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ANALYSIS AND FORECAST OF THE BASIC PRINCIPLES OF TOURIST MARKET DEVELOPMENT IN UKRAINE USING THE METHODS OF ECONOMIC-MATHEMATICAL MODELING

This article performs the analysis and forecast of the basic principles of the tourist market development in Ukraine using the methods of economic-mathematical modeling. As a result of multiple correlation and regression analysis the economic model is constructed for the imports of the account "Travel" in the balance of payments of Ukraine on several factors. Factors affecting the resultant figure are revealed and the effect of their influence is evaluated. Based on the constructed trend model, the forecasted import changes on the account "Travel" in the balance of payments of Ukraine are presented.
Keywords: tourism; tourist market in Ukraine; correlation and regression analyses; forecast.

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АНАЛІЗ ТА ПРОГНОЗУВАННЯ ОСНОВНИХ ЗАСАД РОЗВИТКУ РИНКУ ТУРИСТИЧНИХ ПОСЛУГ В УКРАЇНІ З ВИКОРИСТАННЯМ МЕТОДІВ ЕКОНОМІКО-МАТЕМАТИЧНОГО МОДЕЛЮВАННЯ

У статті удосконалено підхід до кореляційно-регресійного моделювання розвитку туристичного ринку України. У результаті множинного кореляційно-регресійного аналізу отримано економічну модель залежності імпорту по статті «Подорожі» платіжного балансу України від ряду факторів. Виявлено основні фактори, що впливають на результативний показник, та оцінено ефект їхнього впливу. На основі побудованих трендових моделей подано прогнозні дані зміни імпорту по статті «Подорожі» платіжного балансу України.
Ключові слова: туризм, туристичний ринок України, кореляційно-регресійний аналіз, прогнозування.
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АНАЛИЗ И ПРОГНОЗИРОВАНИЕ ОСНОВНЫХ ПРИНЦИПОВ РАЗВИТИЯ РЫНКА ТУРИСТИЧЕСКИХ УСЛУГ В УКРАИНЕ С ИСПОЛЬЗОВАНИЕМ МЕТОДОВ ЭКОНОМИКО-МАТЕМАТИЧЕСКОГО МОДЕЛИРОВАНИЯ

В статье усовершенствован подход к корреляционно-регрессионному моделированию развития туристического рынка Украины. В результате множественного корреляционно-регрессионного анализа получена экономическая модель зависимости импорта по статье «Путешествия» платежного баланса Украины от ряда факторов. Определены основные

факторы, влияющие на результативный показатель, и оценен эффект от их воздействия. На основе построенных трендовых моделей представлены прогнозные данные изменения импорта по статье «Путешествия» платежного баланса Украины.
Ключевые слова: туризм, туристический рынок Украины, корреляционно-регрессионный анализ, прогнозирование.

Introduction. Today, tourism plays one of the main roles in shaping domestic economy. Economic and social effects, manifested in the form of increasing the number of foreign exchange earnings to the country's budget, creating new jobs and cultural development of the nation's tourism refers to one of the priorities of economic policy. Thus, in connection with the development of tourism there is an urgent need for a comprehensive analysis of the main performance indicators to assess and identify the prospects. To achieve this, it is expedient to use the modern toolkit of economic and mathematical modeling, including correlation and regression analyses.

Analysis of recent research and publications. Application of economic-mathematical methods and models for the study of tourism market is present in the works of foreign and domestic scientists. V. Vitlinskyy (2003), L. Krasnikova (1998), I. Lukianenko (1998) proposed the use of econometric models for analysis, evaluation and planning of business. Applications of regression analysis for studying the relationship between economic indicators were discussed in the works by of O. Buzhin (2007), T. Golubeva (2006), O. Demchenko (2007), Y. Larin (2010), O. Malcev (2008), I. Okhrimenko (2007). The methods of regression analysis for tourism were used in the works of L.O. Ivchenko (2005). R. Balashov and Y. Goncharov (2010), who applied mathematical analysis for indicators of tourist enterprises, offering the improved approach to the selection of mathematical model parameters.

Remaining part of the problem. Despite the diversity of the studies, the determination of the influence of several factors for import under the account "Travel" in the balance of payments (BOP) of Ukraine, by using economic and mathematical tools, was not considered.

The aim is to apply multiple correlation and regression analyses to identify patterns of development of the tourism market in Ukraine, determining also the impact of several factors on imports in the account "Travel" of the balance of payments of Ukraine and its trends.

