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Econometric Models of Forecasting the Sustainable Development of the Tourism Network in the Innovation Economy

Kamoliddin Shodiev [1], *Farkhodov Azizjon Botirovich* [2]

Abstract: In the article, it is possible to include long-term networks such as planning investment in the infrastructure sectors related to the tourism industry - hotels, motels, sanatoriums, highways, railways, airlines. Due to this, it is of great importance in forecasting the number of tourists visiting the Republic of Uzbekistan, their average stay (number of hotel nights), as well as their spending and optimal development of the tourism network. Therefore, in this article, we used univariate and multivariate econometric models used to forecast the development of the tourism industry.

One-sided econometric equations representing the flow of tourists to the Republic of Uzbekistan are calculated as follows. An adequate form of these models is described in logarithm.

$$\log Y_t = a + b \log Y_{t-1} + g_1 \log RP_t + g_2 \log EX_t + th \log Y_t + \sum l_k D_k \quad (*)$$

$$\log Y_t = a + b \log Y_{t-1} + g \log X_t + th \log Y_t + \sum l_k D_{kt} \quad (**)$$

Here, tourists who visited our republic from the country where the tourists came from in the period Y-t (measured by the amount of income from tourists per capita, soums); RPt is the ratio of the cost of transport costs for travel between the countries where the tourist came from and the countries where the tourist came from; EX - dollar/sum exchange rate of the countries where the tourist left and the tourist arrived; X is the real exchange rate of currencies (found by deflating the exchange rate). Y - GDP per capita in the country where the tourist came from, developed in t - period, dollars; D are surrogate variables that account for various events, Olympic Games, etc., in the visited country.

Key word : tourist, forecast, econometric model, regression parameters, optimization.

INTRODUCTION.

The econometric model of forecasting international tourism indicators (demand and supply) in the Republic of Uzbekistan can be as follows. Number of tourist arrivals in Uzbekistan Y = f (GDP production per capita (D), total investments spent on the formation of fixed capital (I), the number of airlines flying from the territory of the republic to other countries (A), the number of 1, 2, 3 and 4-star hotels in Uzbekistan (M) , that is, it can be written as condensed:

$Y = f(D, A, U, M, E)$ or $Y = b_0 + b_1(D) + b_2(U) + b_3(A) + b_4(M) + E$

Here E represents the sum of random factors can include long-term networks such as planning investment in hotels, motels, sanatoriums, highways, railways, airlines . Due to this, it is of great importance in forecasting the number of tourists visiting the Republic of Uzbekistan, their average stay (number of hotel nights), as well as their spending and optimal development of the tourism network.

[1] Samarkand State University of Architecture and Construction, Chief Specialist of the Coordination of International Ratings and Accreditations, Samarkand

Therefore, in this article, we used univariate and multivariate econometric models used to forecast the development of the tourism industry.

LITERATURE REVIEW. From the scientists of our country Scientific works of Uzbek scientists such as A.F. Saidov 2, B.Kh. Turaev 3, A.A. Norchaev 4, O.Kh. Khamidov 5, N.R. Rakhmonova 6, S.S. Ro'ziev 7are also worthy of attention. they paid a lot of attention to the problems of development, improvement and the theory and practice of the hospitality industry . In addition, on the basis of various aspects and complexities, considering the current real situation of the economy of Uzbekistan, we see that many aspects and directions of the tourism market are not sufficiently studied, which requires a systematic marketing research.

METHODOLOGY .

One-sided econometric equations representing the flow of tourists to the Republic of Uzbekistan are calculated as follows. An adequate form of these models is described in logarithm.

