УДК 330:519.25

V. Danilov, A. Zhyrova, A. Jirov

SUPPLY AND DEMAND MODEL-BAZED ANALYSIS
OF SELF-ORGANIZATION IN TOURISM

Abstract. This paper studies methods of research and state such economic categories as supply and demand depending on the price, which made it possible to allocate certain trends in the behavior of the tourist market in view of recessions and elevated. Proposed and practically tested model interdependence of supply and demand on the price of a mathematical model of the tourist area.
Keywords: Information technology; dynamic economic-mathematical model; demand; offer; elasticity of demand; elasticity of supply; tourist region.

Formulation of the problem. The dynamic of tourism and recreation development in terms of the institutionalization of social relations and functions require coordination of these activities with socio-cultural, natural and recreational, ecological, economic, informational and technological factors of regional and state levels.

Social tourism is an important component of the tourism industry. It includes rehabilitation and recreation of the general population at the lowest available prices.

We construct a mathematical model of market fluctuations, which formalizes the natural history of market processes.

The main part. The range of tourism products significantly affects on the development of the tourism industry and is a regulator of economic agents. Market mechanisms of tourism industry based on the supply and demand compliance law, the law of value, the law of the average rate of profit [1 , p. 87].

We introduce the notation:

p - unit price of the goods or services;

q - supply of goods or services;

d - elasticity of demand.

Sensitivity of demand reaction to price changes - the relative change in demand per unit of relative price changes.

d> 1 – price elastic demand;

d < 1 – price inelastic demand;

d = 1 - a unit price demand elasticity;

s - the elasticity of the supply curve.

Price elasticity of supply - the relative change in the volume of supply per unit of relative price changes.

s > 1 – price elastic supply;

s < 1 - price inelastic supply;

s = 1 – a unit price supply elasticity.

Demand and supply functions provided; can be written as

$$qp^d = p_r, \tag{1}$$

$$qp^{-s} = q_r, \tag{2}$$

where - the parameters of demand and supply curves .

Curves of demand and supply is a graphical display of demand functions and proposes. Equilibrium in an economy indicates an approximate balance between supply and demand. This is a situation where buyers and sellers agree to continue a certain time to buy and sell at a certain price. If demand grows, so does the cost, thus increasing the production and supply. Then there is a surplus of products, and prices are down. In such conditions in the economic system there oscillations. But such "self-organization" of the market is possible under certain restrictions that must be created by the country. The imbalance may cause due to natural disasters, the emergence of new technologies, inflation and so on. These trends must be considered taking into account the time, because there are instantaneous equilibrium (at constant proposal), medium-term equilibrium (for changes in supply and an unchanged number of firms) and continued equilibrium on the market.

The market price is influenced by many factors, but in a competitive market they operate only through demand and supply. Although we can assume that price changes create a number of independent random events. Market demand curve formalizes objective inverse relationship between price and volume of products or services that buyers are willing to buy. It should be noted that the demand for some travel products characterized by the relative sensitivity of consumers to price changes: a slight change in price leads to significant changes in the quantity purchased travel products [2, p.203]. Demand for such products is elastic. However, there are products for which consumers are relatively netlyvi

to change their prices: a significant change in price leads to only small changes in the number of purchases. This demand - inelastic.

For the analysis of market dynamics is convenient to consider economic factors as continuous variable. While this is often not the case, for example, prices can change quickly .

The system of differential equations can be written in this form

$$\frac{dln(p)}{d\tau} = p_r - qp^d \tag{3}$$

$$\frac{dln(q)}{d\tau} = q_r - qp^{-s} \tag{4}$$

or

$$\frac{dp}{d\tau} = p(p_r - qp^d) \tag{5}$$

$$\frac{dq}{d\tau} = q(q_r - qp^{-s}) \ , \tag{6}$$

where $\tau = t/T$ $-$ given time;

t $-$ current time;

T $-$ sertain time scale, such as season.

The model can be used for the qualitative analysis of the dynamics of market processes, but it can be useful in some practical cases, the presence of statistical information.

As a practical implementation of this model was investigated odnin of the important components of tourism activities in Ukraine - the social sciences. This includes the organization of rehabilitation and recreation of the general public at the lowest available prices.

In this paper conducted simulation quantity served tourists closed joint stock company for tourism and sightseeing "Ukrproftur", which in terms of a systematic approach is a complex dynamic system- because it includes operating **10** subsidiaries and **17** regional joint-stock companies, which control **69** tourist farms (hotels, tourist and recreational facilities, boarding houses, tourist camps and camping), **56** travel and tours, other departments, provides recreation and outdoor activities of all segments of the population.

