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Modeling Influence Factors on International Tourist Arrivals in Romania

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The capitalization of tourism potential implies, besides the existence of specific tourism infrastructure, also a modern transport infrastructure which can generate a sustainable economic development. In fact, tourism infrastructure, mainly in mass tourism destinations, is considered to be decisive for tourist arrivals, the accessibility being one of the prime factors in choosing a destination. In this line, using nonparametric correlation models, the paper is focused on the influence of tourist accommodation capacity (number of units), net investment in hotels and restaurants and consumer price index of services on the dimension of international tourist arrivals. The fundamental objective of the research is to identify the degree of connection between the those variables above, which could allow a flexible answer for the sustainable development of the tourism strategy in Romania, by increasing the share of Tourism sector in GDP. The results of the research highlight a strong association between the analyzed variables and validates the proposed working hypotheses.
JEL Classification C1, C5, Z3

Keywords: tourism**,** foreign tourist arrivals, transport, accommodation capacity, investment, ARIMA model

1. Introduction

Tourism development relies on specific tourism infrastructure and also transport infrastructure, decisive for tourist arrivals and also future investments in regional economies. The specific tourism infrastructure such as accommodation units, restaurants, tourist attractions and activities are primarily developed by the private sector. Private investment in tourism facilities is closely related to modern air and road accessibility and also to affordable basic services such as power, water, sewerage, electricity, health facilities and telecommunications, which together make regional economies more viable (Álvarez-García, J.; Durán-Sánchez, A.; DelRío-Rama, M.C., 2018).

Modern transport infrastructure is mandatory in order to provide both efficient linkages to the regional system and internal accessibility. The first step for achieving this goal is examining the region's economic development strategy, and then determining the transportation investments that would be needed to support this strategy, followed by a set of pre-defined transportation improvements and estimating the associated economic benefits. Furthermore, collaboration between central and local actors can determine and bring significant impact for formulating best strategies to promote tourism in the region. (Petrović, M.D. et. All, 2018)

Tourist flows have a double direction, between the outbound regions and inbound ones and include three types of flows:

- people flows;
- capital flows;
- information flows.

For developing countries, inbound tourist flows can have a major impact on their national economies. It can be manifested on multiple plans: socio-economic, cultural, political, and the influence differs from one region to another depending on the level of development and the importance given by decision-makers.

Tourism industry is also an important source of economic development, creating jobs not only in its own sector, but also in connected ones such as financial services, retailing, and telecommunications, having a positive influence on regional employment and income.

Tourism in Romania is an export industry that generates foreign exchange trade and creates jobs. It differs from other export industries due to the fact that the customer comes to Romania for the product, which is not sent in the client's country, as normally happens in other industries. Tourism is complex, cannot be divided and affect other sectors of the economy, social issues, cultural or other kind of life in Romania. Also, the essence of recent tourism is the development of tourism experiences as practices, activities to see etc. (Hlee, S.; Lee, H.; Koo, C., 2018)

2. Literature review

Evaluation of tourism industry of Romania indicates that tourism is one of Romania's export industries that can compete effectively with other countries. However, there were problems regarding product standards and services, marketing and advertising, access and other infrastructure, culture, the environment, the Organization and the laws that have to be overcome in order to achieve potential (Tudorache, D.M.; Simon, T.; Frenţ, C.; Musteaţă-Pavel, M., 2017). These issues constitute the result of periods of weak or lack of investments in tourism, transport and of profound changes related to the transition to a free market economy.

Overrun these difficulties require investment of resources both in tourism and in another sectors-support as a means to transport through the infrastructure industry. Tourism will compete with other sectors in order to obtain these investments. It is therefore important that there be a clear policy and objective in respect of tourism but also to infrastructure development which will support consumer travel mobility or European and have a planned approach to achieving the goals set.

Accessibility, attractiveness and amenity are the three great "A" indispensable for tourism, their quality being closely related to the size of the inbound tourist flows. These three features cover both the quality of the technical infrastructure (transport, public and telecommunication infrastructure) and especially of the actual tourist infrastructure (accommodation units, treatment facilities, conference rooms, exhibition centers, leisure facilities).

Della Corte, Piras, and Zamparelli achieved a more complex scheme to describe the attractiveness of tourist destinations, termed the "Six A's": Accessibility; Attractiveness, defined as the local tourism potential that attracts demand; Accommodation facilities; Amenities available at the destination; Assemblage, describing the activity of tour operators/local actors to generate complex offers; Ancillary services, including the activities of incoming agencies, local institutes, and supporting organizations. (Della Corte, V., Piras A., Zamparelli G., 2010).

The link between tourist demand and supply is ensured primarily by transport infrastructure, its existence being a preliminary condition for tourism(Topole, M., 2009; Todorovic, M., Bjeljac, Z., 2009).

However, although the connection between tourism activities and transport infrastructure has been widely examined previously (Page, S., 2005; Prideaux, B., 1993), there are still significant gaps in this research topic (Chew, J., 1987; Gunn, C.A., 1994; Hall, C.M., 1991; Inskeep, E., 1991; Page, S., 1994, 1999; Robbins, D., Thompson, K., 2007). One of the authors who analyzes the shortcomings is Knowles (Knowles, R., 1993), pointing out that in many cases researchers took transport into account as a passive element in tourism, not as an integral part of tourism activities. Though the tourism product to be consumed by tourists,i.e. the set of services (accommodation, catering, entertainment and other services) is based on attractions accordant with the motivation of tourists, it also includes transport. (Tóth G., Dávid L. D., Vasa L., 2014)

The questions we will try to find an answer in this study are: which of the two types of infrastructure (transport or tourist) is a priority for the tourist services consumer in choosing Romania as a tourist destination? Is poor road accessibility, consequence of the low number of highway kilometers, the main restriction factor for the size of the inbound tourist flows?

