THE MODELS OF PROGNOSIS OF REGIONAL TOURISM'S DEVELOPMENT

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Abstract: The touristic activity is a profitable branch of the economy of Uzbekistan, in particular, of the Samarkand region. Therefore, many economists study future activity of this branch. The article observes types and methods of such prognosis. The most significant of them are the regressive equations and methods of Holt and Brown.

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The tourism is the most important industry generating budget resources. The touristic business uses nowadays approximately 7% of world capital, and the part of tourism forms more than 10% of world trade (Papiryan, 1998). The exponential increase of tourists over the world is observed during the last decades. Moreover, the number of international tourists in the entire world is growing annually in average with 6% rate. Comparable picture is also characteristic for many regions and territories.

In this context, modeling of processes happening in the tourist business looks as contributing to examining driving forces and stability of the industry, as well as allowing producing prognosis estimations. The results of modeling are necessary for the elaborating of strategy, acceptance of business decisions and planning in the tourist sphere on the different levels.

The main objects of modeling in tourism are the number of arriving tourists and the indices connected with the seasonal prevalence of rest industry. The number of tourists arriving to the rest plays the most important role, because it forms the macro economical index, on the grounds of which the subsequent estimations are forming (Yakovlev, 2005). The aim of this research is the analysis of main directions of modeling of the arriving tourists' number and the volume of receipts, and the elaborating on this base the recommendations for application of some methods in the practice.

The economical-mathematical methods of analysis create the big possibilities for the investigation of connections, power and exposure of regularities and empirical observation of difficult social-economical phenomena (Shmoylova, 2004). Nowadays was created the large number of program products accelerating the process of application of these methods and allowing making selection of the most significant model of prognosis.

The research raises the problem of elaborating of the model of determination of touristic product's price. This touristic product is created by touristic operators on the base of resources existed and involved into the touristic product. The observed studies related to these aspects include works of Bashina (2002), Ivanova (2000), Seegal (2002), Shmoylova (2004), Jumanov (2004) which elaborated and improved the methods of prognosis on the base of correlation-regressive analysis.

In the touristic work with the help of the methods of correlation-regressive analysis the revealing of connection between the factors and the power of this connection is possible, as well as the determining of degree of interference into the processes of regulation, control, estimation and direction of the touristic operator's work.

The most important stage of model's building in tourism is the selection of connection's form which characterizes the dependence of resulting prognosis index on the established factors having influence on this index.

The touristic product of Samarkand in the modern tourist market is its unique history, architectural monuments, the nature and ecology, the infrastructure of entertainments, the national customs and traditions, the workmanship, religion and hospitality. The region has many possibilities in the advancement of national touristic product in the world market.

The important factor which determines the attractiveness of region for tourists is the climatic conditions and exotic nature of the region. This entire national heritage could bring the economical, social and ecological advantage to the republic by the scientifically organized and expedient use on the base of trustworthy prognosis indices of tourism's development in the region. During the prognosis of indices of development of regional tourism till 2013 it is expedient to use the one-factor models (Ivanova, 2000).

Considering this approach the selected indices are ones of receipt's volume (millions of sums in comparable prices), the number of arrivals (thousands of persons) during a number of years.

For the prognosis of indices of service's volume the most important and correct function is the fifth function (Table 1) - $Y=t/(2.229612+3.241498t)$. It should be noted that the data of dynamical row were filtered. The mean error of prognosis is 2.6%. For the prognosis of indices of attended tourists' number the most important and correct function is the twelfth function (Table 1) - $Y=0.182937t/(80.598834+t)$. The mean error of prognosis is 3.7%.

These tables testify the even volume of touristic services by the further effective realization of problems of tourism's development in the region and creating of the favorable conditions for the development of adjacent sub branches which render services both to foreign and to internal tourists by means of the realizing of strategy of regional touristic product's forming on the base of vertical diversification (Bashina, 2002).

TABLE 1.THE ONE-FACTOR MODELS OF PROGNOSIS OF REGIONAL TOURISM'S DEVELOPMENT

No	Analytical form	Function
1.	$Y=a+bt$	Linear
2.	$Y=a* b^t$	Demonstrative
3.	$Y=at^b$	Staid
4.	$Y=ae^{bt}$	Exponential
5.	$Y=t/(a+ bt)$	Fractional-rational
6.	$Y=a+bt^2$	Square
7.	$Y=a+b/t$	Fractional-rational
8.	$Y=1/(a+bt)$	Fractional-rational
9.	$Y=1/(a+be^{-t})$	Logical
10.	$Y=a+blgt$	Logarithmic
11.	$Y=a/(b+t)$	Fractional-rational
12.	$Y=at/(b+t)$	Fractional-rational
13.	$Y=ae^{b/t}$	Demonstrative
14.	$Y=a+bt^3$	Cubic

TABLE 2. THE DYNAMICS OF DEVELOPMENT OF TOURISM IN SAMARKAND REGION

The name of indices	All years observed	2000	2003	2006	2009
The volume of services - in all in millions of sums (in acted prices)	36108.17	1.4	190	6689.1	15401
In comparable prices*	16.91	1.40	1.54	2.24	3.3
The service of tourists (thousands of persons)	648.7	51.1	56.3	81.7	120.4

Source: The data of National Company Uzbek Tourism.
Note: * 2000 was accepted as a basis year.

