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SMOOTHING THE SEASONAL FLUCTUATIONS OF INDICATORS OF TOURIST ACTIVITY IN THE FIELD OF TOURISM BY USING THE METHOD OF SLIDING AVERAGES

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Abstract
The article systematizes the factors influencing the intensity of fluctuations, while studying the methodology of smoothing seasonal fluctuations in demand for tourist services in theory. At the same time, the directions for controlling (leveling) the intensity of seasonal fluctuations have been determined.

Keywords
seasonality, seasonal fluctuations, “moving average", stable component, seasonal component, random component, seasonality smoothing.

INTRODUCTION

Today, the tourism sector is considered one of the most rapidly developing in the world economy, and the demand for tourist services and its supply are rapidly improving, influenced by the changes that are taking place. As distinctive features of the tourism industry, it can be shown that, firstly, the number of tourist enterprises, and secondly, the demand for tourist services regularly increases very quickly. This change in the world-wide field of tourism is mainly observed in countries with sufficient tourist resource components, in particular in the Republic of Uzbekistan.

One of the main problems of our country in the field of tourism is the fluctuation of tourist flows in the range of large indicators for the seasons of the year, and even within the framework of measures to stabilize the tourism sector at the country level, this issue does not find a necessary solution.

The extension of the tourist season and the solution of the problem of smoothing seasonal fluctuations in the industry expand the possibility of full employment of the population in the regions, increase the level of use of the material component of tourist facilities, provide rational use of natural resources, reduce the dependence of demand for tourist services on seasonal fluctuations, and, as a result, stabilize.

The purpose of the research is to systematize the theoretical aspects of managing the demand for tourist services, taking into account the factor of seasonality, and to develop practical recommendations.

METODOLOGY

Having studied the most important factors of seasonal fluctuations in the movement of tourist flows in the implementation of the study, the research methodologies on the stabilization of seasonal fluctuations in demand for tourist services, minimizing vibration frequencies were theoretically studied. At the same time, in the analysis of the activities of tourist enterprises, an attempt made to determine the general trajectory of trends using the “exponential smoothing” method, which allows you to align indicators in the form of sharp fluctuations.

The process used methods such as monographic research, comparison, systematic analysis, and empirical research from demand seasonal fluctuations assessment methodologies.

LITERATURE ANALYSIS

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To this day, research related to smoothing fluctuations in the seasonality of demand for tourist services has been carried out by a number of researchers.

In the scientific research of a number of researchers, the influence of the seasonality factor on the demand for tourist services was studied. In particular, in the issues of analysis of the problem of seasonal fluctuations in the field of Tourism and the development of strategies for eliminating the seasonality factor studied by M.Voloshinova and A.Ool [1, 107-114], The issue of hurting the factors affecting the offer of tourist services has been studied by O.Chabanyuk [2, 25-32].

While the issue of leveling the seasonal fluctuations in demand and supply for Tourist Services determined by theoretical studies is another research object of a group of researchers. In particular, in the studies of the K.Gubskaya and A.Ziryanov, YE.Konovalova and I.Lapteva, O.Suranova and N.Ogneva, the methodologies for smoothing the seasonal fluctuations of tourist services were studied theoretically and practically [3, 119-127; 4, 93-102; 5, 208-219; 6, 180-183].

Research has been carried out by L.I.Shmarkova in the direction of the formation of stable trends in the process of forming trends in the activities of tourist enterprises by means of reducing the range of fluctuations using the method of "sliding averages" of existing seasonal fluctuations [7, 134-146].

However, these studies have been carried out for regions within the Russian Federation and other countries, and the researches of seasonality and leveling the level of seasonality of the demand for tourist services in our country have not been studied at the required level.

ANALYSIS AND RESULTS

In the process of determining the demand for services and the volume of sales in the tourism industry, it is required to adequately take into account the seasonality factor arising from the existing resource components of the industry and the assortment of tourist products.

Seasonality in tourism activities is associated with changes in natural-climatic conditions, economic characteristics of employment of the population, supply and consumption of tourist products, and other features of the industry. The main tourist season is the period of the highest intensity of the tourist flow.

Season-considered the period of time during which the main part of a tourist trip occurs, it can be formed from one or more tourist seasons, and various seasonal fluctuations in time can occur for certain features of tourism activities [8].

