

Impact of tourism income generated from the introduction of innovation on macroeconomic indicators in Turkey

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Abstract: This article presents a calculation model based on the impact of tourism services and income of hotel enterprises, which have a special share in this service, on the gross product, GDP, labor resources, capital investment and working capital through econometric models. It assesses labor resources, GDP, investment in fixed capital and key indicators for the development of the tourism complex of the Republic of Turkey and provides relevant forecasts. In addition, the statistical significance of the model based on the Eviews software package was checked and its suitability for forecasting purposes was determined.

KEYWORDS: MACROECONOMIC INDICATOR, SOFTWARE PACKAGE, TOURISM SECTOR, MODEL, ADEQUACY, INCOME, CORRELATION, RECESSION, CAPITAL.

1. Introduction

Modeling the country's macroeconomic indicators based on macroeconomic processes and forecasting for future periods is one of the effective tools for analyzing the factors affecting the formation of a country's GDP and determining the ways of its development. One of the main ways to study the effectiveness of tourism services in the field of economic activity is an approach based on the application of econometric models of macroeconomic indicators. Econometric models create more favorable conditions for the analysis of cause-and-effect relationships between variables, mainly for large-scale research, their forecasting, construction of economic policy scenarios (options) based on simulation experiments with models and selection of optimal options. Obviously, accurate forecasting of macroeconomic indicators with the help of econometric models, taking into account limited resources, is an effective tool for analyzing the country's economic development potential.

2. Main indicators of the tourism system of the Republic of Turkey

Need for forecasting at the level of economic systems is these systems are constantly changing under the influence of the external environment (natural phenomena, market conditions, economic crises, inflation, etc.). Introduction of innovation in this sector plays a large role in the development of the tourism sector in Turkey. Therefore, when developing management strategies in connection with the current state of the external environment, it is always necessary to effectively use a database that is adequate to these conditions. In essence, forecasting allows to assess the expected state of environmental factors to which the economic system is exposed, playing the role of reducing the risks associated with uncertainty.

In the study, the gross domestic product is determined using the Cobb-Douglas production function as follows.

$$\text{GNP}(t) = a * L^{\alpha}(t) * K^{\beta}(t) * M^{\gamma}(t) \quad (1)$$

Here, GNP is an indicator of GDP in t years;

L - labor force indicator;

K - indicator of capital investment in fixed capital or fixed assets;

M - indicator of current assets;

a, α , β , γ - are the parameters of production functions evaluated by the method of least squares.

Functions of production consist mainly of mathematical elements that reflect the dependence of the results of production on the consumption of resources, and determine the mechanism of behavior of the economic system as an argument and a function. [1] At the micro level, the input elements of the economic system are K-production funds (capital reserves) and L-labor resources. In this case, in general, the nonlinear production function $y = F(K, L)$ can be considered a model of the economy. This means that production can be interpreted as a function of consumption of resources.

Cobb-Douglas production function, which is a special case of a multiplicative production function, is defined by a general formula

$$Y = AK^{\alpha_1}L^{\alpha_2} \text{ or } Y = AK^{\alpha}L^{1-\alpha}$$

Here, A is the neutral coefficient of technical progress,

α_1 - the coefficient of elasticity of funds ($\alpha_1 = \alpha$),

α_2 - the coefficient of elasticity of labor ($\alpha_2 = 1 - \alpha$). [2]

That is, the coefficient α_1 is the elasticity of production in the economic system for fixed assets, and the coefficient α_2 - for living labor.

Coefficient α_1 characterizes the percentage increase in production with 1% increase in fixed assets, and coefficient α_2 characterizes the percentage increase in production volume with 1% increase in live labor costs. [2] Obviously, if $\alpha_1 > \alpha_2$, then intensive development will prevail in the economic system, and vice versa, extensive development will prevail.

3. Gross domestic product (GDP) is important of the macroeconomic indicators.

It should be noted that in most developed countries, GDP, which reflects the total market value of all goods and services produced in the country, differs from the gross national product (GNP), which reflects the total market value of all goods and services produced by the citizens of the country using their own factors of production not more than 1% [3]. Global gross domestic product is about \$75 trillion, of which Turkey's GDP is only 1.13%. In the United States, the figure is 18%, and in China it is 17.6%. Also, according to forecasts, China can replace the United States in 2030 with the highest GDP level.

Although Turkey's trade turnover increased by \$37.3 billion in 2017 compared to 2016, GDP decreased by 1.3% or \$ 11.73 billion. The table below shows Turkey's key macroeconomic indicators for 2016-2017.

