

## ESTIMATING TOURISM DEMAND: THE CASE OF FYROM

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*The paper underlines the importance of applying forecasting methods in estimation of tourism trends. In this respect, two quantitative methods were used: (1) the method of exponential smoothing, through two of its variants: Double Exponential Smoothing and the Holt-Winters Smoothing; and (2) the Box-Jenkins methodology, through several alternative specifications. The result of the research is a medium-term estimation of foreign tourism demand for destinations in the Former Yugoslav Republic of Macedonia (FYROM) by the end of 2014. Despite the fact that all applied methods are not capable of explaining the driving factors behind the results, the estimated values can serve as a base for identifying measures and activities necessary for creating comprehensive tourism policy.*

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JEL Classification: *L83, M1, O1*

### INTRODUCTION

There is an evident relationship between the tourism planning and the forecasting process. Without reliable estimates of future demand, it is difficult to formulate adequate tourism development plan (Vanhove, 1978). The tourism policy may ensure that visitors are hosted in a way which maximizes the benefits to stakeholders, while minimizing the negative effects, costs, and impacts associated with ensuring the success of the destination (Goeldner & Ritchie, 2006).

However, all efforts to consider and understand the interrelated nature of tourism industry require monitoring and evaluation when tourism policy issues are involved (Edgell *et al.*, 2008). Hence, tourism policy may be viewed as simple process by those whose job is to create



and implement it (Wilkinson, 1997). At the same time many case studies on planning provide indications that the policy-making issue is not a trouble-free process (Mason, 2003). Moreover, planning decisions in tourism is an issue of great challenge for each national government (Brida *et al.*, 2011) since they view tourism as a catalyst for economic growth, which means they take active participation in tourism industry (Cheang, 2009). Due to the fact that tourism is generated by demand, the possibility arises that tourism demand may assist in providing in-depth analysis about tourist flows. This is of great help in decision-making process and drawing up tourism policies (Claveria & Datzira, 2009).

There is a wide range of factors which can influence tourism demand. These factors are normally found within the tourist-generating countries (Lickorish & Jenkins, 1997). So, tourism demand affects all sectors of an economy - individuals and households, private businesses and public sector as well (Sinclair & Stabler, 1997).

In principle, estimation of tourism demand can be done either by processing quantitative data by strict mathematical rules, or by pooled opinions of experts regarding the past and future of the events. This paper fully addresses only the quantitative methods.

## **NECESSITY OF ESTIMATING TOURISM DEMAND**

Tourism researchers and practitioners are interested in estimating tourism demand for many reasons because it is a key determinant of business profitability as a very important element in all planning activities (Song & Turner, 2006). On the other hand, estimation of tourism demand can be helpful to economic planners in reducing the risk of decisions regarding the future (Frechtling, 2001). In the same line, predicting the tourism demand is important to the tourism managers because more accurate estimations reduce the risks of decisions. So, the accuracy is one of the most important forecast evaluation criteria (Witt & Witt, 1992). Consequently, there is a wide range of techniques and procedures available for tourism policy analysis (Chowdhury & Kirkpatrick, 1994). Furthermore, estimating can serve as means to deal with the alternative future not as a single inevitable state, but a change which can evolve in strikingly different ways (Coates & Jarratt, 1989). Anticipating tourism flows considers the historical facts as well as the scientific knowledge in order to create images of what may happen in future (Cornish, 1977).

## METHODS FOR ESTIMATING TOURISM DEMAND

There is a large body of literature regarding application of methods for estimating tourism demand. Namely, numerous researchers have been involved and a wide variety of techniques has been used. In principle, all methods are generally categorized in two-categories: qualitative and quantitative (Song & Li, 2008). The qualitative methods use pooled opinions of experts to organize the past information of the variable and often are recommended as methods which seldom generate better predictions (Hall, 2005). On the other hand, the quantitative methods organize past information about a phenomenon by strict mathematical rules and assume that at least some elements of past patterns will continue into the future (Makridakis *et al.*, 1998).

In estimating tourism demand, it is expected that the final model would produce projections which are as accurate as possible. However, it is not always the case because of many problems like: lack of sufficient time series data in terms of number of observations on tourism demand variables, measurement errors, unclear picture for the system of tourism demand etc. (Song & Witt, 2000). Thus, certain evaluation criteria are used in order to select potential starting methods, as well as to identify an adequate model. However, no individual model consistently performs well in all situations (Witt & Song, 2002) meaning that no single forecasting model is the best for all situations under all circumstances (Makridakis *et al.*, 1982).

