Modelling Prediction of Consumer Demand in the Tourism and Hospitality Based on Time Series

Bohdan Danylyshyn, Lidiia Shynkaruk, Olha Prokopenko, Svitlana Bondarenko, Kateryna Veres, LiliiaKovalenko

Abstract*: *Travel services, unlike other services, cannot be stored or stockpiled for the future. Unsold hotel rooms, excursions or unfilled seats on the aeroplane cannot be sold over time. When real demand provides planned load factors, the business grows. This indicates the importance of demand forecasting for all tourism enterprises.In forecasting tourism demand, quantitative and qualitative approaches are used. A quantitative approach is based on statistical information for the previous period, and a qualitative one is based on people's opinions and opinions.

Multivariate regression analysis is the most popular model for forecasting tourist demand. It takes into account many factors on which the tourist flow depends. In conditions of limited data, a time series model is used, which gives a high forecast, especially in pronounced seasonality.

For a more accurate forecast of tourism demand, it is necessary to combine quantitative and qualitative approaches.

Keywords* : *Consumer Demand, Hospitality, Modelling Prediction, Time Series,Tourism.

I. INTRODUCTION

Demand for travel and services is a determining factor in the tourism market. Almost any tourism-related enterprise is interested in reliable information about the demand for its products, especially about the estimated demand. The cost of advertising, investment planning, business expansion opportunities and the like depends entirely on this indicator. Previous studies of the authors [1-3] showed that in order to develop infrastructure, expand the transport network, services, build new hotels, amusement parks, it is necessary to have the most likely information about how many tourists will arrive in a particular place, how much time they will spend here, what their needs will be, how much money they will spend here. Information on tourist demand and scientifically based forecasts can become a reliable basis for developing a long-term tourism development program, the implementation of which will provide the maximum socio-economic effect with minimal losses [3-6].

One of the problems of the efficiency of the tourism business is the coordination of supply and demand. Difficulties arise, first of all, in that a tourist product, unlike many others, cannot be stored, stored to make a reservation for the future, because unused offers - unsold hotel places or excursions - lead to irreversible losses. Things are going well where real demand ensures the achievement of the planned load factors of hotels and vehicles. This indicates the importance of determining and forecasting demand for all enterprises and persons providing tourism services.

Real demand is measured by the following indicators:

- Number of arrivals;
- The number of days or nights;
- Average cost per visitor.

Potential demand is measured by the possible number of visitors.

The number of people who want to go on a trip depends on several factors that contribute to or hinder the trip at a specific time and place. The factors that contribute to travel characterise the propensity to travel. These include a high level of personal income, the proximity of tourist facilities, the availability of tourist resources, low travel costs, a favourable exchange rate, and the attractiveness of a tourist destination [7-9].

Factors that impede travel characterise travel restrictions. This is the high cost of travel, the poor reputation of the place of residence or country, political instability, concerns about security and sanitation.

Many tourism industry companies periodically experience difficulties and are uncertain about the future. In an ever-changing competitive business environment, the need for forecasting demand is growing, which is the basis for effective planning [10-12].

Tourism demand is expressed in terms of the number of tourists arriving from the country of origin in the country of destination or expenses incurred in the host country.

In economic analysis, there are several areas in which work promises to increase the accuracy of forecasts, but not all of them can take into account the specific characteristics of tourist services.

II. MODELS AND METHODS FOR FORECASTING TOURISM DEMAND

In forecasting tourism demand, quantitative and qualitative approaches are used.

Revised Manuscript Received on November 15, 2019

***** Correspondence Author

Bohdan Danylyshyn, Department of Regional Studies and Tourism, Kyiv National Economic University named after Vadym Hetman, Kyiv, Ukraine

Lidiia Shynkaruk, Producation and Investment Management Department, National University of Life and Environmental Sciences of Ukraine, Kyiv, Ukraine

Olha Prokopenko, Department of Business Administration Tallinn University of Technology, Tallinn, Estonia

Svitlana Bondarenko*, Department of Economic Management of Natural Resources, Institute of Market Problems and Economic-Ecological Research of the NAS of Ukraine, Odessa, Ukraine

Kateryna Veres, Department of Tourism and Hotel Business, National University of Food Technologies, Kyiv, Ukraine

Liliia Kovalenko, Department of Hotel and Restaurant Business, Odessa National Academy of Food Technologies, Odessa, Ukraine

A quantitative approach is based on statistical information for the previous period, and a qualitative one is based on people's opinions and opinions. Positive results can be achieved by combining quantitative and qualitative approaches.A quantitative approach to forecasting tourism demand involves the use of causal and non-causal models.