(1) $\log Y_t = a + b \log Y_{t-1} + g_1 \log RP_t + g_2 \log EX_t + th \log Y_t + \sum l_k D_k$

(2) $\log Y_t = a + b \log Y_{t-1} + g \log X_t + \theta \log Y_t + \sum l_k D_{kt}$

Here, tourists who visited our republic from the country where the tourists came from in the period Y-t (measured by the amount of income from tourists per capita, soums); RP_t is the ratio of the cost of transportation costs for travel between the countries where the tourist came from and the countries where the tourist came from; EX - dollar/sum exchange rate of the countries where the tourist left and the tourist arrived; X is the real exchange rate of currencies (found by deflating the exchange rate). Y - GDP per capita in the country where the tourist came from, developed in t - period, dollars; D are surrogate variables that account for various events, Olympic Games, etc., in the visited country. a , g_1, g_2, th, l_k - regression parameters in the first equation (1) are income per visiting tourist, per capita income compared to its lag value a year ago, relative tourism costs, exchange rate and considered a function of other random causes. The reason for introducing the logarithmic variable is that the tourists who came in the period t–1 tell their friends, colleagues and relatives about their impressions after the trip. This will definitely affect the number of tourists in the following years.

In the second model, variables representing relative prices and exchange rates are replaced by real effective variables, which in turn have a positive effect on finding model parameters. A system of econometric models (3-10) was created in scientific research to forecast the number of tourists from the Republic of Uzbekistan to other countries. This, in turn, means the offer of tourists departing from Uzbekistan to Kazakhstan, Kyrgyzstan, Russia, China, South Korea, Turkey, the United Arab Emirates and Greece.

(3) $\log Y_{1t} = \log a_1 + b_1 \log Y_{1,t-1} + g_{11} \log X_{1t} + g_{12} \log X_{2t} + \ldots\ldots + g_{19} \log X_{9t,}$

(4) $\log Y_{2t} = \log a_2 + b_2 \log Y_{2,t-1} + g_{21} \log X_{1t} + g_{22} \log X_{2t} + \ldots\ldots + g_{29} \log X_{9t,}$

(5) $\log Y_{3t} = \log a_3 + b_3 \log Y_{3,t-1} + g_{31} \log X_{1t} + g_{32} \log X_{2t} + \ldots\ldots + g_{39} \log X_{9t,}$

(6) $\log Y_{4t} = \log a_4 + b_4 \log Y_{4,t-1} + g_{41} \log X_{1t} + g_{42} \log X_{2t} + \ldots\ldots + g_{49} \log X_{9t,}$

(7) $\log Y_{5t} = \log a_5 + b_5 \log Y_{5,t-1} + g_{51} \log X_{1t} + g_{52} \log X_{2t} + \ldots\ldots + g_{59} \log X_{9t,}$

(8) $\log Y_{6t} = \log a_6 + b_6 \log Y_{6,t-1} + g_{61} \log X_{1t} + g_{62} \log X_{2t} + \ldots\ldots + g_{69} \log X_{9t,}$

(9) $\log Y_{7t} = \log a_7 + b_7 \log Y_{7,t-1} + g_{71} \log X_{1t} + g_{72} \log X_{2t} + \ldots\ldots + g_{79} \log X_{9t,}$

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(10) $logY_{8t} = log\ a_{8} + b_{8} logY_{8,t-1} + g_{81} logX_{1t} + g_{82} logX_{2t} + \ldots\ldots + g_{89} logX_{9t,}$

Variable factors of the flow of tourists from Uzbekistan We created econometric models based on data from 2012-2023.

Tourist offer to Kazakhstan:

$logY_{1t} = 2.980 + 0.474\ logY_{1,t-1} - 0.601\ logX_{2t} + 0.222\ logX_{3t} - 0.561\ logX_{4t} - 0.344\ logX_{5t} - 0.188\ logX_{6t} + 0.730\ logX_{7t} + 0.014\ logX_{8t} + 0.518\ logX_{9t}$;

Tourist offer to Kyrgyzstan:

$logY_{2t} = 2.502 + 0.822\ logY_{2,t-1} - 0.245\ logX_{2t} - 0.097\ logX_{3t} - 0.320\ logX_{4t} + 0.629 logX_{5t} + 0.405\ logX_{6t} + 0.260\ logX_{7t} - 0.181\ logX_{8t}$;

The flow of tourists to the Russian Federation:

$logY_{3t} = 6.818 + 0.261\ logY_{3,t-1} - 0.283\ logX_{4t} - 0.802\ logX_{5t} + 0.665\ logX_{6t} + 0.081\ logX_{7t} + 0.852\ logX_{8t}$;