Tourism demand can be expressed in a various ways. Some of them explained it by consumer expenditure or receipts (Grouch, 1992; Li *et al.*, 2004) as the only applicable variable which can be directly translated into economic impact (Sheldon, 1993). Others employed tourist expenditure on certain tourism product categories, such as meal expenditure (Au & Law, 2002) and sightseeing expenditure (Au & Law, 2000). Moreover, others made their focus on tourist typologies, motivation, determinants of choice of activities and demand (Johnson & Thomas, 1992). Even more, tourism demand can be measured by visitors' use of good or a service (Frechtling, 2001), tourism revenues (Akal, 2004), tourism employment (Witt *et al.*, 2004) and tourism import and export (Smeral, 2004). However, the tourist arrivals variable is the most popular measurement of tourism demand (Crouch, 1994). This variable may be further decomposed into holiday tourist arrivals, business tourist arrivals, tourist arrivals for visiting friends and relatives purposes (Turner & Witt, 2001a, 2001b; Kulendran & Wong, 2005), and tourist arrivals by air (Coshall, 2005; Rosselló, 2001). Hence, while reviewing eighty-five international

tourism demand forecasting models, Crouch (1994) found that nearly two-thirds of them defined demand in terms of arrivals or departures. Furthermore, the number of arrivals, the tourist expenditures, and the tourist receipts are utilized as dependent variables, while the national income, the exchange rate, the total number of population or the price, as for explicative variables (Botti *et al.*, 2007).

Similarly, the visitor expenditure is often identified as only applicable variable which can be directly translated into economic impact (Sheldon, 1993). Additionally, tourism can promote and cause long-term economic growth, known as tourism-led growth hypothesis (Brida, 2010).

Furthermore, the performance of the estimating models varies according to the length of the forecasting horizons (Li *et al.*, 2005). Estimating domestic tourist flows is considerably easier than international tourist flows' over a one-year horizon (Witt *et al.*, 1992).

### **Application of Exponential Smoothing Method**

We estimate tourism demand in the FYROM, quantified by the number of foreign tourists, for the period 2009-2014 employing the method of exponential smoothing. This method can be applied in many variants, but for the aim of this research, the following two are used: the Double Exponential Smoothing model (DES) and the Holt-Winters Smoothing model (HWS). Both models can be used when dealing with short time series with linear trend and no seasonality. In this respect, we do the modelling with short time series with an upward trend in the period 2001-2008.

**Table 1** Number of foreign tourists in FYROM, 2000-2008

Year	Arrivals
2001	98 946
2002	122 861
2003	157 692
2004	165 306
2005	197 216
2006	202 357
2007	230 080
2008	254 957

*Source:* State Statistical Office, 2008 and 2009.

The equations for the DES model are:

Level:  $L_t = \alpha A_t + (1 - \alpha)(L_{t-1} + b_{t-1})$  (1)

Trend:  $b_t = \alpha (L_t - L_{t-1}) + (1 - \alpha)b_{t-1}$

(2)

Forecast:  $F_{t+h} = L_t + hb_t$  (3)

It is commonly used that the constant has value of 0.2 or less. Despite the fact that the choice of the value of the constant is pretty much limited, it can be used in obtaining more accurate forecasting results. The calculations are:

Constanta value = 0.182

Trend = 22 636

The HWS model is very similar to the DES model, because it can be applied in series with linear trend in the movement with no seasonality. The difference is that the HWS model is based on two smoothing constants, while the DES model uses only one because of its simplicity.

The HWS model uses the following equations:

Level:  $L_t = \alpha A_t + (1 - \alpha)(L_{t-1} + b_{t-1})$  (4)

Trend:  $b_t = \beta (L_t - L_{t-1}) + (1 - \beta)b_{t-1}$

(5)

Forecast:  $F_{t+h} = L_t + hb_t$  (6)

The calculations are:

First smoothing constant ( $\alpha$ ) = 0.48

Second smoothing constant ( $\beta$ ) = 0.23

Trend = 21 887

**Table 2** Estimating tourism demand with DES and HWS model, 2009-2014

Model	2009	2010	2011	2012	2013	2014
DES	278 927	301 565	324 203	346 840	369 478	392 116
HWS	276 374	298 261	320 148	342 035	363 922	385 809

From Table 2 it can be concluded that both models have similar estimating results. According to the DES model, the number of foreign tourists in the FYROM for the period 2009-2014 is projected to be within the interval of 279 000 - 390 000 tourists. Based on this model, the number of foreign tourists in the following six years will increase for approximately 120 000.

The HWS model estimates that the number of foreign tourists in the 6-year period will be within the interval of 276 000 - 386 000 tourists. So, based on this projection the number of foreign tourists in the FYROM will increase for 100 000.

Both models are very often used mainly because of their accuracy and simplicity. Respectively, their advantage is the ability to follow the linear trend of the original time series as well as to be used in medium-term projections. However, the biggest disadvantage is their inappropriateness in estimating time series with seasonality components or without linear trend. In such cases, other models of exponential smoothing are used, like: simple exponential smoothing, Holt-Winters multiple smoothing (with three parameters) etc.