Seasonal fluctuations should be understood as regular, periodic phenomena of ups and downs in time intervals and seasonality in indicators of tourist activity. Regardless of the form in which seasonality is manifested, in any case, its impact negatively affects the effectiveness of the activity of the tourism industry. The influence of seasonality leads to uneven use of resources in the field and manifests itself in the creation of services and other processes. In all cases, seasonality is the result of the influence of uncontrollable factors. Significant seasonal fluctuations are characteristic of the low level of development of the tourist offer. The modern level of Service is able to eliminate seasonal unevenness in the development and sale of tourist products in some cases. Even in cases where it is impossible to directly influence the processes that cause seasonal fluctuations, their influence should be taken into account when improving technological, organizational and economic and management processes.

To stabilize the level of fluctuations in tourist activity, the most important issue is the extension of the main tourist season and the equalization of seasonal fluctuations in specific indicators in the field of tourist activity. Solving this issue makes it possible to ensure full employment of the population, increase the level of use of the main funds of the industry, rational use of resource

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components, reduce the dependence of demand for tourist services on seasonal fluctuations, and, as a result, increase the profit of tourist enterprises.

The objective need to take into account seasonal fluctuations significantly complicates the solution of specific economic problems. To manage the evolution of trends in seasonal economic processes, it is necessary to measure, analyze and anticipate their development.

If the process of the relationship between supply and demand for tourist products reflects periodic fluctuations with a constant period, or is equal to the annual interval, then we use a trend based on a seasonal time series, the indicators of which are formed under the influence of three components – stable (U_t), seasonal (S_t) and random (ε_t). Depending on the type of relationship of the Trend components, the time series can be described by an additive model, that is, it will be possible to express it as the sum of these components in the form of an additive - (1) or multiplicative - (2) model as the product of the components.

$$Y_t = U_t + S_t + \varepsilon_t \qquad (t=\overline{1,t}) \qquad (1)$$

$$Y_t = U_t \cdot S_t \cdot \varepsilon_t \qquad (t=\overline{1,t}) \qquad (2)$$

There is: Y_t – level of time series; U_t – stable component; S_t – seasonal component; ε_t – random component; t – number of observations.

Indicators of tourist activity with the characteristic of seasonal change are measured in absolute indicators in the construction of additive models, its structural components are measured in relative indicators in multiplicative models.

The study of seasonal timed series reflecting tourist activity is a complex study that requires the use of modern methods of statistical analysis and, on this basis, the formation of reliable and reasonable forecast indicators. In this research process, the following should be studied:

- determining whether or not a trend is present in the seasonal timeframe range;
- determination of whether seasonal fluctuations exist in the seasonal time series;
- separation of structural components in time series indicators;
- analysis of the dynamics of change of seasonal wave;
- research on the factors that determine the seasonal fluctuation of the trend;
- formation of predictive indicators based on the model in necessary cases.

In analysis processes, it is often assumed that seasonal fluctuations do not change from year to year. For most features of the activities of tourist enterprises operating on the basis of seasonal fluctuations, this assumption is incorrect, since over time, both the form and the scale of seasonality fluctuations change. There is a need to analyze changes in seasonal fluctuations, which should include solving three interconnected tasks:

- analysis of the dynamics of the amplitude of seasonal oscillations in each period;
- analysis of the dynamics of extreme points of seasonal oscillation;
- study of changes in the form of seasonal oscillations.

Many methods for filtering time series based on seasonal fluctuations are designed to first determine the trend and then the seasonal component, with the trend in its pure form also necessary for analysis of seasonal oscillation dynamics.

Traditionally, very simple methods of measuring seasonal fluctuations are used – absolute differences, relative differences, and methods for constructing seasonality indices. The first two methods involve finding differences between the actual levels of the seasonal time series and the levels found in determining the underlying trend of change. The absolute difference method works

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directly on the magnitude of these differences, while the relative difference method works on the ratio of absolute differences to the leveled level of the seasonal time series.

When implementing the absolute or relative method of differences in practice, it should be taken into account that seasonal fluctuations of a certain indicator of tourist activity may differ for the corresponding periods and interfere with random fluctuations. To eliminate random fluctuations, it is necessary to take into account the average deviations over several years.

The search for the optimal expression of the Trend component and its mathematical description is the most important point in the study of the seasonal process. When determining the main trend of the studied process, used the "sliding averages" method or the analytical leveling method [9].