In general, the quality of tourist accessibility has a decisive role in choosing tourist destinations (Thompson, K., Schofield, P., 2007; Celata F., 2007).Tourism in easily accessible towns indicates intensive development as opposed tothose hard-to-access stagnates.

However, the literature highlights the fact that tourist motivation, depending on the typology of international tourist destinations, is different. Thus, some authors consider that tourism motivation is based primarily on the importance of tourist attractions and the specific tourist infrastructure (accommodation units, tourist facilities, technical equipment, etc.) present in the receiving region and less on its accessibility provided by transport infrastructure (Crompton, J. L., 1992). This decision concerns the unique destinations, in terms of cultural value, specific to certain tourist attractions. On the contrary, accessibility is decisive for tourism motivation when receiving regions have similar tourist amenities (beach tourism). Therefore, travel motivation is always in line with the typology of tourist destinations and does not rely exclusively on accessibility of the receiving regions.

Therefore, while approaches may differ, the general conclusion is that the development of major transport infrastructure can contribute to tourism development, being decisive for environmental protection and economic development (Curtis, P.G.; Kokotos, D.X., 2009; Brida, J.G., Barquet, A., Risso, W.A., 2010; Dodds, R., Butler, R., 2010).

The role of transport infrastructure in tourism was approached by many studies in the last two decades. Litman (Litman, T., 2008) achieved on 12 transportation factors that effect the accessibility of a certain region, as follows: Transportation modes – quality of transportation options (speed, comfort, and safety); Transportation network connectivity – density of link and path connections, or directness of travel between destinations; Travel cost; Mobility – travel speed and distance, capacity, travel time; Integration of the links and modes within the transportation system; Transportation demand; User information; Mobility substitutes – telecommunications and delivery service substitutes for physical travel; Transportation management; Land use factors; Prioritization of travel activities; The value of inaccessibility or isolation. Improving these accessibility factors can contribute to the economic success of a tourist destination (Currie, C., Falconer P., 2014). In general, the accessibility of a tourist destination can be improved by developing the transport infrastructure and improving the connectivity with the tourist facilities (Van Truong N., Shimizu T., 2017). The impact of transportation on tourism was achieved in many quantitative studies, in which authors used computable general equilibrium models, spatial interaction models, shift-share analysis etc.

A recent study published by Van Truong et al. concluded that, among the 69 papers published between 1960 to 2015, 39 (56%) assessed the connection between tourism and the economy using CGE models; 24 (35%) used the same model to analyze the connection between transport infrastructure and the economy; 4 (6%) described the connections between transportation relevant factors (oil prices) and tourism; and only 2 papers (3%) focused on the direct relation between transportation and tourism (Konan, D., Kim, K., 2003; Kweka, J., 2004). The major findings of one of the last two papers mentioned above, concerning the direct relation between transportation and tourism, were that transport infrastructure upgrades can stimulate tourism in two paths. The first path is by reducing the costs (transportation, promotion and distribution for tourism, especially in remote locations). The second path concerns the accessibility, therefore encouraging growth in the tourism activities.

Tóth, Dávid and Vasa used a spatial interaction model to analyse the connection between accesibility and tourism in Europe and the conclusions reflected that tourist arrivals are not distance dependent, the strong link being between the interaction ability of the starting region, the attractiveness of the destinations, and the turnover calculated on the basis of destination competition and the number of guest nights. The same authors, attempted a different approach using the shift-share analysis during 2003-2009. One of the conclusions reflected that the growth of tourist arrivals was slower than the european average in East Central Europe countries (Poland, Czech Republic, Slovakia, Hungary, Romania, Slovenia), the main reason for slower growth of tourist arrivals being the accessibility of the regions since there is a positive spatial factor in this region.

3. Materials and Methods

In this paper, we focus on the correlation between the foreign tourists arrivals, tourist accomodation capacity, net investment in hotels and restaurants and comsumer price index.

The analysis of tourism activity in Romania, based on statistical indicators that characterize the level, structure, dynamics and intensity of the sector was achieved using:

- the preliminary analysis of the chronological series;
- the trend analysis applying mechanical and analytical methods and identifying the most appropriate adjustment method for the series made up of total tourist arrivals in Romania during 1997-2017 and the forecast of tourist arrivals in Romania by 2020.

The evolution of the tourist arrivals manifests itself under the influence of a complex of factors, some of them essential, others with a reduced influence. Therefore, in the analysis of the connections described above, we will use nonparametric correlation models, in which the determinant factor will be the number of foreign tourist arrivals, and the dependent factors will be the existing tourist accommodation capacity (number of units), the net investment in hotels and restaurants and the consumer price index of services (ARIMA Model).

The ARIMA model represent Auto-Regressive Integrated Moving Average and is one of the most general class of model for forecasting a time series which can be made to be "stationary" by differencing (if necessary), perhaps in conjunction with nonlinear transformations such as logging or deflating (if necessary).

Box & Jenkins have proposed a forecasting methodology for a variable, using only the past and the present as the database: the Auto-Regressive Integrated Moving Average (ARIMA) model (Box,G., Jenkins, G., 1970). These models enjoy a great popularity thanks to:

- the quality of forecasts generated;
- flexibility of the models;
- rigorous mathematical modeling of the model;
- is also a suitable method for predicting some variables with a rare evolution.