The flow of tourists to the People's Republic of China:

$logY_{4t} = 5.656 + 0.364\ logY_{4,t-1} + 0.492\ logX_{4t} + 0.302\ logX_{5t} - 0.003\ logX_{6t} - 0.180 logX_{7t} + 0.029\ logX_{8t}$;

The flow of tourists from Uzbekistan to South Korea:

$logY_{5t} = 3.148 + 0.176\ logY_{5,t-1} - 0.238\ logX_{5t} - 0.302\ logX_{5t} - 0.0\ 75\ logX_{6t} - 0.091\ logX_{7t} + 0.593\ logX_{8t}$;

The flow of tourists to Turkey:

$logY_{6t} = 3.926 + 0.153\ logY_{6,t-1} - 0.671\ logX_{6t} + 0.671 logX_{7t} + 0.05\ 5\ logX_{8t} - 1.169 logX_{9t}$

The flow of tourists from Uzbekistan to the UAE:

$logY_{7t} = 4.657 - 0.006\ logY_{7,t-1} + 0.895\ logX_{7t} + 0.216\ logX_{8t}$ is $0.283\ logX_{9t}$

The flow of tourists to Greece:

$logY_{8t} = 2.036 - 0.004\ logY_{8,t-1} - 0.283\ logX_{9t}$

When the parameters of the above models were checked according to statistical criteria, their validity was confirmed. It was confirmed that the coefficient of elasticity of visit to income (X_{7}) in the model is positive for all countries (except China) and it varies from 0.08 to 0.730 percent.

The demand function for tourism services is written as follows:

(1) $Q_{it} = f(Y_{it}, P_{it}, P_{st}$, Dummies), where

Q_{it} - demand variable for tourism services, arrival of tourists to Uzbekistan from i - country in t - period ; Y_{it} - the index of the gross domestic product of the i - country in the t - period (6DP, 2023=11200); P_{it} - the cost of living in Uzbekistan, relative to the i country from which tourists came , t - period. It is found by the following formula:

$P_{it} - [(CPI_{uzb} / EX_{uzb}) / (CPI_{i} / EX_{i})]$

where CPI_{Uzb} and CPI in Uzbekistan and consumer goods index in the country where tourists came from; EX_{uzb} and EX_{i} are, respectively, the currency exchange index (2023=11200). The currency exchange rate was calculated against the US dollar.

P_{st} – Average index determined in relation to substitute goods for selected countries and regions. Geographical and cultural characteristics were taken into account in the selection of countries. Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan were taken as substitute countries for Uzbekistan.

The substitute price index was calculated as a weighted index of consumer goods for four countries (as a weighted weight, it was calculated according to the number of tourists in international tourism of these countries):

4

$P_{st} = \sum (CPI_j / EX_j) * \omega_j$

j=1

where j = 1,2,3,4 respectively Kazakhstan, Kyrgyzstan, Tajikistan and Turkmenistan ω_j – j – was calculated in relation to the number of international tourist arrivals for the country, i.e.

4 4

$W_j = \sum [TTA_j / \sum TTA_j]$

j=1 j=1

TTA_j is the total number of international tourist arrivals in country j.

According to the main purpose of our research, we transform the demand function for tourism services into VAR and BVAR - vector autoregressive and Bayesian autoregressive models.

We represent the study in the simplest unrestricted VAR model with lag variables:

$\ln x_{it} = A_1 \ln x_{it-1} + A_2 \ln x_{it-2} + ... A_p \ln x_{it-p} + CD_t + U_t$ (15)

where x_{it-1} type endogenous variables (Q_{it}, Y_{it}, P_{it}, P_{st}) ;

D_t - deterministic variables (it includes a free term and a dummy variable) P - the next number of autoregression; It is necessary to find the coefficients of A_j and S matrix. According to the usual rule, we describe the VAR model in logarithm. In our research, based on these models, recommendations were made to increase the prospects and competitiveness of tourism in Uzbekistan.