Main results of research. To identify interdependencies and trends in the tourism industry of Ukraine, we conducted the multiple correlation and regression analyses. We investigated the influence of several factors on imports in the account "Travel" in the BOP of Ukraine. Primarily based on the theoretical analysis of the formation of total imports in the "Travel" account we should take the factors that have effect on it. Trend analysis of tourism in Ukraine shows a direct relationship between the dynamics of tourism market and the level of welfare, as among the major factors that affect the level of spending for the Ukrainians traveling abroad should highlight the real GDP per person in Ukraine, and the average monthly salary per person in Ukraine. The immediate direct impact on imports in the account "Travel" in the BOP of Ukraine will be the number of citizens of Ukraine, who traveled abroad in the study period. One of the main components of tourism infrastructure is transport, so the changes occurring in it affect the development of tourism. Therefore, we can presume that the dynamics of average world prices for oil can make a significant impact on the

volume of Ukrainian spending on travelling abroad. Based on the theoretical analysis, we can assume that the reverse effect on imports in the account "Travel" in the BOP of Ukraine exert the number of domestic tourists served by travel operators in Ukraine (Table 1).

Table 1. **Working table for multiple correlation and regression analyses determining the dependence of imports in the account "Travel" from the influence of several factors**

Year	Import in the account "Travel", mln USD	Real GDP per person in Ukraine, UAH	Number of citizens of Ukraine, who traveled abroad, persons	Medium monthly wage per person in Ukraine, UAH	Average annual world oil prices of USD/bbl	Number of domestic tourists served by travel operators Ukraine
	Y	X_1	X_2	X_3	X_4	X_5
2000	470	3436	13422320	230	27,6	1350774
2001	566	4195	14849033	311	23,12	1487623
2002	657	4685	14729444	376	24,36	1544956
2003	789	5591	14794932	462	28,1	1922010
2004	2462	7273	15487571	590	36,05	1012261
2005	2805	9372	16453704	806	50,64	932318
2006	2834	11630	16875256	1041	63,1	1039145
2007	3569	15496	17334653	1351	64,3	2155316
2008	4023	20495	15498567	1806	90,9	1386880
2009	3330	19832	15333949	1906	55,5	1094170
2010	3742	23600	17180034	2239	79,6	649299
2011	4461	28806	19773143	2633	108,3	604728

Source: compiled by the authors according to the data from State Statistics Service of Ukraine.

To determine the factors that affect the imports in the account "Travel", the correlation analysis was conducted for the data in Table 1. The results of the correlation analysis are shown in Table 2.

Table 2. **The correlation coefficients on the imports of the account "Travel" in BOP of Ukraine**

Factors	The correlation coefficient
x_1	0,91
x_2	0,81
x_3	0,90
x_4	0,93
x_5	-0,65

Source: Constructed by the authors.

As seen in Table 2, factors such as real GDP per person in Ukraine, the number of citizens of Ukraine, who traveled abroad, the average wage per person in Ukraine and the average world oil prices, have a close linear relationship with the total amount of the citizens to travel abroad. Number of domestic tourists, served by travel operators Ukraine has a moderate inverse relationship with the studied parameters. That is, it can be assumed that an increase in the number of domestic tourists will diminish the expenses of the Ukrainians traveling abroad. All the factors are significant and should be taken in to account.

In order to determine the factors that should be included in the multifactor regression model, let's examine it for multicollinearity. If multicollinearity between

the factors exists, then there is no need to include them in the model together because one of them can be expressed in another. The calculated pair correlation coefficients are presented in Table 3.

Table 3. **The autocorrelation analysis for the factors listed in Table 1**

Variables	X_1	X_2	X_3	X_4	X_5
X_1	1				
X_2	0,77	1			
X_3	0,99	0,76	1		
X_4	0,94	0,81	0,92	1	
X_5	-0,49	-0,44	-0,51	-0,47	1

Source: Developed by the authors.

As illustrated in Table 3 between the factors of real GDP per person in Ukraine, the average monthly wage per person in Ukraine and the average world oil prices there is a strong linear relationship. This means that in subsequent calculations it is enough to use only one of them. The other 2 are determined by constructing 2 linear models. As the previous analysis shows, it is advisable to leave real GDP per person in Ukraine because it generalized the index indicating the level of citizens welfare. To determine the analytical form of functional dependence we use the method of multiple regression analysis. As a result, this model is obtained:

$$Y = 0.13 x_1^1 + 0.00018 x_2^1 - 0.000035 x_3^1 - 2243,$$
$$R = 0.92, \tag{1}$$
$$\Delta Y = \pm 674,$$

where Y — the import on the account "Travel"; X_1^1 — real GDP per person in Ukraine; X_2^1 — the number of citizens of Ukraine, who traveled abroad; X_3^1 — the number of domestic tourists served by travel operators in Ukraine.

The above model allows determining the sensitivity factors by analyzing "what-if". What is the value of input factors recorded in the last year and in turn change the value of each factor within 10%, at fixed values of the other factors. It is calculated by the modified output factor in absolute and in relative terms. The results of this analysis are shown in Table 4.

Table 4. **Sensitivity analysis of effective factor in variables input by 10%**

Changing factor	10%	Imports on the account "Travel", mln USD	Sensitivity, %
X_1^1	31687	5598	7.12
X_2^1	21750457	5599	7.13
X_3^1	665201	5224	-0.04

Source: Constructed by the authors.