An auto-regressive-medium-type model ARMA (p, q) has a self-resisting component or a medium-sized component:

$$Y_t = a_0 + a_1 Y_{t-1} + a_2 Y_{t-2} + \cdots + a_p Y_{t-p} - b_1 \varepsilon_{t-1} - b_2 \varepsilon_{t-2} - \cdots - b_q \varepsilon_{t-q} + \varepsilon_t \quad (1)$$

where:

p is the number of autoregressive terms;

q is the number of lagged forecast errors in the prediction equation;

ε_t is a white noise process (this being a succession of random and identically distributed random variables with zero average).

When $q = 0$ is obtained an autoregressive p model, AR(p):

$$Y_t = a_0 + a_1 Y_{t-1} + a_2 Y_{t-2} + \cdots + a_p Y_{t-p} \quad (2)$$

and for $p = 0$ is obtained a mobile average q model:

$$Y_t = a_0 - b_1 \varepsilon_{t-1} - b_2 \varepsilon_{t-2} - \cdots - b_q \varepsilon_{t-q} + \varepsilon_t \quad (3)$$

The basis for such models is the following considerations:

- the evolution of the economic phenomena is under the impetus of the existing resources, of the already created capacities, of the accumulated experience, of the tradition, of the habit (for example, in consumption, and thus in the field of tourism). Economic variables are inertial, with a strong autoregressive component (mainly in the evolution of macroeconomic indicators). The autoregressive part captures the internal mechanisms of process generation
- the mobile average component is the effect of unpredictable events on the variable, effects assimilated gradually over time. This component is justified by the intervention of sudden, unexpected changes in external factors correlated with the variable (for example strikes, various news, the sudden change of weather for tourism variations). For example, the effect of an important but unexpected news on hotel services in a certain area will affect the number of foreign and / or national tourists in the next period. The mobile average part captures the gradual assimilation of shocks (accidental deviations) outside the system.

The number of accommodation bed-places available in tourist accommodation units, multiplied by the number of days of operation during the considered period, represents the capacity of tourist accommodation in operation (expressed in bed-places/days). The bed-places in the rooms or structures temporarily closed due to lack of tourists, for renovations or for other reasons are not taken into account. The net occupancy rates of tourist accommodation capacity in operation are calculated by reporting the total number of overnight stays to the tourist accommodation capacity in operation during the considered period.

The next step was to determine the main trend, which is a regular succession of slow systemic variations, noticeable for long periods of time.

The research was achieved using two analytical methods: the linear function and the quadratic parabola. The checking criteria for the quality of the adjustment have highlighted the quadratic parabola as the most appropriate function for adjusting and forecasting calculations to determine the dynamics and SWOT analysis, aiming the promotion and development directions.

4. Data Analysis

The most important factors that could influence the number of foreign tourists who visited Romania between 1997-2017 are: tourist accommodation capacity (number of bed-places), net investment in hotels and restaurants, consumer price index of services.

The data presented in Table 1 reflects that tourist accommodation capacity has slightly decreased since 1997 when it registered a value of 287,943 bed-places and culminated in 2004 when the minimum of 27,5941 accommodation places was registered. This decrease was possible due to the very slow privatization process in Romania. Since 2005 we can notice an upward trend due to the almost complete privatization of state structures (92%). At the same time, the investments and national development programs launched by the Ministry of Tourism have made a significant contribution to the increase in the number of accommodation places.

Although investments have increased from 399.50 billion lei in 1997 to 7504.30 billion lei in 2004, the share of Romanian tourism in GDP is low. The same goes for the profits made by tourism entrepreneurs. This problem is mainly due to the lack of complex tourism products, the existence of old and unmodernized tourism capacities, privatized during 2001-2002, and the lack of facilities for the development of complex and modern tourist facilities. This negative evolution is enhanced by the lack of accommodation capacities in tourist regions that offer great opportunities for practicing niche tourism and ecotourism.

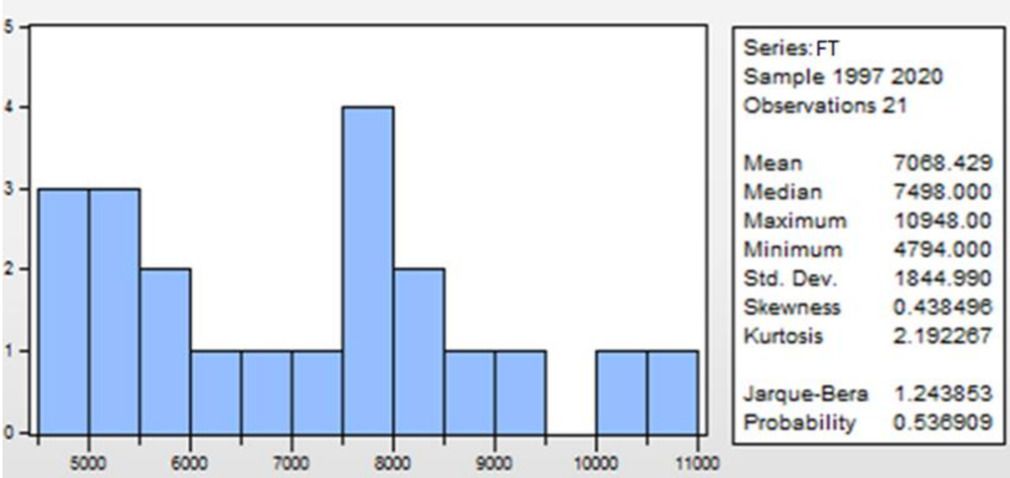
The third factor that could influence the number of foreign tourists in Romania, the consumer price index to services, had a decreasing trend since 1997 from the value of 276.5 to 102.04 in 2017. It should be taken into account that this index is a slow-moving index, which highlights the fact that the economic situation has improved every year.