A. Causal models

Causal models try to explain changes in tourist demand by the change in certain variables and predict future demand. Causal models are economic-mathematical models, for example, multivariate regression analysis and a model that studies dynamics depending on constraint and propensity factors.Multivariate regression analysis is the most popular model for forecasting tourist demand.In general, the functions of tourism demand are multi-factor dependencies in which demand depends on factors such as personal income, travel cost, comparative prices, and the exchange rate. This model is used to predict changes in tourist demand with changes in one or more factors, for example, how the indicator of tourist expenses will change if personal income or the price of an air ticket increases by 5% or the national currency decreases by 10%.Fig. 1 shows the dependence of the tourist flow from different countries on the distance to the destination, as well as different periods for travel.This approach allows us to estimate the quantitative relations between the predicted variables and those variables that are likely to affect these variables. Retrospective data are used for the assessment.

Further, prospective values are determined by predicting the influence of variables and the already estimated ratio.

At the first stage of building a model to predict the size of the market, those variables that affect the demand for international tourism are estimated. The following quantities take part as model variables:

1) Per capita income in the country of origin (for private tourist trips or trips to visit relatives and friends, they usually use personal income, and for business trips - other general income indicators, for example, national income).
2) Cost, which includes the cost of transportation to the destination, expressed in the currency of the country of origin (the cost of transportation is determined using the fare of air travel, or the cost of fuel when using land transport), and the costs incurred at the destination (cost of living etc.).
3) The exchange rate, although it is already incorporated (attached) to some extent in other price indicators. In practice, people may be more aware of exchange rates than the relative cost of living in both the country of origin and the host country.

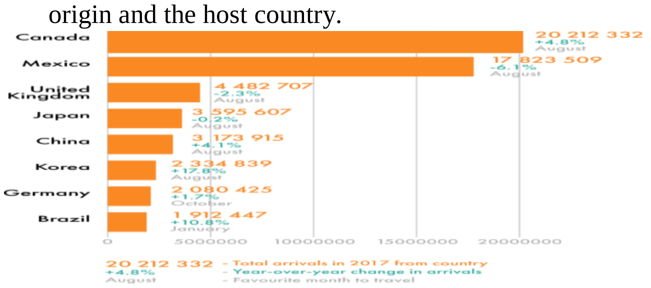

Fig. 1. Countries that sent the most tourists to the United States in 2017

4) Cost of replacement products. Potential tourists usually when planning their vacation in a tourist center compare the costs of spending it with the expenses of a house and expenses during previous holidays spent in other places. Such a comparative analysis may be an important determinant of demand for international tourism to a given destination from a certain place of origin. Therefore, the compared costs can be included in the above model in the form of weighted average values (transport and accommodation expenses).
5) The variable component of the event can be included in the demand model of international tourism to confirm the influence of one of the historical events.
6) The parameter, called a trend, can display changes in the popularity of the tourist centre over the studied period.
7) The indicator of the activity of promoting a tourism product reflects the cost of its promotion abroad. These costs are taken into account by the leadership of the tourist centre and can play a significant role in determining the level of demand for international tourism. They are calculated in the currency of the country where they are carried out, i.e. country of origin.
8) 8. Variables that confirm affection for a particular locality (if a vacation with tourists leaves pleasant memories of the tourist centre, they will certainly return there).

The forecasting process in tourism using regression analysis includes the following steps:

- selection of variables affecting the forecasted demand variable, and the establishment of a mathematical form by the relationships between them;
- collection of model-related information;
- use of a database to establish a measure of the impact of influencing variables on predicted variables in the past (estimation of coefficients of a mathematical equation);
- testing on the model installed at the previous stage to determine its level of realism;
- using the model to predict if the model tests are satisfactory.

It is very important to evaluate the parameters (their sign and magnitude) obtained using the regression model to determine the correct (acceptable) theoretically (corresponding to the requirements of economic theory) parameters. Mostly incorrect parameters appear due to the imperfection of the model itself.

The analytical model for forecasting the demand for international tourism has a logarithmic linear form:

$$\begin{aligned} \boldsymbol{In\left(\frac{Nijt}{Nit}\right) = a0 + a1\, In\left(\frac{Iit}{Njt}\right) + a2\, In\, Pjt} \\ \boldsymbol{+ a3\, In\, Psit + a4\, In\, Pxijt} \\ \boldsymbol{+ a5\, In\, Paijt + a6\, In\, PASijt} \\ \boldsymbol{+ a7\, In\, Psijt + a8\, In\, PSSijt} \\ \boldsymbol{+ a9\, Ukt + a10\, t} \\ \boldsymbol{+ \frac{a11\, In\, (Tij(t-1)}{Ni(t-1)} + Bijt} \end{aligned} \tag{1}$$

Retrieval Number: D4338118419/2019©BEIESP
DOI:10.35940/ijrte.D4338.118419

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication

where *t* is the number of years;

a0, a1, a2, ..., a11 - parameters (unknown);

Tijt - the number of arrivals of tourists from the country of origin i to the destination (tourist centre) j in the t-th year;

Nit - population in the country of origin of tourists i in the t-th year;