When determining the sliding mean, enlarged intervals of the same number of levels are formed. Each subsequent interval is obtained by gradually moving from the initial level of the previous interval to one level. According to the formed enlarged intervals, the sum of the values of the levels and, based on it, is the moving average, which refers to the middle of the specified interval. The longer the grinding interval, the more moderate and determined trend will be flatter.

The advantage of sliding averages is that they will be easy to calculate, interpret, align random and periodic fluctuations and determine the current trend in the change of the process being studied. The disadvantage of this method is that it does not allow the general trend of the indicator to be expressed in the form of a mathematical model, and therefore cannot be used for forecasting. Studying the seasonal time series trend using the sliding average method only allows pre-analysis of the seasonal time series.

To obtain a quantitative model that describes the general trend of changes in the seasonal temporal series level, an analytic series alignment method must be used. In this case, the actual levels of the seasonal time series are replaced by calculated levels using an analytical model, the choice of their optimal shape largely determines the result of trend extrapolation.

When choosing an analytical model form, it is necessary to take into account the analysis of the essence of the indicator of tourist activity under study. To do this, it is necessary to resort to the analysis of the graphical representation of the yempirik data of the levels of dynamic rows. However, even in this case, it will not always be possible to accurately determine the type of model, therefore, it is recommended to use the analysis of a graphical representation of the leveled levels of a row in which random fluctuations are erased to some extent.

Seasonality indices can be calculated as the ratio of a given real level of a time series to a level calculated using the moving average method, or to a given degree of strain. Obviously, they have different values for different levels of the seasonal series and depend on the leveling method. Comparison of the values of seasonality indices allows you to analyze the volatility trend of seasonal fluctuations of the indicator.

Thus, the optimal approach in the study of the time series of activity indicators of tourist enterprises is to analytically align the previously aligned time series using sliding averages, and then evaluate the effect of seasonal and residual components.

Indicators of the number of tourists served by the "Silk road" tourist enterprise were used in the justification of seasonal timed row alignment methods in the research process (Table 1).

Table 1

The number of tourists served by the tourist enterprise

Month	Years			
	2020	2021	2022	2023
January	10	0	0	0
February	0	0	0	5

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March	0	0	0	6
April	0	49	12	42
May	2	32	50	77
June	30	155	159	128
July	76	139	133	83
August	31	76	84	106
September	3	26	32	71
October	0	9	11	15
November	1	8	0	18
December	0	1	10	8

As can be seen from the table data, the number of tourists served by the tourist enterprise has a trend of seasonal changes in the form of sharp fluctuations in individual intervals of years. In order to more clearly see the trends of this change, let's see the indicators of activity in a tourist enterprise in a graphical way (Figure 1).

The figure clearly shows the level of seasonal fluctuations in the indicator of the number of tourists served by a tourist enterprise. The number of tourists served tends to increase from early to mid-year and decrease from mid to late-year, with the amplitude of seasonal fluctuations very sharp.

Thus, we assume the existence of a seasonal temporal series, and its property is reflected by the additive model -(3). In the study, we set ourselves the task of separating the components of the YT(type) time series. Based on the 12-digit sliding average calculated using the Formula, we study the nature of the general trend using the sliding average method, in which the length of the leveling interval should be the product of the oscillation period, which is equal to 12 months for the studied indicator:

$$p_t = \frac{\frac{p_{t-6}}{2} + p_{t-5} + \ldots + p_t + \ldots + p_{t+5} + \frac{p_{t+6}}{2}}{12} \qquad (3)$$