Table 1. Statistical Data during 1997-2017 (*source: http://statistici.insse.ro*)

Year	Foreign tourists (thousands)	Accommodation capacity (number of units)	Net investment in hotels and restaurants (billion lei)	Consumer price index of services (value)
1997	5149	287943	399.50	276.50
1998	4831	287268	711.60	192.10
1999	5224	282806	1185.80	184.00
2000	5264	280005	1097.80	153.90
2001	4938	277047	2746.70	135.40
2002	4794	272596	3315.00	126.80
2003	5595	273614	4815.20	114.80
2004	6600	275941	7504.30	114.70
2005	5839	282661	936.60	110.50
2006	6037	287158	1249.20	108.20
2007	7722	283701	1600.90	106.63
2008	8862	294210	1993.40	108.57
2009	7575	303486	1353.30	108.97
2010	7498	311698	1528.20	104.78
2011	7611	278503	1134.20	104.45
2012	7937	301109	1223.30	105.07
2013	8019	305707	872.70	103.19
2014	8442	311288	946.10	103.16
2015	9331	328313	1222.30	102.04
2016	10223	328888	1695.20	99.21
2017	10948	343720	1445.20	99.23

The first step we achieve in the analysis of the data series is the calculation of certain descriptive indicators, as well as graphs in order to draw certain directions and make observations based on the studied series.

Figure 1. Histogram of foreign tourists (*source: Table 1*)



The series has an asymmetry coefficient of 0.44, so we can conclude that its values are not the achievements of a normal distribution, but of a distribution with positive asymmetry. Kurtosis is less than 3, so the distribution is platictic.

An econometric model is valid if there are no significant differences between the distribution of its associated errors and the normal centered and reduced distribution. One way to verify the hypothesis of errors normality is to apply the Jarque-Bera test. The following assumptions are made:

- HO: model errors are distributed normally;
- H1: model errors are not distributed normally.

The Jarque Bera Test is based on the p-value. Since p-value is 0.536>0.05, the H0 hypothesis is accepted, so the variable of interest follows a normal distribution.

Figure 2. Normality test by Q-Q plot (*source: Table 1*)

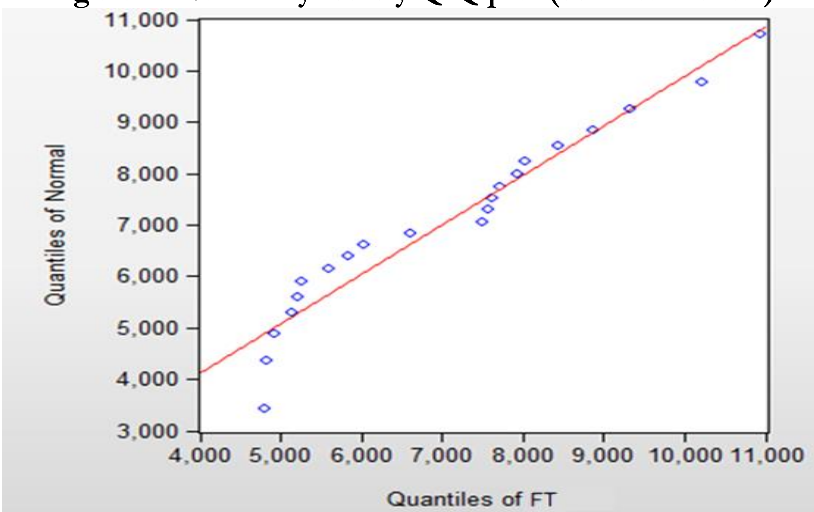
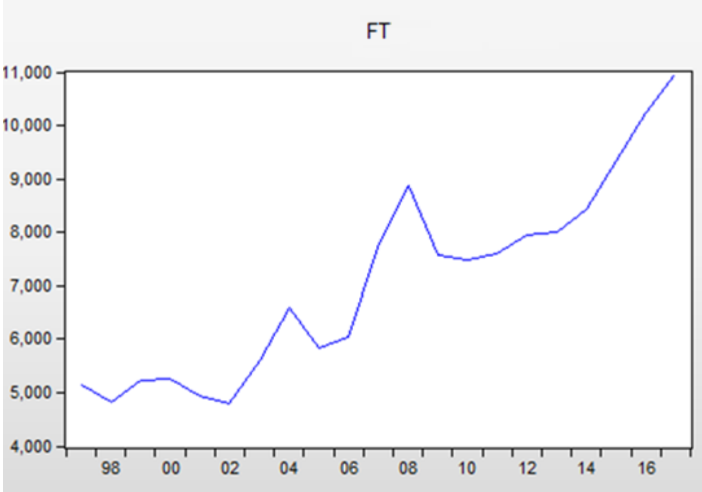


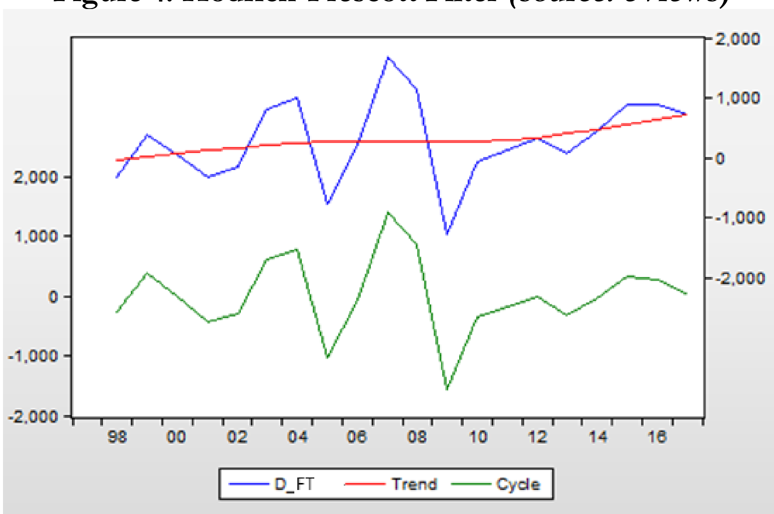
Figure 3. Graph of foreign tourists between years 1997-2017 ((*source: Table 1*)



Since several methods can be used to determine the central trend for the same chronological series, each of them providing a certain quality of adjustment, several procedures can be used to establish it, based on the comparison of deviations of terms adjusted from real terms.