Iit - per capita income in the country of origin of tourists i in the t-th year;

Pjt is the price for tourists in the tourist centre j in the t-th year;

Psit - weighted average price of accommodation for tourists in the tourist centre, a substitute for residents of the country of origin of tourists i in the t-th year;

Pxijt - exchange rate between the currencies of the country of origin i and the tourist centre j in the t-th year;

Paijt - fare for air travel from the country of origin i to tourist centre j in the t-th year;

PASijt - weighted average fare for flights from country of origin i to the tourist centre substitute j in the t-th year;

Psijt - weighted average fare for moving by ground transport from country of origin i to tourist centre j in the t-th year;

PSSijt - weighted average fare for moving by ground transport from country of origin i to the tourist centre substitute j in the t-th year;

Ukt - event variable k, in the t-th year;

a10t - the value of the trend;

$a11\ In\ (Tij\ (t-1)\ /\ Ni\ (t-1))$ - a variable showing affection for the tourist centre, which is included in the model for those countries of origin and destinations for which they need for their inclusion was predetermined by preliminary empirical results;

Bijt is a random error value.

The analysis allows us to identify the distribution of patterns discovered in the past to the future, as well as to study the impact of changes in various economic factors on the demand of international tourism for different countries.

The model, which studies the influence of constraint and propensity factors, makes it possible to analyse the dependence of the situation on conditions conducive to travel (population income growth) and conditions restricting travel (long distances and high cost).

B. Non-causal models

Non-causal models, such as time series, based on studying the trends of one variable, for example, the number of arrivals or tourist expenses over several years. Non-causal models are used in cases where there is not enough information or knowledge to explain the reasons for the changes.

Time series are numerical valuesthat describe the change in the indicator over time and usually take the form of a table or graph. The nature of the changes in the levels of the series over time and trends are formed make it possible to predict the value of the indicator with sufficient probability, especially for short-term periods.

C. Quality approach

To forecast tourism demand and predict the possible development of tourism-related events, it is necessary to use qualitative approaches. In many cases, qualitative characteristics significantly complement the results of the analysis of quantitative indicators. By calculating and analyzing quantitative indicators, researchers seek to objectively evaluate existing trends. In the formation of quality indicators, the decisive role is played by subjective factors: experts in assessing certain phenomena rely on their perception and experience.

Qualitative models in tourism research should be applied where there is no possibility to use quantitative ones. For example, during the construction of a new tourist centre or the development of a new area, when analysts do not have information about the number of arrivals, seasonality of demand, or average costs for this place of stay. Qualitative models can be useful even when dramatic changes take place in the external environment of the tourism business, in political or social life, which can affect the state of tourism. In such a situation, quantitative methods of analysis may be unacceptable or insufficient for the assessment and forecasting in tourism.

It is perhaps difficult to find a research method that would be equally acceptable to everyone in such a multicomponent and dynamic industry like tourism. For example, in Australia, the Tourism Forecasting Council has developed its method as a combination of quantitative and qualitative approaches. It is based on an economic and mathematical model built based on two main indicators: income and prices - for individual market segments. The results of quantitative analysis are adjusted according to qualitative characteristics, such as expected changes in consumer behaviour, government policy, foreign policy factors, unusual situations. Final forecasts are the most likely indicators taking into account all factors.

To study the tourism market using methods of marketing survey of real or potential travellers. However, since consumer surveys require a lot of time and money, sometimes enterprises that provide travel services are interviewed instead of consumers. For example, national tourism organisations can obtain statistical information from hotels and major tour operators about the status of futures reservations and intentions about renting places for next year and thus determine fairly accurate guidelines. The analytical conclusions of specialists in this regard can significantly supplement the estimated indicators.

The Delphi method (model) known to experts is also used for tourism research. The method is based on reaching a consensus of opinions of reputable scientists and researchers regarding specific situations or forecasts in tourism. At the initial stage, a questionnaire is developed and sent to a group of well-known experts, each of which gives independent answers. Thus, it is possible to avoid pressure on specialists. After an initial analysis of the responses received, a second or third round of polling is possible until a consensus is reached or a point of convergence is found.

Scientists Uysal and Crompton have proposed their model of tourism research - ongoing expert workshops. According to the scenario developed by Uy-sal and Crompton, a group of experts is invited to a seminar on a specific topic. Experts make reports, in-depth and multi-faceted cover various issues within the framework of the topic and regulations, participate in debates about the current situation (basic analysis); a possible future situation; forecasts of the development of the current situation. According to scientists, it is advisable to conduct such seminars at least once a year. The materials of the seminars can become a significant contribution to the formation of employment forecasts, the construction of new facilities, the expansion of the services sector and the like.

III. METHODOLOGY: DEMAND FORECASTING OF TOURISM SERVICES USING A TIME SERIES MODEL

Demand forecasting based on a time series model is more often used in conditions of limited data. However, the nature of changes in the levels of the series over time and trends make it possible to predict the value of demand with sufficient probability, especially for short-term periods.