300 tourists took part in our 2023 statistical survey, and their distribution by continent is as follows

Continents	**Share**
Europe	54%
East Asia and Oceania	26%
Middle East	11%
Others	9%

162 tourists from Europe, 78 from East Asia, 34 from the Middle East and 36 from other countries took part in the contest.

SELECTED MONITORING RESULTS

By age	
18-30	64
31-50	124
Above 51	112
TOTAL	300

Arrival in Uzbekistan	
There is a first	88
2 and 3 days	158
many times	54
TOTAL	300

Source of information	
Agent/con.	78
TV/radio	48
Embassy of Uzbekistan	14
internet data	76
previous type	60
others	24
TOTAL	300

Travel expenses	
$ 1000 or less	28
$ 1001- $ 2000	98
$ 2001- $ 3000	76
More than $ 3000	82
did not answer	12
TOTAL	296

Transportation cost	
$ 1000 and under	188
$ 1001- $ 2000	92
Over $ 2000	2
did not answer	8
TOTAL	290

Hotel expenses	
$ 500 or less	100
$ 501- $ 1500	178
More than $ 1500	4
did not answer	8
TOTAL	290

The purpose of coming	
Historical/cultural tourism	90
Active and sports tourism	20
Eco-tourism	16
Pro-poor tourism	18
Education	26
Pilgrimage	26
Health	18
social	38
others	48
TOTAL	300

Satisfaction with the trip	
Very good	20
Getting a visa is easy	24
low satisfaction	48
good previous impression	22
another reason	38
TOTAL	152

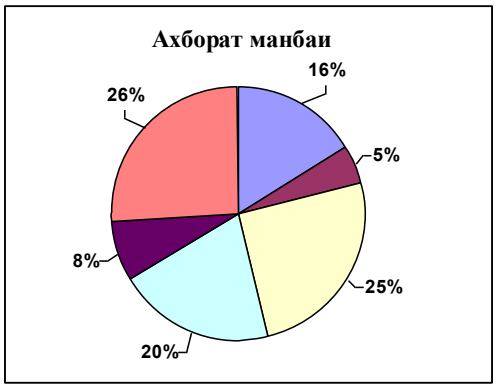
PROFILE OF FOREIGN TOURISTS WHO CAME TO UZBEKISTAN IN 20-23 YEARS .

Usually, people who come as tourists to countries with historical and cultural monuments are elderly people. This has been confirmed in studies.

1 - Diagram

Tourists under 18-30 years old made up 37% of tourists aged 30-50 years and over 50 years old 42%. The main tourists (29%) visit historical and cultural places, 13% visit friends and relatives, 9% - in the field of education, 6% - treatment and recreation, 7% - active tourism, sports,

2 - Diagram



5% - visited the republic for ecotourism purposes. 53% of tourists visited for the second and third time, and 68% of those who came more than once.

3 - Diagram

Information for tourists about Uzbekistan

Answers were also received from the respondents about the organizations and representatives. 25% of tourists received information from the Uzbek tourism agency, 25% from the Internet, 20% from those who visited our republic before, 16% from TV and radio, and 5% from Uzbek embassies.

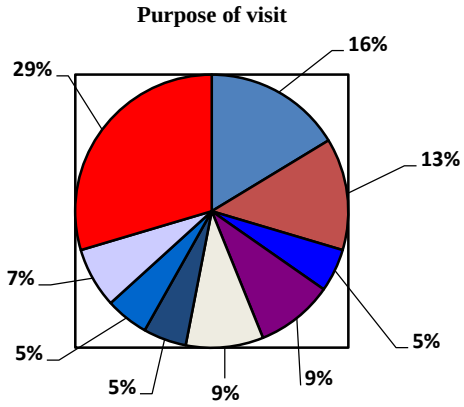
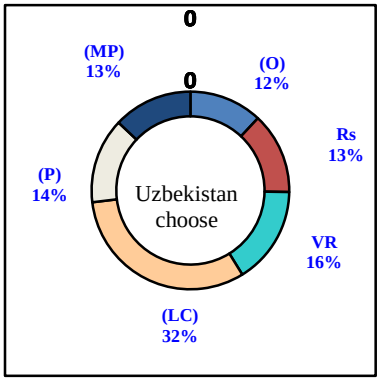


Diagram 4



The selected observation showed that 300 people chose Uzbekistan to see its cultural and historical monuments, especially 32% found it acceptable because of low travel costs, 16% - ease of obtaining a visa, and 14% - previous impressions left a good impression.