Table1. Turkey's main macroeconomic indicators

Main macroeconomic indicators	2016	2017
GDP (\$ billion)	862,774	851,046
GDP growth (%)	2,6	7,4
GDP per capita (\$)	10 807	10 597
Industrial production index	126,6	130,0
including in the processing industry	127,5	131,4
Agricultural production index	9,3	9,9
Fixed assets investments (million Turkish lira)	190,260	514,222
Consumer price index (in %)	8,53	11,92
Economic and unemployment	10,9	10,8

rate,%		
Employment rate (%)	0,3	0,3
Budget deficit / GDP surplus, %	-1,14	-1,52
International reserves, \$ billion	106,108	107,619
Other reserves, \$ billion	0	0
Dollar exchange rate of the national currency	3,02	3,77
Euro exchange rate of the national currency	3,69	3,99
Share of public debt in GDP, %	29,1	28,2
National Bank discount rate, %	7,25	7,25
Retail trade turnover, (\$ billion)	72,3	73,5
Retail sales index	129,5	131,1
Trade turnover, \$ billion	341,2	378,5
Exports of goods, \$ billion	142,6	156,5
Imports of goods, \$ billion	198,6	222,0
Total export of services (\$ million)	37 235	43 925
Balance of other trade services (\$ million)	-1 706	-1 623
Foreign direct investment in Turkey, \$ billion	12,1	5,0
Domestic investment in Turkey, \$ billion	6,1	7,4
Credit rating (according to Standard & Poors) BB + BB +	BB+	BB+

Source. Compiled by the author according to the Turkish State Statistics Institute.

As can be seen from the data in the table, due to decrease in GDP, GDP per capita also decreased by \$210. The decline in GDP is due to the depreciation of the national currency against the dollar and the euro. Unemployment rate of the economically active population decreased by 0.1% to 10.8% compared to the previous year. Turkey's international reserves also increased by \$1.511 billion to \$107.619 billion. Despite a decrease of \$7.1 billion in foreign direct investment in Turkey compared to 2016, the volume of domestic investment increased by 21.3% compared to the previous year. The low discount rate of the National Bank compared to some neighboring countries (7.2%) resulted in the country's credit rating being BB +. Total service exports in 2017 increased by \$6690 billion compared to 2016 and amounted to \$43925 billion. Share of tourism in total service exports was 51.2%, and in total service imports was 20.3%. These indicators are reflected in the table below for 2013-2017.

Table2. Trade services in the Republic of Turkey for 2013-2017, (\$million)

Years	2013	2014	2015	2016	2017
Total service exports	46 638	50 506	46 225	37 391	43 925
Transport	13098	14361	14142	13110	15462
Tourism	27997	29552	26616	18743	22478
Construction services	675	1084	374	512	474
Insurance services	1000	1154	1124	1159	1251
Financial services	779	824	658	676	631
Other trade services	602	535	250	622	883
Public services	798	826	826	616	610
Other services	1689	2170	2083	1746	1768

Total service imports	21 158	22 581	22 266	22 128	23 792
Transport	9821	10121	8227	8077	9832
Tourism	4817	5072	5368	4783	4823
Construction services	0	0	0	0	34
Insurance services	1718	1651	1566	1676	2014
Financial services	1334	1903	1779	1610	1192
Other trade services	2554	2353	1765	2340	2506
Public services	1686	2324	1902	1788	1394
Other services	1558	1354	1259	1328	1372

Source. Calculated according to the Central Bank of Turkey

As can be seen from the table of trade services in the Republic of Turkey for 2013-2017, share of tourism in total service exports in 2014 increased by 5.5% compared to the previous year and amounted to 58.5%, but decreased in subsequent years. On the contrary, the share of tourism in total service imports developed with increasing dynamics in 2013-2017.

4. Impact of income from Turkish tourism services on GDP in Turkey.

Table3. Revenues from tourism and GDP dynamics in the Republic of Turkey

Years	Revenues from tourism, \$ bln (X)	GDP, \$ bln (Y)
2001	13,45	200,31
2002	15,21	238,34
2003	16,3	311,94
2004	20,26	404,85
2005	24,12	501,16
2006	23,15	550,8
2007	27,21	675,01
2008	30,98	764,64
2009	32,01	644,47
2010	33,03	772,29
2011	36,15	832,5
2012	36,46	873,7
2013	39,23	950,33
2014	41,41	934,08
2015	41,62	859,45
2016	31,36	863,39
2017	38,62	851,52

Source. Compiled by the author according to the Turkish State Statistics Institute.

To analyze the regression of the relationship between income from tourism and GDP for 2001-2017, data from table 2 and ready-made packages of mathematical programs EViews, MatLab, MS Excel, MathCad and others are used. For this purpose, using the software package Eviews, we obtain following result based on data in Table 2.