Tourism demand is expressed by the number of tourists arriving or expenses in the region of stay.

We apply this method to forecast the demand for labour services in Croatia. Since 2005, the flow of tourists to Croatia is constantly increasing. At the same time, the ratio of foreign and local tourists is changing. The tourism demand model takes into account macroeconomic indicators, such as revenues in countries where tourists come from, tourism prices in Croatia, transport costs and exchange rates between these countries.

The arrival of tourism is characterized by the following function:

$$AR = F\,(Y, TP, CT, ER) \qquad (2)$$

where AR is the tourist arrival from each country, Y is the real income per capita, TP is the price of tourism, CT is the cost of transport, ER is the exchange rate between the currencies of the countries. Variables are expressed in logarithms to account for the multiplicative effects of a time series and are denoted by L.

Data on real income variables include real GDP per capita and real consumption per capita.

Tourism prices, which include the value of goods and services purchased by tourists in a country, are measured by relative prices or actual exchange rates. The relative price variable is given by the exponential ratio of the consumer price index (CPI) by countries. The Logarithm of Relative Prices (LTP) indicates the difference between the logarithm of the price level in Croatia and the countries where tourists come from during the period.

$$LTP = ln\left[\frac{CPI(MGL)}{CPI(Origin\,)}\right] = ln\,CPI(MGL) - ln\,CPI(Origin) \qquad (3)$$

Average prices for transport costs from another country to Croatia include transport costs.

The real exchange rate measures the effective prices of goods and services in the region when the consumer price index adjusts between differences in exchange rates in the currencies of countries. The real exchange rate is determined by the logarithm of relative prices minus the logarithm of the exchange rate:

$$LER = ln\left[\frac{CPI(MGL)}{CPI(Origin\,)}\frac{1}{ER}\right] = LTP - lnER, \qquad (4)$$

where ER are the exchange rates in units of currency.

Variables: tourist arrivals, real per capita income, tourism prices, transport costs, and real exchange rates are unsteady, and contain a predefined stochastic trend. In general, demand is positively related to income, and negatively related to tourism prices, transport costs and real exchange rates of countries. This is accompanied by multidimensional cointegration analysis.

The tourism demand equation can be written as follows:

$$AR_t = \alpha_1\,AR_{t-1} + \alpha_2 Y_t + \alpha_3\,ER_t + \beta_t + \xi_t \qquad (5)$$

where ARt is an endogenous variable representing the logarithm of the number of tourists or tourism spending, depending on the purpose of the model; $ARt - 1$ represents the autoregressive process of the model; Yt - real GDP; ERt is the logarithm of the combination of the real effective exchange rate of the tourist's income currency relative to the domestic currency and relative to the currency of a competing destination, respectively; βt is the seasonal component presented for the quarterly: $\beta_t = \gamma_1 \cos\frac{\pi}{2}t + \gamma_1^{*} sin\frac{\pi}{2}t + \gamma_2 \cos \pi t$; ξt has a zero mean and a variation of σ2; α1, α2, α3, γ * 1, γ2, γ3 - parameters.

Consider a tourism demand model based on consumer theory. The obtained elasticities of the model show significant effects of mutual demand - a variety of tourist preferences.

You can compute the Tourism Price Index (TPI) using daily consumption and a basket of goods and services consumed by tourists. Consumers are limited in time and income so that they choose affordable services to maximise their utility.

The utility function representing the tourist preference is determined by the consumer preference class, called the Price of an independent generalised linear logarithm. The tourist preference is represented by the cost function C (U, P), which determines the minimum consumer consumption necessary to achieve a certain utility U according to prices P. Deaton and Muellbauer proposed the following consumption function:

$$lnC(U,P) = \alpha_0 + \sum_{i=1}^{n}\alpha_1 \ln p_i + \frac{1}{2}\sum_{i=1}^{n}\sum_{j=1}^{n}\gamma_{ij}^{*}\ln p_i \ln p_j + U\beta_0 \prod_{i=1}^{n} p_1^{\beta_1}, \qquad (6)$$

where pi is the price for tourism services of the i-th destination, n is the number of destinations, U is the utility, $C\,(U,P)$ is the expense function, $\alpha 0, \alpha i, \beta 3, \beta i,\ \gamma_{ij}^{*}$ are the parameters.

$$p_i = p_{ik} * TPI_t * R_{ik} + TC_{ik} \qquad (7)$$

where p_{ik} is the average tourist expense of the k-th country at the i-th destination, R_{ik} is the bilateral exchange rate, TC_{ik} is the transport cost between i and k countries.