As shown in Table 4, with real GDP growth per person by 10% will increase the total costs of Ukrainian traveling abroad by 7.12%, and in absolute terms by 372 mln USD. Thus, there is a significant direct relationship between improving the welfare of citizens of Ukraine and their expenses while travelling to other countries. It's confirmed by the questionnaire and indicates that the majority of the Ukrainians having financial opportunity prefer traveling abroad. With the 10% growth of the citizens of Ukraine, who go abroad with the fixed values of the other factors Ukrainian expendi-

ture on travel abroad increased by 7.13%, which is quite logical. According to the economic interpretation of the constructed model, in case of increase by 10% in the number of domestic tourists, served by travel operators Ukraine, will reduce the volume of imports on the account "Travel" by 2 mln. This indicates a reverse effect between the factors and can be justified by the fact that today the number of domestic tourists is insignificant because mathematically monitored so low reverse sensitivity. If you look at the results of autocorrelation (Table 3), the observed inverse relationship with all the factors, and the latter in turn have a direct connection with the resultant figure. Therefore, we can state a clear inverse relationship between the number of domestic tourists served by travel operators in Ukraine and the expenses of the Ukrainians travelling abroad.

The next step is to build a forecast. To do this we need to build a trend model for each input factor. The analysis leads to the following model:

$$x_1^1 = 6.52 \times 10^8 - 652690 \times Y + 163.3 \times Y^2, \ R = 0.99; \tag{2}$$

$$x_2^1 = -7.17 \times 10^8 + 365561 \times Y, \ R = 0.79; \tag{3}$$

$$x_3^1 = 1289645 + 511292 \times \cos(1.13 \times Y + 20.95), \ R = 0.79, \tag{4}$$

where Y — year.

These models allow building a forecast for the next period by substitution models for the required year. Substituting the data in equation (1) we obtain the forecast on the imports volume on the account "Travel" in mln USD by 2016, provided that all inputs will change according to the calculated trend (Figure 1).
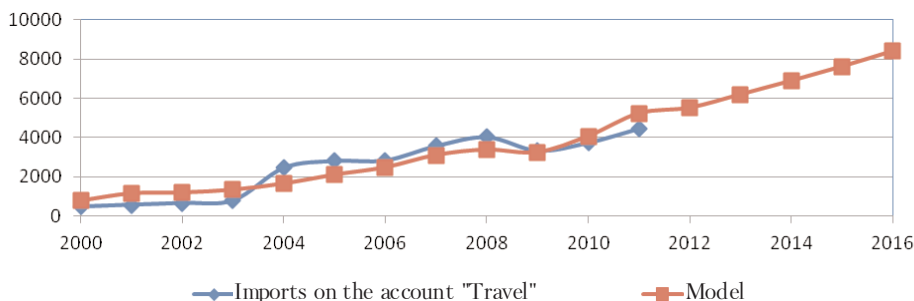
Source: constructed by the authors.

Figure 1. **Forecast for the volume of imports on the account "Travel" by 2016,** *mln USD*

As shown in Figure 1 for the forecasted period from 2012 to 2016 there is a trend of increase in the imports of the account "Travel". The average growth rate in the forecasted period will be 11,1% and in 2016 the total cost Ukrainian travelling abroad amounts to 8391 mln USD.

Conclusions. Thus to reduce Ukrainian costs of travelling abroad and to redistribute these funds at domestic market there should be an increase in the number of domestic tourists. The study shows that for the preservation of the current trends these is a need to reduce the price at domestic resorts. Improvement in welfare can be achieved by improving organizational factors of domestic tourism market, upgrading the quality of living conditions, refining service, expanding their range etc.

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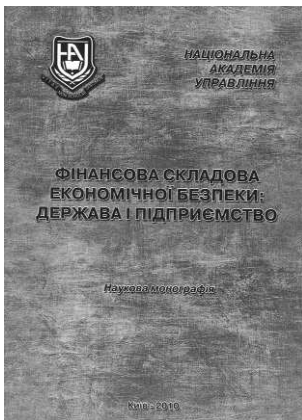Статистичні дані за 2000—2011 роки // Державна служба статистики України // www.ukrstat.gov.ua.

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КНИЖКОВИЙ СВІТ

СУЧАСНА ЕКОНОМІЧНА ТА ЮРИДИЧНА ОСВІТА
ПРЕСТИЖНИЙ ВИЩИЙ НАВЧАЛЬНИЙ ЗАКЛАД
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Фінансова складова економічної безпеки: держава і підприємство: Наук. монографія. — К.: Національна академія управління, 2010. — 232 с. Ціна без доставки — 40 грн.

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У монографії розкрито місце і засади фінансової безпеки в системі економічної безпеки на двох рівнях управління економікою країни: держави і підприємства. Розкрито роль економічної безпеки в розвитку економіки України, визначено і обґрунтовано шляхи забезпечення фінансової безпеки на рівні держави.

Викладено методологічні основи фінансової безпеки підприємства та управління нею. Визначено форми і методи удосконалення механізму управління фінансовою безпекою на рівні підприємства.