As can be seen from Figures 1-2 , the prices of tourist services are increasing , despite the decreasing number of tourists (Figure 1).
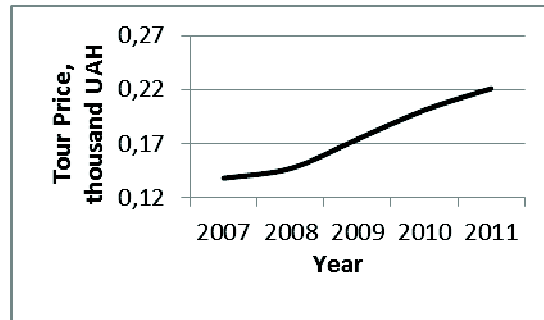
Figure 1 - Changes in prices for travel services

$$D = pq$$

On the basis of the system of differential equations (5) - (6) was carried out simulations of the process of travel services company JSC "Ukrproftur." According to initial data were taken statistics, 2007.

As can be seen from Figure 4 simulated data accurately reflect the statistics. Forecast for 2012-2013 years indicates, that it will be some observed growth rates and a slight decrease in tourists.
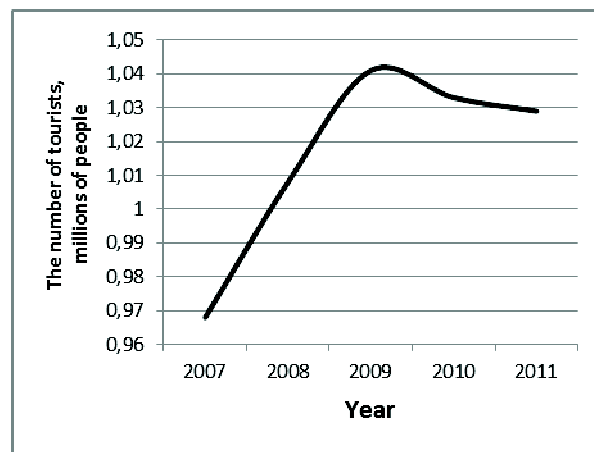

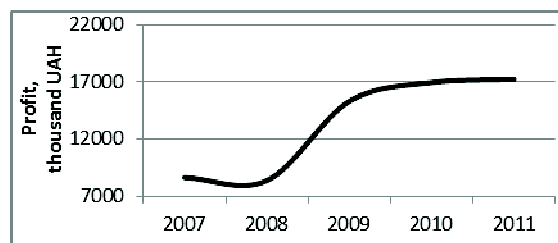Figure 2 - Change in the number of tourists
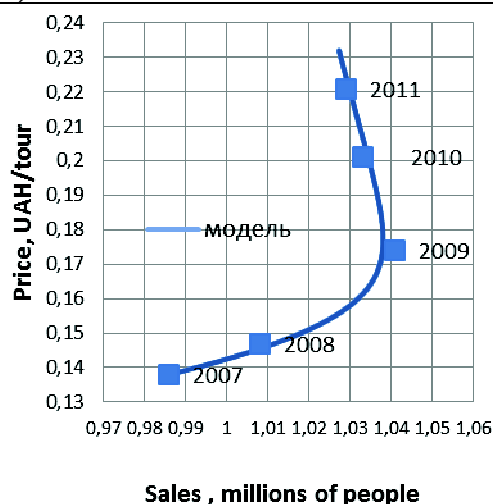

Figure 3 - Industry profit growth

Figure 4 - Results of the modeling process of providing tourism services

($p_r = 1$; $q_r = 0,952$; $d = 0,06$; $s = -0,05$)

In our opinion the forecast duration shall not exceed 1-2 years, because in today's world of late frequently encountered various unforeseen disasters (natural, political, economic). In the long-term forecasts are less accuracy as identifying trends [3, 4].

Conclusions. The mathematical model and accrued on the basis of the results of experimental studies can be used in the quality management system of tourist services as required by standards.

It is proposed to:

- To stimulate the growth of the role of tourism;

- Market reforms require comprehensive use of the variety of elements of tourism marketing;

- To identify the adequacy of the tourism product and market demands are constantly encouraged to analyze their own product, its structure, competitive ability and image;

- To study the demand for tourist services offered technique which involves an analysis of the species, temporal, spatial structures demand.

REFERENCES

1. Маршалл, А. Принципы экономической науки [Текст] / А. Маршалл [пер. с англ.]. -М. : Прогресс, 2005. - Т. II. - 252 с.
2. Пол А. Даніел. Мікроекономіка [Текст] / Пол А. Даніел, Вільям Д. Нордгауз [пер. з англ.]. - К. : Основи, 2006. - 675 с.
3. Єріна А.М. Статистичне моделювання та прогнозування: Навч. посібник. — К.: КНЕУ, 2001. — 170 с.
4. Косенков С.І. Маркетингові дослідження.- К.: Скарби, 2004. -464 с.