Applying the Shephard lemma in the consumption function and using the indirect utility function, the following system of equations of demand for the share of consumer consumption is obtained:

Retrieval Number: D4338118419/2019©BEIESP
DOI:10.35940/ijrte.D4338.118419

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication

$$w_i = \alpha_i + \sum_{j=1}^{n} \gamma_{ij} \ln p_j + \beta_i ln \frac{X}{P}, \qquad (8)$$

where *wi* is the share of consumption to the i-th destination, $\gamma_{ij} = (\gamma_{ij}^* + \gamma_{ji}^*)/2$,, pj is the price of the travel service to j to the destination, X is the total consumption of the consumer to all destinations, P is the aggregate price index defined as:

$$\ln P = \alpha_0 + \sum_{i=1}^{n} \alpha_1 \ln p_i + \frac{1}{2}\sum_{i=1}^{n} \sum_{j=1}^{n} \gamma_{ij}^* \ln p_i \ln p_j \qquad (9)$$

The system of demand equations, which is expressed as a function of relative prices and real consumption, is non-linear. A linear approximation can be obtained by replacing the price index P with an alternative index P*, called the Stone index:

$$\ln P^* = \sum_{i=1}^{n} w_i \ln p_i, \qquad (10)$$

where *wi* are the observed shares of the budget. The equation shows that the proportion of the consumer’s budget spent on travel services of destination i depends on the budget of the consumer and the price of destination i relative to prices in competing destinations.

For compatibility of the model with the main axioms of consumer theory, the following a priori restrictions on the parameters should be imposed.

The sum of budget shares equal to one requires:

$$\sum_{i=1}^{n} \alpha_1 = 1, \ \sum_{i=1}^{n} \gamma_{ij} = 0, \ \sum_{i=1}^{n} \beta_i = 0. \qquad (11)$$

Homogeneity requires $\sum_{i=1}^{n} \gamma_{ij} = 0$ The symmetry condition for consumer choices requires $\gamma_{ij} = \gamma_{ji}$.

The γ_{ji} parameters measure the change in the share of the budget at destination i from 1% of the price change. The β_i parameters determine whether the destination is considered a luxury or a need. They represent the absolute change in the share of expenses, measured as a percentage, given a 1% change in real expenses.

The effects of changing the consumer budget in relative prices are illustrated in Fig.2. Changing the price of the destination leads to 2 actions: the replacement effect (Er) and the income effect (Ei).

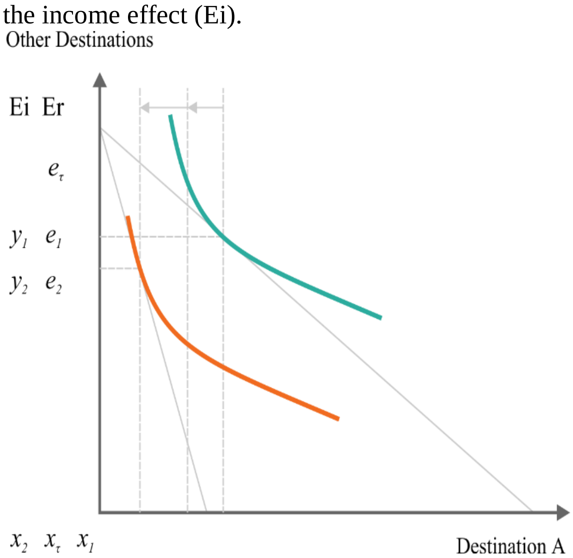

Fig. 2.Replacement and Income Effects

The replacement effect is represented by the movement from e1 to eT: when the price of travel services at destination A increases, demand changes as the consumer has lower demand, where the relative price increases. Thus, the effect of replacing the price increase is negative. A move from eT to e2 shows that demand is changing due to falling incomes, assuming that the relative price is the same.

If $x_1 > x_T > x_2$, then the effects of income and substitution reinforce each other. And if $x_2 > x_1 > x_T$, then the income effect dominates the replacement effect.

Uncompensated price elasticities are often more acceptable for price sensitivity analysis, as consumers are not aware of a change in their real income.

A set of elasticities provides information on the interdependence of competing destinations. The elasticity gives the change in tourism demand as a percentage of the 1% change in the variables in question.

Demand elasticities are calculated by the following parameters. The flow elasticities η_i reflect the sensitivity of demand to changes in consumption: $\eta_i = \beta_i / w_i + 1$. Using the price index P*, one can evaluate non-compensatory and compensatory intrinsic and mutual price elasticities. Non-compensatory price elasticities show how changes in the price of travel services of one destination affect the demand for travel services of other destinations. Uncompensated eigenvalues ε_{ii} and mutual elasticity ε_{ij} are measured:

$$\varepsilon_{ii} = \gamma_{ii} / w_i - \beta_i - 1, \ \varepsilon_{ij} = \gamma_{ij} / w_i - \beta_i w_i / w_i \qquad (12)$$

Compensatory elasticities measure these effects, assuming that real costs remain constant. The compensation eigenvalues ε_{ii}^1 and mutual elasticity ε_{ij}^1 are measured respectively:

$$\varepsilon_{ii}^1 = \varepsilon_{ii} + w_i \eta_i = \gamma_{ii} / w_i + w_i - 1, \ \varepsilon_{ij}^1 = \varepsilon_{ij} + w_j \eta_i = \frac{\gamma_{ij}}{w_i - w_j} \qquad (13)$$

Cross-price elasticities allow classifying destinations as replacements or additions to alternative destinations.