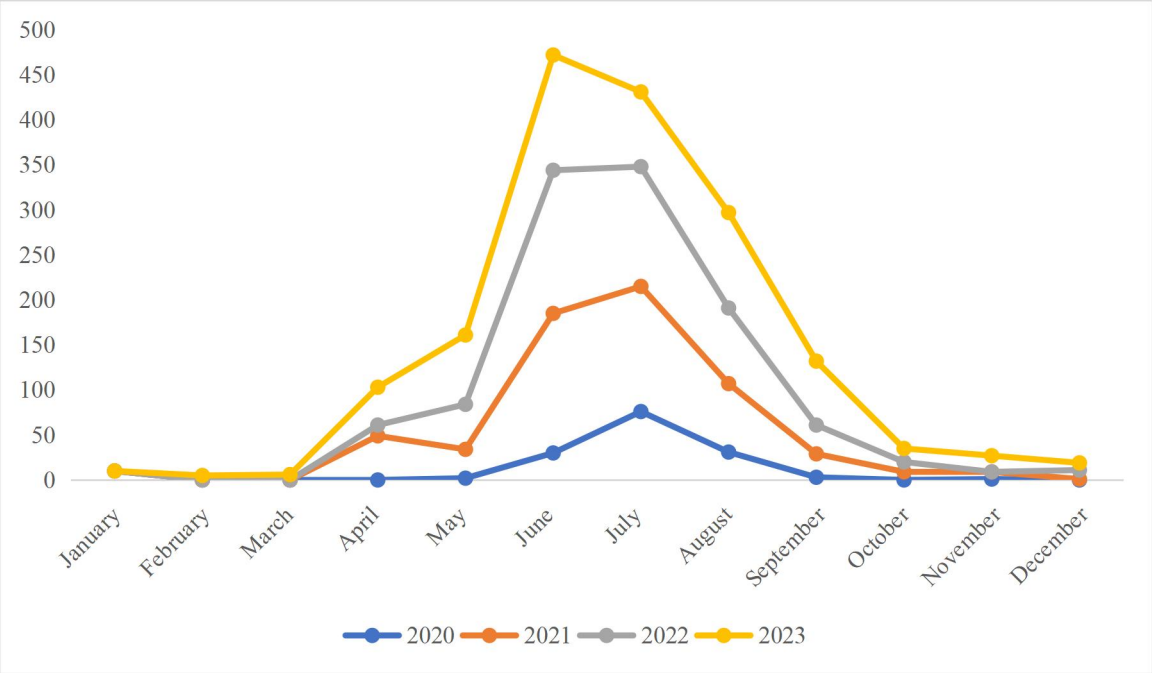

Figure 1. Seasonal fluctuations in indicators of a tourist enterprise

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(3)-formula makes it possible to calculate the leveled of the row except for the first six and the last six. To restore the extreme levels of the series, we use the process: first we calculate the average absolute increase in the first (last) active field, and then we determine by sequentially subtracting six flattened values at the beginning (end) of the timed series.

In the EViews10 software tool, we determine the trend model of the aligned time series:

$$U_{t(tur)} = -0{,}024 \cdot x^2 + 1{,}9122 \cdot x + 7{,}4742$$

The second-order polynomial model reliably describes the flattened series of the exponent, which is reflected in the higher value of the determination coyefficiency ($R^2 = 0{,}8447$).

The presence of an analytical model of the $Y_{t(tur)}$ trend makes it possible to distinguish the seasonal component of the studied seasonal series. We calculate the seasonal component of $S_{t(tur)}$ based on the following algorithm. To assess the overall impact of seasonality and randomness effects, we can calculate $U_{t(tur)}$ trend deviations from the number of deviations in the number of tourists served ($Y_{t(tur)}$) row (Table 2).

Table 2

Calculation of the seasonality component based on the method of sliding averages

Time parameter by month, t	Real values of the time series, $Y_{t(tur)}$	Sliding avarage p	Trend componenti, $U_{t(tur)}$	Differentiation of real values from model values, $Y_{t(tur)} - U_{t(tur)}$	Preliminary assessment of the seasonality component, SE_t	Seasonal component, S_t	Residual component, ε_t
2020							
1	10	17,79	9,36	0,64	-28,32	-28,39	29,02
2	0	16,88	11,20	-11,20	-30,55	-30,61	19,41
3	0	15,97	12,99	-12,99	-31,23	-31,29	18,30
4	0	15,06	14,74	-14,74	-7,86	-7,92	-6,82
5	2	14,15	16,44	-14,44	5,81	5,75	-20,18
6	30	13,24	18,08	11,92	82,78	82,71	-70,80
7	76	12,33	19,68	56,32	71,79	71,73	-15,41
8	31	11,92	21,24	9,76	37,60	37,54	-27,77
9	3	11,92	22,74	-19,74	-4,29	-4,35	-15,39
10	0	13,96	24,20	-24,20	-29,13	-29,19	5,00
11	1	17,25	25,60	-24,60	-31,67	-31,74	7,13
12	0	23,71	26,96	-26,96	-34,17	-34,23	7,27
2021							
13	0	31,54	28,28	-28,28	-28,32	-28,39	0,11
14	0	36,04	29,54	-29,54	-30,55	-30,61	1,07
15	0	38,88	30,76	-30,76	-31,23	-31,29	0,53
16	49	40,21	31,93	17,07	-7,86	-7,92	25,00
17	32	40,88	33,05	-1,05	5,81	5,75	-6,79
18	155	41,21	34,12	120,88	82,78	82,71	38,17
19	139	41,25	35,14	103,86	71,79	71,73	32,13