TABLE 3. THE ECONOMICAL-STATISTIC FUNCTIONS AND PARAMETERS OF VOLUME OF TOURISTIC SERVICES IN SAMARKAND REGION

No	The list of functions	The coefficient of Fisher
1	$Y=0.294141+0.000495$	0.000
2	$Y=0.282187* 1.002782^t$	0.017
3	$Y=0.278907*t^{0.017861}$	0.018
4	$Y=0.282187e^{0.02778t}$	0.111
5	$Y=t/(2.229612+3.241498t)$	1.241
6	$Y=0.289247+0.000150t^2$	0.008
7	$Y=0.309528-0.047047/t$	0.023
8	$Y=1/(3.698114-0.013632t)$	0.063
9	$Y=1/(3.517671+1.893621*e^{-t})$	0.086
10	$Y=0.290112+0.010211gt$	0.002
11	$Y=-0.003686/(0.270408+t)$	0.854
12	$Y=0.169050t/(0.289158+t)$	0.707
13	$Y=0.299876e^{-0.165278/t}$	0.036
14	$Y=0.285003+0.000024t^3$	0.030

TABLE 4. THE ECONOMICAL-STATISTIC FUNCTIONS AND PARAMETERS OF SERVED TOURISTS IN SAMARKAND REGION

No	The list of functions	The coefficient of Fisher
1	$Y=82.431338-0.025798t$	0.001
2	$Y=78.833601 *1.001887^t$	0.016
3	$Y=77.651867t^{0.016425}$	0.017
4	$Y=78.833601e^{0.001885t}$	0.096
5	$Y=t/(0.007461+ 0.011766t)$	0.227
6	$Y=80.881005-0.031717t^2$	0.004
7	$Y=85.971946-13.042950/t$	0.023
8	$Y=1/(0.013279-0.000044t)$	0.062
9	$Y=1/ (0.012638+0.007333e^{-t})$	0.089
10	$Y=81.099125-2.073518lgt$	0.001
11	$Y=- 0.003301/(75.306721+t)$	0.853
12	$Y=0.182937t/(80.598834+t)$	2.433
13	$Y=83.415350e^{-0.171074/t}$	0.037
14	$Y=79.607562-0.005900t^3$	0.022

TABLE 5. THE PROGNOSIS INDICES OF TOURISM'S DEVELOPMENT IN SAMARKAND FOR THE PERIOD SINCE 2010 TILL 2013

The name of index	The correct function for the prognosis	F-coefficient	Years				The mean error for the prognosis, %
			2010	2011	2012	2013	
The volume of receipts in millions of suns (in comparable prices)	Y=t/(2.229612+ +3.241498t)	1.241	19161	23459	28328	33805	2.6
The service of tourists (thousands of persons)	Y=0.182937t/ (80.598834+t)	2.433	123.3	128.0	129.2	132.0	3.7

Note: Own forecast of the author (the prognosis with the regard of influence of world economical-financial crisis).

Such models provide an acceptable exactness and have a good prognosis quality. The number of tourists' arrival can be described in the best way by means of equations of second order. Moreover, the fact should be mentioned that the selection of the form of regressive equation has a greater importance than the valuation of its parameters. The further research allowed determining that the regressive equation is comfortable if we deal with the data which increase or decrease monotonously. If the data are characterized with the presence of peak meanings, the application of regressive equations is not so effective, because it leads to the errors more than 20% in short-term prognosis. In the number of works it is mentioned that the numerous variables of regressive equations (prices, incomes, rates of exchange of currency and so on) are dynamically changeable unstationary quantities between which the interdependency exists. The ignoring of the stationarity problem leads to the result that the parametrical tests (in particular, t-tests and F-tests) are becoming unreliable and can give erroneous results. But in spite of the existing limitations it is not expedient to refuse completely the regressive equations because they are the most simple, effective and comfortable under determined circumstances.

Side by side with the regressive models we propose the application of adaptive statistic models for the getting of estimation of the arrived tourists' number. For such models the use of statistic data according to the arrived tourist's number during the some retrospective period is typical. The virtue of such approach from our point of view is the fact that the statistical data reflect the action of all significant factors. Moreover, these models have good prognosis qualities because they take into account the inertness and delay of the influence of factor signs. By the totality of signs the adaptive statistic models can be concerned to dynamical prognosis models. The primary analysis of retrospective data about the number of tourists' arrival to different regions shows that the character of changing of data corresponds to the linear additive types of trends. Therefore the model of Holt and the model of additive smoothing out of Brown were selected for the research (Jumanov, 2004).