Negative cross-price elasticities indicate that two destinations- additives and positive substitutes indicate.

IV. RESULT AND DISCUSSION

The calculated tourism demand elasticities of Croatia are shown in Table 1.

Table- I: Non-compensatory tourism resilience of Croatia

Countries	Budget share wi	Flow elasticity η_i	Own elasticities ε_{ii}	Взаимные эластичностиε_{ij}			
				Австрия	Чехия	Франция	Италия
Austria	0,206	1,32	-1,75	-	0,748	-0,143	-0,167
Czech Republic	0,257	1,25	-2,08	0,614	-		0,310
France	0,441	0,77	-0,89	0,046	0,071	-	0,006
Italy	0,096	0,72	-1,5	-0,236	0,966	0,052	-

An essential aspect of tourism modelling is the condition of equilibrium (saturation), that is, an oscillation near a certain stationary value. Equilibrium is the achievement of stable prices at which supply and demand are balanced. If we accept the hypothesis of the possibility of achieving equilibrium, then we have to look for models of the form of equations with an asymptotic approximation to a certain saturation line. Over the past years, tourism and prices (for air travel, hotels, etc.) have undergone a significant transformation, a steady growth trend is observed, and therefore, the term “saturation” is still inappropriately applied to tourism.

A promising direction in modelling tourism processes is the use of diffusion models. Currently, diffusion models are used in various fields, such as marketing, management, information business technologies.

Let *f(t)* be the probability function of the acquisition of a tour by potential customers at time *t*, and *F(t)* be the probability function that describes the share of potential customers from the entire population at the same time. Then *f(t) /[1- F(t)]*is the conditional probability of the arrival of a certain number of customers at the indicated time t. It can be assumed that this conditional probability can be described by a linear dependence on *f(t)/[1-F(t)]=a+b•F(t)*, where a, b are coefficients.

If N^* is the total number of potential customers, then the number of customers arriving at time t will be equal to $Y_t = N^* \bullet f(t)$, while the number of potential customers is $N_t=N^* \bullet F(t)$. Then the total number of customers arriving is:

$$Y_t = a(N^* - N_t) + b \bullet N_t(1-N_t/N^*) \qquad (14)$$

You can describe N * as a function of factor attributes in a logarithmic form:

$$\ln(N_t^*) = d_0 + \sum_{j=1}^{k} d_j \ln X_{jt}, \qquad (15)$$

where *Xjt* are factor signs, *dj* are regression coefficients.

Using (14), we can also write Yt as a quadratic function of Nt-1:

$$Y_t = a * N^* + (b - a)N_{t-1} - (b / N^*)N^2_{t-1} \qquad (16)$$

Substituting (15) in (16), we obtain

$$Y_t = a \bullet \exp[d_0 + \sum_{i=1}^{k} d_i X_{jt}] + (b-a)N_{t-1} - bN^2_{t-1} / \exp[d_0 + \sum_{j=1}^{k} d_j X_{jt}] \ (17)$$

If we denote $\alpha = a \bullet \exp(d_0), \beta = (b-a) и \gamma = b/\exp(d_0)$, then we obtain the following expression of the total number of tourists:

$$Y_t = \alpha * \exp[\sum_{i=1}^{k} d_i X_{it}] + \beta N_{t-1} - \gamma N^2_{t-1} / \exp[\sum_{j=1}^{k} d_j X_{jt}] \qquad (18)$$

It is possible to estimate the parameters a, b, and d based on the values of α, β, and γ when determining b0. To evaluate the parameters of the given model, nonlinear methods should be used, since there is a parametric nonlinearity. The advantage of the model is its complete consistency in the conditions of non-stationary data.

Adaptive models use statistics on the number of tourists arriving for a certain retrospective period. The advantage of this approach is the fact that statistical data reflect the effect of absolutely all any significant factors. Moreover, these models have good predictive qualities, since they take into account the inertia and delay of the influence of factor attributes. By the totality of features, adaptive statistical models can be assigned to dynamic forecast models.

One of the factors affecting the volume of the tourism market is seasonality. The fluctuation in demand for tourism services gives a seasonality curve. The study of the dynamics of the tourist flow indicator allows us to quantify the development of tourism and give a forecast of its development for the coming months.

The data on the dynamics of the tourist flow from the first quarter of 2014 to the fourth quarter of 2019 was taken as initial data for forecasting.

