2020,
6. no. ZRU-635.
7. Nuriddinov ZA, Burtseva TA, Nasriddinov FF Statistical assessment of the potential development of regional economies. Journal of Economics: Analysis and Forecasting. January-March 2021 No. 1. 109-b.