In the linear additive model of trend is supposed that the mean significance of prognosis index f_t changes according to the linear function of time $f_t = \mu + \lambda \cdot t + \varepsilon_t$, where μ is an average of process, λ is the velocity of increase/decrease, ε_t is the casual error. The method of Holt is based on the estimation of parameter - the measure of degree of linear increase or decrease of index in the time. Moreover the factor of increase λ is estimated by the coefficient b_t that in its turn is calculated as an exponentially weighed average of differences between the current exponentially weighed mean significances of process u_t and their previous meanings u_{t-1}. The typical peculiarity of this method is the fact that the calculation of current significances of exponentially weighed average u_t includes the calculation of previous index of increase b_{t-1} and thus adapts to the previous significance of linear trend. The model can be written in the following way:

$$u_t = A \cdot d_t + (1 - A)(u_{t-1} + b_{t-1}),\ b_t = B \cdot (u_t - u_{t-1}) + (1 - B) \cdot b_{t-1},$$

where A and B are coefficients which determine the character of smoothing out of the data, d_t is the actual significance of the data.

We made a numeral comparative analysis for the verification of prognosis qualities of Holt's model and the model of adaptive smoothing out. As a retrospective base of data we used the information of National Company Uzbek tourism. The indices of arrival of tourists and receipts of means from tourism were analyzed.

In the Table 6, the results of calculations of arrived tourists' number in the Samarkand region are adduced. It is seen that as a whole, both regressive equations and analyzed models have a good prognosis qualities. Moreover, the short-term prognosis for one period (one year) and middle-term prognosis (for two years) shall be differed.

The models of Holt and Brown give the most exact results for short-term prognosis. The least range of dispersedness of the values provides the Brown's model of additive smoothing out, to which is peculiar to concentrate on the trend. The regressive equations give less exact results. Nevertheless, we can use them as a first approaching to the prognosis. To similar conclusion leads the analysis of middle-term prognosis where the model of adaptive smoothing out gives the most exact results. The typical peculiarity of adaptive models is the presence of both over-stated estimations and understated estimations whereas the estimations are as a rule over-stated for the regressive equations (Seegal, 2002). It is explained with the action of the factor of selection of curve's form by the analytical smoothing.

Table 7 shows the prognosis estimations of receipts from the touristic activity in the Samarkand region. They show approximately the same results. The character of estimations testifies the correctness of regressive equations. It should be taken into account that the prognosis estimations were made for the period when some economical slump was observed in the touristic region.

Therefore the more exact estimation should be expected with the presence of steady trend. At the same time, we can suppose that the estimation of receipts from the touristic activity has a definite specific character and requires the elaboration of special methods of prognosis.

TABLE 5. THE PROGNOSIS DATA ABOUT THE TOURISTS' ARRIVAL AND THE RECEIPTS FROM TOURISM DURING THE 2010-2011

	2010	2011
Arrival, thousands of persons	123.3	128.0
Receipts, millions of sums	19161	23459

Source: Data of National company Uzbektourism

TABLE 6. THE RESULTS OF CALCULATION OF THE NUMBER OF TOURISTS' ARRIVAL ACCORDING TO DIFFERENT MODELS

The regressive equation, 2010-2011		The Holt's model, 2010-2011		The Brown's model of adaptive smoothing out, 2010-2011	
Thousands of persons	%	Thousands of persons	%	Thousands of persons	%
123.7	-0.2	123.9	-2.3	123.3	0.1
129.2	0.5	132.5	-2.4	128.3	0.8

TABLE7. THE RESULTS OF CALCULATION OF THE NUMBER OF TOURISTS' ARRIVAL ACCORDING TO DIFFERENT MODELS

The regressive equation, 2010-2011		The Holt's model, 2010-2011		The Brown's model of adaptive smoothing out, 2010-2011	
Millions of sums	%	Millions of sums	%	Millions of sums	%
19232	-2.1	19301	-2.8	18998	-0.5
23501	-6.8	233591	-8.0	23402	-4.3

There is interesting fact that the presence of unevenness of regional economical processes in tourism has not influence on the prognosis estimations. This fact confirms one more time the possibility of application of Holt's model and Brown's model of adaptive smoothing out for the getting of prognosis. Thus, we can assert that:

1. The use of models describing the linear-adaptive trend (Holt's model and Brown's model of adaptive smoothing out) side by side with the econometrical models is the perspective direction in the modeling of processes in the tourism;
2. The regressive equations allows to get the correct prognosis estimations in tourism (the error as a rule don't exceed 20 %). Moreover, the some overstating of the estimation is observed;
3. Unevenness of regional economical processes in tourism haven't a significant influence on the character of use of adoptive models;
4. The instillation of elaborated models into the programs of regional development in perspective will provide the successive rise of ability for competition of destination.

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