Given the seasonal wave, you can build a forecast that takes into account future seasonal fluctuations(Fig. 3).

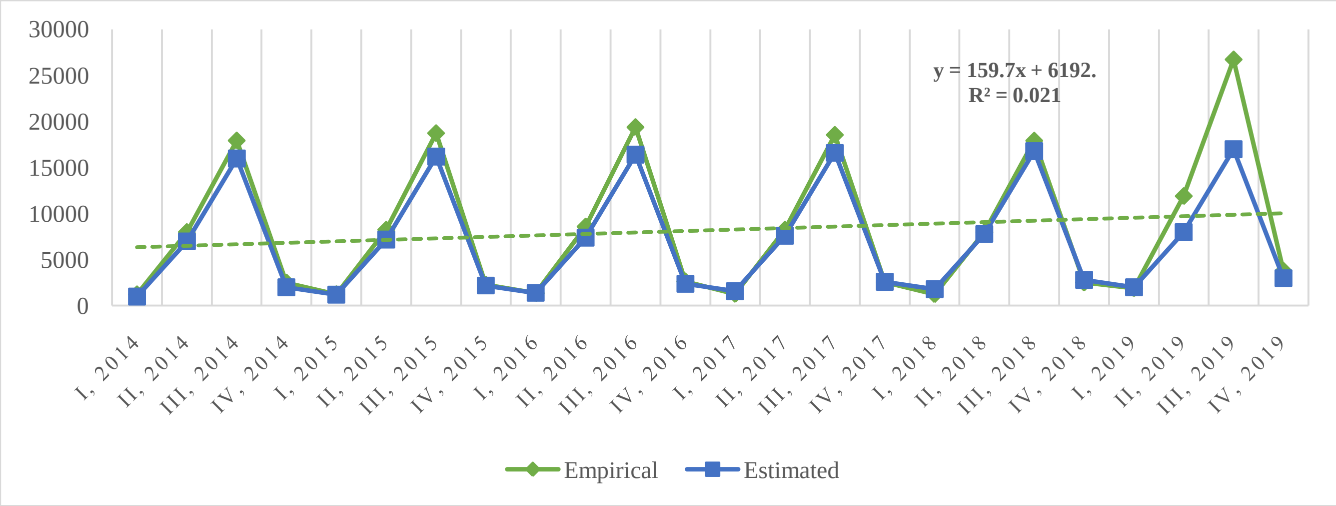

Fig. 3.Tourist flow forecast (thousand people)

In Fig. 3, the dynamics shows the presence of a strong seasonality effect in a series of dynamics with a pronounced annual cycle. So, the highest values of tourist flow are in the summer months.

This series of dynamics contains a growth trend; therefore, before calculating the seasonal wave, the actual data should be processed so that a general trend is revealed. To do this, we use the method of analytical alignment of a number of dynamics.

When using the analytical alignment method, the algorithm for calculating seasonality indices is as follows:

- the corresponding linear trend calculates for each quarter aligned levels at a time (t);
- the relationship of the actual quarterly data (yi) to the corresponding aligned data ($\overline{y}_i$) is determined:

$$I_i = (y_i / \overline{y}_i) \qquad (19)$$

- are the geometric mean values of their ratios calculated for the same periods:

$$I_{geometricmean} = \sqrt[n]{I_1 * I_2 * I_3 * \ldots * I_n} \qquad (20)$$

where *n* is the number of periods of the same name.

The construction of a linear trend (Figure 3) allows us to calculate seasonality indices presented in Table 2. According to the obtained linear trend (Y = 6192.6 + 159.75t), the tourist flow increased by an average of 160 thousand people. quarterly. This indicates the presence of a long-term growth trend in the studied series of dynamics.

Table- II: Seasonality indices

Years \ Quarters	I	II	III	IV
2014	0.19	1.23	2.68	0.37
2015	0.18	1.12	2.45	0.33
2016	0.18	1.10	2.44	0.32
2017	0.15	0.98	2.16	0.29
2018	0.14	0.88	1.94	0.27
2019	0.20	1.22	2.71	0.38
$I_{geom.mean}$	**0.17**	**1.08**	**2.38**	**0.32**

An analysis of the indices indicates the presence of a pronounced seasonal wave in the studied series of dynamics. The largest amount of tourist flow reaches in the summer months, especially in the third quarter.

To build forecast values, you need to multiply the values of each trend month by the corresponding seasonality index. As the seasonality index, the geometric mean value of seasonality indices for 2014-2019 was used.

The forecasting results based on a linear trend are presented in Figure 4. According to the forecast values, the tourist flow in the third quarter of 2019 will increase by 1.4 times compared to the same period in 2018.