We can notice in this graph that during the analyzed period, the trend was slightly increasing, but with great variations during the economic crisis that started in 2007. To estimate a long-term component of the time series (trend), the simplest method that can be used in the eViews program is the Hodrick-Prescot filter.

Figure 4. Hodrick-Prescott Filter *(source: eViews*)



The trend based on the model represents an "average" evolution, and the empirical values are around the trend, describing systematic fluctuations affected by perturbation, in the case of evolutions with seasonality or cyclicality, or simple random deviations, determined by the action of some random factors.

For the foreign tourists (FT) series, the trend and deviation are shown in the Figure 4. Cycle (Deviation from Trend) is the difference between the actual series and the trend. From the graph we can see that the trend is stochastic. Cycle represents deviation from the trend (the difference between the actual and the trend series).

5. Model Analysis

The study analyzes the evolution of the number of foreign tourists who visited Romania between 1997 and 2017, depending on the following variables: tourist accommodation capacity, net investment in hotels and restaurants and consumer price index to services. We analyze the evolution of the foreign tourists (FT) variable according to the three factors we mentioned above, described by the following relationship:

$$FT_t = a_0 + a_1\, AC_t + a_2\, NIHR_t + a_3\, CPIS_t + \varepsilon_t \quad (4)$$

where:
FT – number of foreign tourists;
AC – tourist accommodation capacity;
NIHR – net investment in hotels and restaurants;
CPIS – consumer price index to services;
a_0, a_1, a_2, a_3 – model parameters;
ε – observation error.

Estimation Command: ========================= ***LS FT C AC NIHR CPIS***
Estimation Equation: ========================= ***FT = C(1) + C(2)*AC + C(3)*NIHR + C(4)*CPIS***
Substituted Coefficients: ========================= ***FT = -11808.5340192 + 0.0696797885743*AC + 0.0522024893516*NIHR - 14.0749131316*CPIS***

Dependent Variable: FT
Method: Least Squares
Date: 07/19/19 Time: 12:22
Sample: 1997 2017
Included observations: 21

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-11808.53	3576.596	-3.301613	0.0042
AC	0.069680	0.010644	6.546198	0.0000
NIHR	0.052202	0.127370	0.409850	0.6870
CPIS	-14.07491	4.740855	-2.968855	0.0086

R-squared	0.839028	Mean dependent var	7068.429
Adjusted R-squared	0.810621	S.D. dependent var	1844.990
S.E. of regression	802.8965	Akaike info criterion	16.38397
Sum squared resid	10958926	Schwarz criterion	16.58293
Log likelihood	-168.0317	Hannan-Quinn criter.	16.42715
F-statistic	29.53617	Durbin-Watson stat	1.881049
Prob(F-statistic)	0.000001		

Since the p value for the NIHR variable is more than 5%, compared to the AC and CPIS values, the variables remaining in the model are AC (tourist accommodation capacity) and NIHR (net investment in hotels and restaurants), which significantly influence the variable to explain FT with a probability of 95%. The other variable, NIHR (net investment in hotels and restaurants), has no significant influence and will be eliminated, therefore the new model is described below.

Estimation Command: ========================= ***LS FT CPIS AC C***
Estimation Equation: ========================= ***FT= C(1)*CPIS + C(2)*AC + C(3)***
Substituted Coefficients: =========================

FT= -14.800936618*CPIS + 0.0676543671292*AC - 11021.8498489

Dependent Variable: FT
Method: Least Squares
Date: 07/21/19 Time: 17:34
Sample (adjusted): 1997 2017
Included observations: 21 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CPIS	-14.80094	4.294632	-3.446381	0.0029
AC	0.067654	0.009207	7.348044	0.0000
C	-11021.85	2947.335	-3.739599	0.0015

R-squared	0.837438	Mean dependent var	7068.429
Adjusted R-squared	0.819375	S.D. dependent var	1844.990
S.E. of regression	784.1206	Akaike info criterion	16.29857
Sum squared resid	11067211	Schwarz criterion	16.44778
Log likelihood	-168.1349	Hannan-Quinn criter.	16.33095
F-statistic	46.36334	Durbin-Watson stat	1.925353
Prob(F-statistic)	0.000000		

In order to obtain the estimators of the model parameters using the least squares method and to apply correctly the significance tests, the Student test and the Fisher test, a check is needed to make sure the errors are auto-correlated or not correlated. Thus, using the results of the Durbin-Watson test, we come to the conclusion that the errors are not correlated because the value obtained DW = 1.925 is greater than the table value of 1.538 (from the DW table).Because the test is positive, homoscedasticity is analyzed using the White test, considering that for Fcalc = 4.98.