RESEARCH RESULTS .

The econometric models of the development of the tourism network were created as follows. First, a model was built to find out the factors affecting the export of tourism services. Secondly, to check the competitiveness of Uzbekistan in offering tourism services, Thirdly, to determine the influence of various factors on the specialization of the tourism industry

1. Investments in the export of tourism services, population and previous the effect of the number of visits

log *(EXPORTS)* = -2.64 - 0.16 log *(INC)* + 0.67 log *(INV)* – 0.38 log *(POP)* + 0.57 log *(PV)* – - 0.27 *TROP*

Here ***INC is*** income, ***INV is*** investments in the total sector, ***POP is*** the population **,** ***TROP is*** the openness of the country to trade.

The coefficient of determination is high: $\mathbf{R^2 = 0.82}$

2. Competitiveness of the tourism industry of Uzbekistan RCAI :

RCAI = 13.66 - 0.94 log *(INC)* - 0.83 log *(POP)* + 0.70 log *(PV)* - 1.12 *TROP*

The results of the study confirmed that monetary income of the population, population and previous tourist visits have a significant impact on competitiveness. **R^2 = 0.49**

3. The specialization model of the tourism network was obtained as a function of the share of the export of tourism services in the GDP:

log *(EXPORTS/GDP)* = -0.43 - 0.76 log *(INC)* + 0.91 log *(INV)* - 1.09 log *(POP)* + 0.53 RCAI

According to the rule in the economic theory, the income of the population, the number of the population has an inverse effect on the function, and in turn, it was found that the increase of the investment in the industry and the index of the competitiveness of the industry has a positive effect on the function.

Research results indicate that Uzbekistan attracts tourists (usually the elderly) with its historical and cultural monuments. This is not accidental, because young people often prefer active tourism (sports or education). It should be noted that there is a great potential for the development of active tourism (mountaineering, boating on mountain rivers, etc.) in our republic. The status and reputation of Uzbekistan in international tourism depends on holding historical monuments and national festivals (Navroz holiday, art festivals in Boysun district of Kurkhandarya region and Samarkand). Those who took part in the survey noted that the possibility of obtaining information about tourism through the Internet, the possibility of booking hotels through the Internet, and ordering tickets through the Internet will expand. It is necessary to widely involve information and communication technologies in the field of tourism and travel.

Uzbekistan is gaining an international reputation due to the possibilities of developing ecotourism. As a result of our research, it became clear that many tourists (51%) are interested in natural landscapes and nature reserves of our republic. Among young tourists (26%), they expressed interest in the environmental situation in the region. In fact, our republic has 9 nature reserves, 2 national parks and 2 natural heritage sites for the development of ecotourism. Scientific-methodological studies have confirmed the possibilities of development of ecotourism, the increase of the population of the country where tourists come has a major impact on the level of competitive tolerance of the tourism industry. Because tourists dream of seeing a real landscape untouched by human foot. The increase in monetary income of the population has a negative effect on the export of tourism and travel services. It has been confirmed that industry investment has a positive effect on the index of specialization and competitiveness of the tourism industry.

The Republic of Uzbekistan has relative comparative priorities in investing in the tourism and travel industry. Achieving this is the creation of a good environment for foreign investment in our country, low tax rates. An increase in the weight of foreign investment can cause negative consequences for the development of the economy in terms of taking part of the profits abroad.

The low competitiveness of Uzbekistan in the field of tourism is the small number of foreign tourists compared to the population. Calculating the multiplier effect of tourism shows that it reduces the marginal level of imports. It is equal to the republic 4,45 ra. This means that 1 soum of export from tourism and tourism will increase the additional gross domestic product by 4 soums and 35 tithes.

Recently, the cancellation of visas for tourists from Russia, Ukraine, Malaysia, Turkey and other countries has given positive results for the development of the tourism industry.