Table4. Results of the regression analysis of the relationship between tourism income and GDP in the Republic of Turkey according to the Eviews application software package

Dependent Variable: Y
 Method: Least Squares
 Date: 01/20/19 Time: 18:29
 Sample: 2001 2017
 Included observations: 17

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X	25.83377	1.805334	14.30969	0.0000
C	-100.0706	55.58623	-1.800277	0.0920

R-squared	0.931746	Mean dependent var	660.5059
Adjusted R-squared	0.927196	S.D. dependent var	248.6519
S.E. of regression	67.09193	Akaike info criterion	11.36014
Sum squared resid	67519.91	Schwarz criterion	11.45816
Log likelihood	-94.56115	Hannan-Quinn criter.	11.36988
F-statistic	204.7672	Durbin-Watson stat	2.430765
Prob(F-statistic)	0.000000		

Source. developed by the author based on the Eviews software application

Based on the results obtained in the Eviews application software package, regression equation will be as follows:

$$Y = 25,83377 * X - 100.0706 \quad (1)$$

According to the data in Table 2, if we build a correlation matrix in MS Excel application software package, we get the following table:

Table 5. Correlation matrix

	Y	X
Y	1	0,96527
X	0,96527	1

Source. developed by the author based on the MS Excel application

As can be seen from the table 5, there is a very high direct relationship between the Y and X variables on the Chedok scale (0.7-0.9) ($R_{yx} = 0,96527$).

Determination coefficient obtained based on the Eviews application software package ($\sqrt{R^2} = 0.96527 = 0,98248$).

Dynamics of the Fitted and Actual values obtained by the Eviews application software package with the regression equation of the model (1), as well as the residuals between them, are given in the graph below.

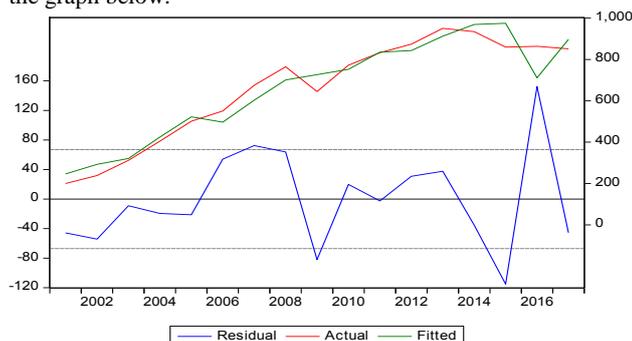
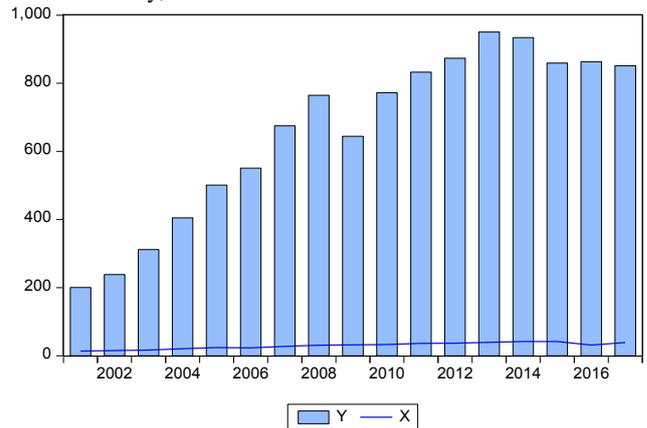


Fig1. Dynamics of the Fitted and Actual values

According to the graphical Eviews application software package, which reflects the dynamics of income from tourism services with GDP in Turkey, will be as follows.



Source. developed by the author based on the Eviews application

For linear regression obtained by double correlation $y = \alpha_0 + \alpha_1 x = 25.83377 * X - 100.0706$, we calculate the elasticity coefficient, which expresses the percentage change in the dependent variable as a result of a change in 1% of the free variable. This ratio is calculated according to the following formula.

$$E = \frac{\alpha_1 \bar{x}}{\bar{y}} \quad (2)$$

Here, α_1 is the coefficient of the contact equation shown above. ($\alpha_1 = 25,83377$)

\bar{x} - calculated average of GDP in Turkey for the studied periods, ($\bar{x} = \frac{\sum x}{n} = 29,44529$)

\bar{y} is the calculated average of income from tourism services for the studied periods ($\bar{y} = 646,4965$)

Based on these indicators, the coefficient of elasticity will be as follows.

$$E = \frac{\alpha_1 \bar{x}}{\bar{y}} = \frac{25,83377 \times 29,44529}{646,4965} = 1,176624$$

As a result of the report, it can be concluded that 1% increase in revenues from tourism services for the period under review resulted in 1.18% increase in GDP in Turkey.

5. Conclusions

Thus, based on the econometric assessment of the impact of tourism revenues on GDP in Turkey, it was determined that 1% increase in tourism revenues for the period under review resulted in 1.18% increase in GDP in Turkey. According to the results obtained in the Eviews application software package, there is a very high correlation between income from tourism services and GDP, which is close to the functional dependence expressed by the regression equation. According to the results obtained in the Eviews application software package, about 96.3% of GDP in Turkey for 2001-2017 is due to changes in revenues from tourism services. GDP growth was 3.7% under the influence of other factors. The amount of GDP and standard errors found by the regression equation obtained according to the Eviews application software package, as well as the characteristics of the use of the equation for forecasting purposes are determined by a graph. Based on these characteristics, income from tourism services in the Republic of Turkey can be forecasted for any period, depending on GDP.

8. References

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