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20	76	41,25	36,12	39,88	37,60	37,54	2,34
21	26	41,25	37,05	-11,05	-4,29	-4,35	-6,69
22	9	39,71	37,93	-28,93	-29,13	-29,19	0,27
23	8	38,92	38,76	-30,76	-31,67	-31,74	0,98
24	1	39,83	39,54	-38,54	-34,17	-34,23	-4,31
2022							
25	0	39,75	40,28	-40,28	-28,32	-28,39	-11,89
26	0	39,83	40,97	-40,97	-30,55	-30,61	-10,36
27	0	40,42	41,61	-41,61	-31,23	-31,29	-10,32
28	12	40,75	42,20	-30,20	-7,86	-7,92	-22,28
29	50	40,50	42,74	7,26	5,81	5,75	1,51
30	159	40,54	43,24	115,76	82,78	82,71	33,05
31	133	40,92	43,69	89,31	71,79	71,73	17,58
32	84	41,13	44,09	39,91	37,60	37,54	2,37
33	32	41,58	44,44	-12,44	-4,29	-4,35	-8,09
34	11	43,08	44,75	-33,75	-29,13	-29,19	-4,55
35	0	45,46	45,00	-45,00	-31,67	-31,74	-13,26
36	10	45,29	45,21	-35,21	-34,17	-34,23	-0,98
2023							
37	0	41,92	45,37	-45,37	-28,32	-28,39	-16,98
38	5	40,75	45,48	-40,48	-30,55	-30,61	-9,87
39	6	43,29	45,55	-39,55	-31,23	-31,29	-8,26
40	42	45,08	45,56	-3,56	-7,86	-7,92	4,36
41	77	46,00	45,53	31,47	5,81	5,75	25,72
42	128	46,67	45,45	82,55	82,78	82,71	-0,16
43	83	45,94	45,32	37,68	71,79	71,73	-34,05
44	106	45,94	45,15	60,85	37,60	37,54	23,31
45	71	45,94	44,92	26,08	-4,29	-4,35	30,43
46	15	45,94	44,65	-29,65	-29,13	-29,19	-0,46
47	18	45,94	44,33	-26,33	-31,67	-31,74	5,41
48	8	45,94	43,96	-35,96	-34,17	-34,23	-1,73

To counteract the effects of random factors, we find the initial calculations of the SEt seasonal component by averaging the deviation values ($Y_{t(tur)}$- $U_{t(tur)}$) for those months. Then it is necessary to make adjustments to the initial values of the seasonal component in the appropriate order, since the overall effect of seasonality on the dynamics of the studied time series indicators should be neutral. For an additive model, the sum of seasonal component values for a complete seasonal cycle must be zero.

The adjusted estimate of the seasonal component is determined using the following formula:

$$S_t = SE_t - \overline{S_t} \qquad (4)$$

There is:

$$\overline{S_t} = \frac{\sum_{t=1}^{12} SE_t}{12} \qquad (5)$$

As seen $\overline{S_t} = 0{,}089$.

It allows us to conclude that the built-in trend Model of the time line of the number of tourists served by a tourist enterprise has an increasing trend with a monotonous rate of decline, which

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indicates that the tourist enterprise has taken its place in the tourist services market and has practically reached a stable level of this indicator.

CONCLUSION

The desire to attract more customers by tourist enterprises should be supported by the development of an adequate strategy, taking into account the nature of the identified trends. At the same time, it is necessary to take into account the formed form of the oscillation of the seasonal wave of each of the studied indicators. Analysis of its evolution allows us to conclude that in July there are stable peaks in the graphics Center. At the same time, there is an unacceptable long stable "dead season", which occupies almost three-quarters of the annual cycle. Obviously, this fact is due to the influence of objective factors, in particular, time stereotypes associated with the fact that tourists prefer to spend their holidays in the summer.

At the same time, it will be objectively possible to develop a more realistic strategy of a tourist enterprise to attract customers, form various service offers with rational intervention of advertising, popularize alternative types of Tourism, use the "off-season" resources of the timeline for the formation of exclusive types.

Thus, the study of changes in The Shape of seasonal wave fluctuations based on the built additive model allows you to develop targeted measures to eliminate seasonal fluctuations or align the range of deviations, competently coordinate the strategic activities of tourist enterprises in order to attract new customers.

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