Heteroskedasticity Test: White

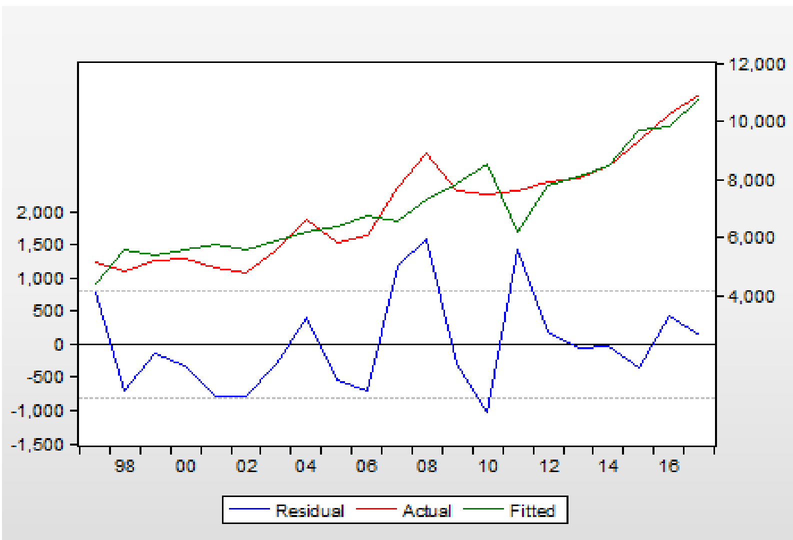
F-statistic	0.932231	Prob. F(5,15)	0.4878
Obs*R-squared	4.978562	Prob. Chi-Square(5)	0.4185
Scaled explained SS	2.671556	Prob. Chi-Square(5)	0.7505

Scalar = 7.81472790325

Observing that 7.81> 4.97 (Ftab> Fcalc) we accept the null hypothesis, considering the series is homoscedastic, so the influence of the exogenous variables on the endogenous variable is significant.

Heteroskedasticity Test: White

F-statistic	1.898402	Prob. F(9,11)	0.1569
Obs*R-squared	12.77515	Prob. Chi-Square(9)	0.1730
Scaled explained SS	7.079856	Prob. Chi-Square(9)	0.6288



Multicolinearity
Inflation Variance Factor or VIF
We calculated VIF = 1 / (1-eq2 @ r2), where r2 represents the determination coefficient.
In this case, VIF <10, so the condition H_0 (does not have multicollinearity) is fulfilled.
Scalar = 6.15148231804
Check the similitude
The determination ratio (R2 = 83%) shows the percentage by which the influence of significant factors is explained. Therefore, 83% of the variance of d_nts is explained by the variation of the variables *d_cpis sid_ac*.
Checking the significance of the parameters (T-Student Test)
We compare Tcalc with Ttab. To determine Ttab we used the function t=@tdist(.95,n). In our case: 0,354> 0,05, thus the explanatory variables are significant.
Scalar = 0.354694463273
Staticity of the series and determination of the forecasting model

The purpose of the econometric analysis of the time series is to verify the stationarity with the Augmented Dickey-Fuller (ADF) test, followed by the correlation calculation.

According to the results we will compare the value obtained from the Dickey-Fuller test with the critical value taken from the statistical tests.

The intercepted table value (FT), taken from McKinnon's table to test the root hypothesis for the number of observations n = 21, corresponding to a significance threshold of 5%, is -3.04. Since the ADF unit root test = 0.88 is higher than this, we can make the assumption that the series of the number of foreign tourists is first-order and is accepted (the series is stationary).

Augmented Dickey-Fuller Unit Root Test on NTS

Null Hypothesis: FT has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.887588	0.9927
Test critical values:	1% level	-3.857386	
	5% level	-3.040391	
	10% level	-2.660551	

Augmented Dickey-Fuller Unit Root Test on AC

Null Hypothesis: AC has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.000493	0.9480
Test critical values:	1% level	-3.808546	
	5% level	-3.020686	
	10% level	-2.650413	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Unit Root Test on CPIS

Null Hypothesis: CPIS has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-10.23962	0.0000
Test critical values:	1% level	-3.808546	
	5% level	-3.020686	
	10% level	-2.650413	

According to the output, we can see that the ADF test value for the CPIS and AC explanatory variables is -10.24 and 0.000. These are higher than the critical values for significance levels of 5% (-3,020), which means that we reject the null hypothesis and the series are stationary.

Determining the Forecasting Pattern

Next we will determine the type of model that will best shape the dynamic behaviour of the correlation between foreign tourists and influence factors. The model is ARIMA (p, 1, q), and to identify the order p and q we used the correlogram. To display the correlogram, we created first the non-stationary series (first-order differences).

Figure 5. The correlogram of FT series with OLS method *(source: eViews)*

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.783	0.783	14.789	0.000
		2	0.561	-0.133	22.785	0.000
		3	0.448	0.144	28.174	0.000
		4	0.374	0.005	32.154	0.000
		5	0.243	-0.167	33.930	0.000
		6	0.113	-0.050	34.343	0.000
		7	0.069	0.076	34.507	0.000
		8	0.051	-0.015	34.604	0.000
		9	-0.038	-0.161	34.662	0.000
		10	-0.230	-0.329	36.983	0.000
		11	-0.313	0.059	41.722	0.000
		12	-0.283	0.081	46.005	0.000

The resulted model is ARIMA (3,1,7)

The equation is (*ec_arima_d_ft*):

d_ft c AR(1) AR(2) AR(3) MA(1) MA(2) MA(3) MA(4) MA(5) MA(6) MA(7)

Figure 6. The correlogram of CPIS series with OLS method *(source: eViews)*

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.574	0.574	7.9531	0.005
		2	0.438	0.163	12.838	0.002
		3	0.251	-0.080	14.534	0.002
		4	0.130	-0.055	15.018	0.005
		5	0.058	-0.006	15.120	0.010
		6	-0.010	-0.041	15.124	0.019
		7	-0.035	-0.010	15.165	0.034
		8	-0.070	-0.038	15.345	0.053
		9	-0.090	-0.036	15.671	0.074
		10	-0.106	-0.033	16.167	0.095
		11	-0.118	-0.033	16.835	0.113
		12	-0.136	-0.053	17.830	0.121