Uzbekistan's comparative advantage in the export of tourism and travel services is manifested in the price policy, the development of infrastructures, and the existence of an alternative visa plan.

Studies show that the role of tourism and travel services in the export volume of the country is increasing. According to our econometric study, the impact coefficient of investments in tourism and travel services 0,78 rais equal, which means that doubling the volume of investments in the sector leads to a 78% increase in the volume of services in the sector. Accordingly, it can be said that the return of investments in the tourism industry has a tendency to decrease. In the econometric model, it

was included as a factor in the function to find the impact of the flow of tourists visiting our country on the new international tourists. In the econometric model, it was determined that when the flow of international tourists doubles, the number of new tourists will increase by 20%. Therefore, improving the quality of services in the tourism sector will lead to an increase in the flow of new tourists.

In order to determine the impact of the development of the tourism industry on the growth rate of the republic's economy, we conducted an econometric study, we used data from the World Bank to check the relationship between economic growth and income from the tourism industry. Here, the data for the years 2008-2023 in the Republic of Uzbekistan is given in the table below.

1- Table Dynamics of GDP and income from tourism in Uzbekistan.

Years	GDP current price (USD)	Tourism revenue (USD)
20 08	13,350.5	83
20 09	13,948.8	15
20 10	14,744.6	198
20 11	14,988.9	167
20 12	17,078.5	102
20 13	13,760.4	63
20 14	11,401.3	72
20 15	9,687.9	68
20 16	10,134.4	48
20 17	12,030.0	57
20 18	14,307.5	28
20 19	17,030.9	43
20 20	22,308.4	51
20 21	27,934.0	64
20 22	32,103.8	82
20 23	37,720.0	102

2 – Table of GDP and income from the tourism industry in the Republic of Uzbekistan 2008-2023

	GDP	Earned income
Average	17658.1	77.6
Median	14526.5	66.0
Maximum	37720.0	189
Minimum	9688.00	15.0
Quadratic difference	8182.94	74.5
Curvature	1.33792	1.29

The way to check the relationship between GDP and income from the tourism network was that the curve of the republic's GDP and income from tourism in 2008-2023 was in the same direction.

We check the relationship between the GDP of the Republic of Uzbekistan and the income from tourism through the Granger test in econometrics.

The information from the computer is as follows

With one guide

The null hypothesis	Follow up	Statistics	Probability
income and GDP	15	1.15028	0.30459
GDP and income		0.33928	0.57103

With two guides

The null hypothesis	Follow up	Statistics	Probability
income and GDP	14	0.87677	0.44886
GDP and income		0.21454	0.81092

With three guides

The null hypothesis	Follow up	Statistics	Probability
income and GDP	13	11.0099	0.00747
GDP and income		3.10895	0.11015

With four guides

The null hypothesis	Follow up	Statistics	Probability
income and GDP	12	6.01284	0.08619
GDP and income		4.93971	0.11018

The calculation results show that there is a correlation between the GDP of the republic and income from tourism.

CONCLUSIONS

1. A large tourist company in the conditions of globalization successful operation and development is primarily determined by its international competitiveness.
2. Innovative and financial-investment complexes should be distinguished in the general system of management of the enterprise providing tourist services based on strategic marketing. In this case, the long-term development of the innovation complex should be carried out in accordance with the outsider concept, and the development of the financial and investment complex should be carried out according to the insider concept.
3. The methodological bases of the formation of an innovative strategy for the management of tourist business in the conditions of globalization are as follows:

- adapt the business to the changing demands of the market due to the introduction of innovations and diversification of tourist services;
- rational use of internal resources;
- expansion of tourist business structures;
- increasing the volume and share of tourist services in the total volume of goods and services provided to the population.

4. The efficiency of strategic management of a tourist business enterprise is ensured by optimizing the processes of transferring investment resources from high-income short-term complexes to prospective complexes that provide less income in the current period, but ensure the strategic development of the entire tourist company.
5. It was shown that the strategic partnership of tourist companies should be built on the principles of mutual interests and protection from unfair absorption, as well as rational use of combined resources. To solve the task of mutual optimization of partnership relations, it is appropriate to use the method of the balanced indicators model.

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