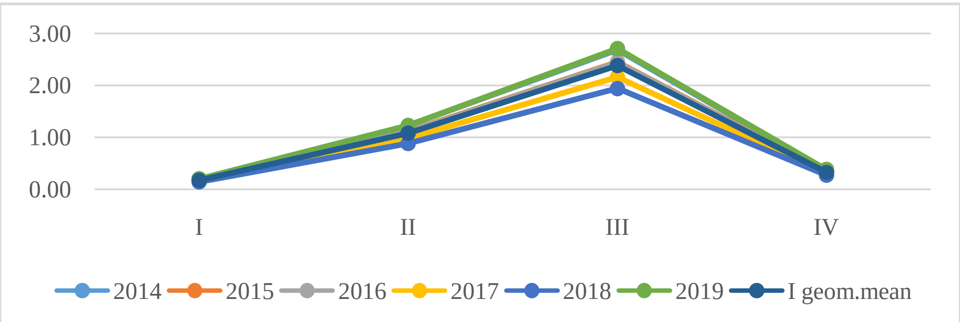

Fig. 4.Seasonal waves of tourist flow

V. CONCLUSION

The obtained forecast values show that while maintaining the main macroeconomic parameters of economic growth, the tourist flow will also increase, which indicates a further improvement in the development of the tourism industry.

In the mid-80-ies of XX century in tourist demand, new trends began to take shape, due to demographic, economic and social factors, as well as changes in the psychology of modern man. The volume and nature of tourism demand are significantly affected by changes in the demographic structure of society and the social model of population in developed and new industrial countries. Also, modern modifications of tourist demand occur under the influence of socio-economic factors. Changes in economic conditions lead to changes in the social sphere, which, in turn, affects the nature of tourism demand.

High competition in the international tourism market, as well as the specifics of travel services, oblige companies to forecast the demand for travel services. In forecasting tourism demand, it is necessary to use quantitative and qualitative approaches. A quantitative approach is based on statistical information for the previous period, and a qualitative one is based on people's opinions and opinions. Positive results can be achieved by combining quantitative and qualitative approaches.

REFERENCES

1. rokopenko, O., Larina, Y., Chetveryk, O., (...), Rozhko, N., Lorvi, I., Digital-toolkit for promoting tourist destinations, International Journal of Innovative Technology and Exploring Engineering, 8(12), 2019, pp. 4982-4987.
2. Bondarenko, S., Laburtseva, O., Sadchenko, O., (...), Haidukova, O., Kharchenko, T., Modern lead generation in internet marketing for the development of enterprise potential, International Journal of Innovative Technology and Exploring Engineering, 2019, 8(12), pp. 3066-3071
3. Danylyshyn, B., Bondarenko, S., Malanchuk, M., (...), Pylypiv, V., Usachenko, O., Method of real options in managing investment projects, International Journal of Innovative Technology and Exploring Engineering, 2019, 8(10), pp. 2696-2699
4. Asli D. A. Tasci, Consumer demand for sustainability benchmarks in tourism and hospitality, Tourism Review, 72(4), October 2017, DOI: 10.1108/TR-05-2017-0087
5. I. Bashynska, I. Lytovchenko, D. Kharenko, Sales tunnels in messengers as new technologies for effective Internet-marketing in tourism and hospitality, International Journal of Innovative Technology and Exploring Engineering, Volume-8 Issue-12, October 2019, pp. 594-598 DOI: 10.35940/ijitee.L3470.1081219
6. Mihail- Sarancha, Anton Mosalev, Experience of development of tourism services in polar regions in foreign countries, November 2015, DOI: 10.12737/14581
7. Hung-Lieh Chou, Jr-Shian Chen, Ching-Hsue Cheng, Hia-Jong Teoh, Forecasting Tourism Demand Based on Improved Fuzzy Time Series Model, International Conference, ACIIDS, Hue City, Vietnam, March 24-26, 2010. Proceedings, Part I, March 2010, DOI: 10.1007/978-3-642-12145-6_41
8. Dimitrios Buhalis, Yeyen Sinarta, Real-time co-creation and nowness service: lessons from tourism and hospitality, Journal of Travel & Tourism Marketing, June 2019, 36(5), pp. 563-582, DOI: 10.1080/10548408.2019.1592059
9. Alisa A. Konovalova, Evgeniya V. Vidishcheva, Elasticity of Demand in Tourism and Hospitality, June 2013, DOI: 10.13187/es.2013.4.84
10. Leong Mei Kei, Syuhaily Osman, Laily Paim, Relationship between Consumer Involvement and Consumer Engagement with Consumer Loyalty in Tourism and Hospitality Industry, December 2017, DOI: 10.6007/IJAREMS/v6-i4/3477
11. D. Shalaev, Institute of Tourism and Hospitality: we make demanded graduates, June 2017, DOI: 10.22412/article_59492fe23170e1.81502246
12. Shwn Meei Lee, Hiroshi Chris Honda, The Implementation of Green Tourism and Hospitality, January 2016, DOI: 10.4172/2167-0269.1000233