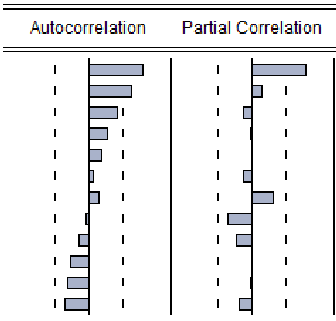
The resulted model is ARIMA (2,1,5)

The equation is (*ec_arima_d_cpis*):

d_cpis c AR(1) AR(2) MA(1) MA(2) MA(3) MA(4) MA(5)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.582901	0.055772	82.17209	0.0000
AR(1)	0.603359	0.191428	3.151880	0.0092
AR(2)	0.242136	0.123851	1.955054	0.0765
MA(1)	0.421496	0.149627	2.816982	0.0168
MA(2)	-0.468841	0.216495	-2.165597	0.0532
MA(3)	-0.276558	0.183315	-1.508650	0.1596
MA(4)	-0.085569	0.154179	-0.554999	0.5900
MA(5)	-0.571540	0.135608	-4.214636	0.0014

Figure 7. The correlogram of AC series with OLS method ***(source: eViews)***



	AC	PAC	Q-Stat	Prob
1	0.693	0.693	11.611	0.001
2	0.546	0.125	19.179	0.000
3	0.361	-0.111	22.679	0.000
4	0.246	-0.013	24.393	0.000
5	0.157	-0.000	25.137	0.000
6	0.044	-0.112	25.201	0.000
7	0.124	0.263	25.733	0.001
8	-0.029	-0.319	25.765	0.001
9	-0.138	-0.196	26.528	0.002
10	-0.230	0.001	28.855	0.001
11	-0.264	-0.018	32.226	0.001
12	-0.319	-0.167	37.693	0.000

The resulted model is ARIMA (3,1,6)
The equation is (*ec_arima_d_ac*):
d_ac c AR(1) AR(2) AR(3) MA(1) MA(2) MA(3) MA(4) MA(5)MA(6)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	14.07619	32.61877	0.431537	0.6775
AR(1)	0.368485	0.485321	0.759260	0.4695
AR(2)	0.323889	0.399134	0.811479	0.4406
AR(3)	0.286953	0.517510	0.554487	0.5944
MA(1)	0.255306	0.388904	0.656476	0.5299
MA(2)	-0.137530	0.363830	-0.378007	0.7153
MA(3)	-0.267941	0.415815	-0.644374	0.5374
MA(4)	-0.151231	0.386831	-0.390948	0.7060
MA(5)	-0.013303	0.372952	-0.035669	0.9724
MA(6)	-0.684575	0.383573	-1.784733	0.1121
R-squared	0.838389	Mean dependent var		12.59790

The stochastic forecasting model

Estimation Command:
=========================
LS LOG(FT) C AR(1)AR(2)AR(3) MA(1) MA(2)MA(3)MA(4)MA(5)MA(6)MA(7)

Estimation Equation:
=========================
LOG(FT) = C(1) + [AR(1)=C(2),AR(2)=C(3),AR(3)=C(4),MA(1)=C(5),MA(2)=C(6),MA(3)=C(7),MA(4)=C(8),MA(5)=C(9),MA(6)=C(10),MA(7)=C(11),BACKCAST=2000,ESTSMPL="2000 2017"]

Substituted Coefficients:
=========================
LOG(FT) = 9.7188347135 + [AR(1)=1.25640588147,AR(2)=-0.615269656411,AR(3)=0.309340061505,MA(1)=-0.503167296832,MA(2)=-0.360844190937,MA(3)=0.0913500668975,MA(4)=0.0681882670495,MA(5)=-0.422469386358,MA(6)=-0.543239598049,MA(7)=0.885195174126,BACKCAST=2000,ESTSMPL="2000 2017"]

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	9.718835	1.582835	6.140146	0.0005
AR(1)	1.256406	0.349222	3.597725	0.0088
AR(2)	-0.615270	0.541894	-1.135406	0.2936
AR(3)	0.309340	0.387800	0.797680	0.4513
MA(1)	-0.503167	0.417483	-1.205241	0.2673
MA(2)	-0.360844	0.522961	-0.690002	0.5124
MA(3)	0.091350	0.480416	0.190148	0.8546
MA(4)	0.068188	0.535529	0.127329	0.9023
MA(5)	-0.422469	0.425314	-0.993312	0.3536
MA(6)	-0.543240	0.496592	-1.093935	0.3102
MA(7)	0.885195	0.283122	3.126552	0.0167

R-squared	0.972360	Mean dependent var	8.881603
Adjusted R-squared	0.932875	S.D. dependent var	0.244870
S.E. of regression	0.063442	Akaike info criterion	-2.399622
Sum squared resid	0.028174	Schwarz criterion	-1.855506
Log likelihood	32.59660	Hannan-Quinn criter.	-2.324596
F-statistic	24.62599	Durbin-Watson stat	1.759617
Prob(F-statistic)	0.000162		

Inverted AR Roots	.95	.15+.55i	.15-.55i	
Inverted MA Roots	.94-.16i	.94+.16i	.42-.91i	.42+.91i
	-.62-.77i	-.62+.77i	-.99	

Figure 8. Diagnostic Correlogram with Auto-correlation (ACF) and Partial Auto-correlation (PACF) ***(source: eViews)***

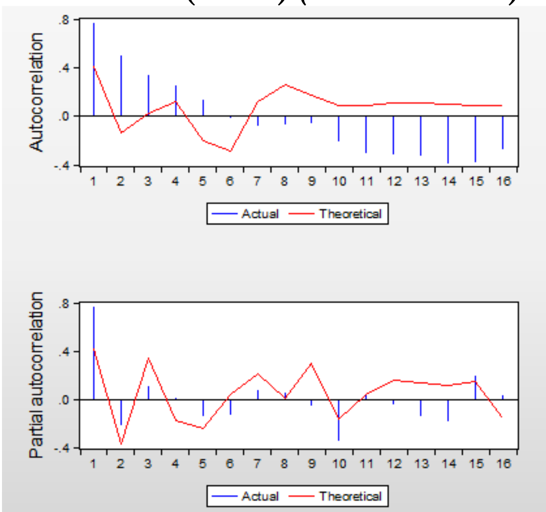
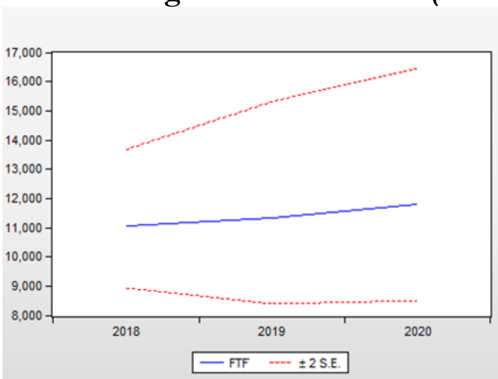
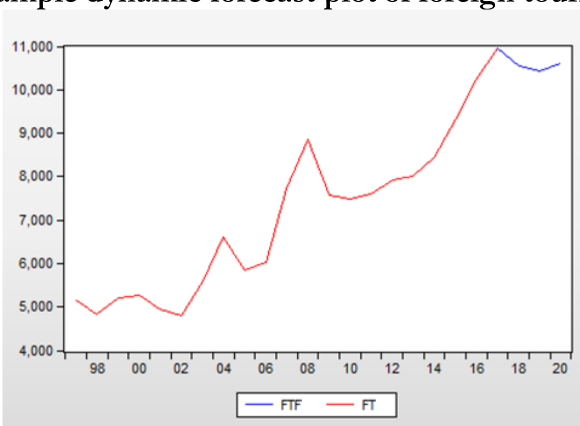


Figure 9. Forecast foreign tourists for 2020 ***(source: eViews)***



The adjustment of the data series, using the linear function and the square parabola, revealed an upward trend for the tourist arrivals in Romania during 1997-2017. We also notice that the trend is similar in the forecast period (until 2020). Since, the figures of the chronological series of all tourist arrivals and Romanian tourist arrivals show similar trends, we can assume that the evolution of the Romanian tourist arrivals will also follow an upward trend.

Figure 10. Out-of- sample dynamic forecast plot of foreign tourists ***(source: eViews)***



6. Discussion

The original econometric models exhibited here have rigorously gone through the stages of specification, parameterization, testing and decision-making (with emphasis on validation.) Thus, the staticity of the data series was tested using the Dickey Fuller test, the parameter estimation utilized the smallest squares method, obtaining high values of the determination ratio (R2 quantifying the percentage by which the influence of significant factors is explained, and R2 adjusted being a corrected value of R2, a possible increase being sometimes due to the number of variables in the model). The main tests used in the model were the T-Student (with the null hypothesis H0: the coefficients are not significantly different from 0 and the alternative hypothesis H1: the coefficients are significantly different from 0), the F (Fisher) test (checking whether at least one coefficient is significantly different from 0 , the null hypothesis H0: all the coefficients are not significantly different 0, and H1: there is at least one coefficient different from 0), the Durbin-Watson test for autocorrelation of model errors, the Jarque-Bera test to test whether or not the model errors are normal, and the White test for homosceasticity or heteroscedasticity economic model.

The analysis of the model revealed that the variables influencing the number of foreign tourists visiting Romania are: tourist accommodation capacity and consumer price index of services, net investment in hotels and restaurants not having a significant relevance to the variable to be explained.

Before selecting an appropriate model, formal stationary tests have been applied in this paper and the results revealed that the series are stationary at level. Secondly, in order to obtain a good estimation, this paper has identified the autoregressive (AR) and moving average (MA) of the entire period of the data. Therefore, the future demand of tourism is forecast based on the combination of AR and MA, known as ARMA model. The forecasts generated by the ARIMA model suggest that Romania will face increasing tourism demand for the period of 2018-2020.

Closely connected to the future research directions, there are also subjective limits, related to the typology, number or form of expression of the indicators. In the future it is necessary to extend the research by adding qualitative variables.

A next step could be a model testing and, implicitly, a comparative analysis with other states at the same level of socio-economic development with Romania.

6. Conclusions

Romania has a remarkable tourism potential. The cultural attractions in the country are extremely diverse - medieval fortresses, Byzantine monasteries, castles and peasant houses decorated according to regional culture. All this cultural resources, accompanied by extraordinary natural landscapes, highly promoted in the last decade, have generated a constant increase in the number of foreign tourists.

The development of Romanian tourism implies the development of a coherent strategy that comprise all the national policies and objectives, to prioritize the proposals for general infrastructure, in order to overcome the existing difficulties in tourism. Analyzing the connections between the variables taken into consideration using the nonparametric correlation models, where the determinant factor is the number of international tourist arrivals, and the dependent factors are the existing tourist accommodation capacity (number of units), net investment in hotels and restaurants and consumer price indexof services (ARIMA Model), we found a link between them.

We consider that our model can be improved adding other more relevant independent quantitative variables, which show the evolution of economic development in Romania. Therefore, we can unreached the study, in the future, including qualitative variables collected during the international tourism exhibition.

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