## Application of Box-Jenkins Methodology

In order to estimate tourism demand in the FYROM, we model the original time series - the number of foreign tourists, in the period 1956-2008 (State Statistical Office, 2008 and 2009), by means of the Box-Jenkins methodology (Box & Jenkins, 1976). It is one of the quantitative methods commonly applied in estimating, known as autoregressive integrated moving averages (ARIMA) models. It is the most popular linear model for estimating time series and enjoys great success in academic research (Qu & Zhang, 1996; Law, 2000 and 2004; Goh & Law, 2002; Kulendran & Shan, 2002; Huang & Min, 2002; Lim & McAleer, 2002; Coshall, 2005).

Taking into consideration that the basic assumption for applying this methodology is obtaining stationary of the time series, the first step in the analysis is to perform the stationary test. So, the correlogram of the series is used and the statistical significance of the calculated autocorrelation coefficients is checked. As stated in the statistical theory, if dealing with a random process, than the autocorrelation coefficients are approximately characterized by the normal distribution, with a zero mean and variance of  $1/n$ , where  $n$  is the sample size (Gujarati, 1995).

In this respect, the standard error of the autocorrelation coefficient is calculated:  $\sqrt{1/53} = 0.137$ . According to the table for normal distribution, we can calculate the 95% confidence interval for the autocorrelation coefficients:

$$\text{Confidence interval} = \pm 1.96 \times 0.137 = \pm 0.269.$$

However, considering the problems with individual testing of the significance of autocorrelation coefficients, the joint hypothesis that all autocorrelation coefficients are equal to zero is tested. This test is usually made with Ljung-Box statistic (LB). The LB-statistics tests the null hypothesis that there is no autocorrelation for all coefficients at certain number of time lags. In this case, it is known that the LB-statistics has low power, because the significant coefficients can be neutralised by the

insignificant ones. Hence, the evidence gained by the LB-statistics is additionally tested by employing two unit root tests: the Augmented Dickey-Fuller - ADF (Dickey & Fuller, 1979) and the Phillips-Perron test - PP (Phillips & Perron, 1988).

**Table 3** Stationary tests of number of foreign tourists

Test	constant	constant + trend	none
ADF	-1.547875 (0.5016)	-1.498094 (0.8174)	-0.511774 (0.4899)
PP	-1.599661 (0.4756)	-1.496664 (0.8182)	-0.557843 (0.4708)

In the first row of Table 3, the values of the ADF-test are shown in its three variants. In all cases, the null hypothesis for the presence of unit root cannot be rejected. Consequently, this test suggests that the series is non-stationary. However, in the beginning of the 1990s, there was a presence of a structural break in the series. In that case, it is known that the ADF-test has low power so the results are checked with the PP-test. As shown in the second row of Table 4, all the variants of the PP-test show that the null hypothesis of a unit root cannot be rejected. Hence, this test, too, suggests that the series is non-stationary.

**Table 4** Stationary tests of number of foreign tourists  
(First Differences: 1956-2008)

Test	constant	constant + trend	none
ADF	-5.376144 ( 0.0000)	-5.445010 (0.0002)	-5.415973 ( 0.0000)
PP	-5.466517 (0.0000)	-5.529348 (0.0002)	-5.503297 (0.0000)

After performing the additional tests, it can be concluded that the Box-Jenkins methodology can be applied. The first step is to identify the appropriate model which will explain the time series movement. Here, crucial instruments are the sample autocorrelation (ACF) and partial autocorrelation (PACF) functions. The detailed analysis of both functions did not show any regularity in the movement of the autocorrelation coefficients (slow decay, sharp picks at certain lags etc.), from which, the model could be identified. What the correlogram suggested is that we have a mixed process, i.e. combination of autoregressive (AR) and moving average (MA) processes.

Due to the unclear character of the time series, several alternative specifications were used to model the original series: ARIMA(1.1.1) with dummy, ARIMA(2.1.2) and restricted ARIMA(1.1.10) with dummy. All models represent the original time series in an adequate manner.

The ARIMA(2.1.2) model has a slightly higher coefficient of determination compared to the previous model, but the second MA is marginally insignificant at 5%. Also, the inverted MA root is 1, which makes the process inappropriate for forecasting.

The restricted ARIMA(1.1.10) with dummy has some positive statistical characteristics: high coefficient of determination, no problems with the inverted AR and MA roots and results in favour of the Akaike and the Schwarz information criteria. Yet, this model is discarded due to the problems with the interpretation of the MA term. Once again, we emphasise that the inclusion of the MA term with a time lag of 10 periods ensures good approximation of the time series in the past, but not in the future.

Accordingly, only the results of the ARIMA(1.1.1) with a dummy are presented here, as the most appropriate model for estimating tourism demand.

**Table 5** ARIMA(1.1.1) model of number of foreign tourists

Dependent Variable: Foreign tourists (First differences)				
Method: Least Squares				
Sample: 1958 - 2008 (51 observations)				
Variable	Coefficient	Std. Error	t-Statistic	Probability
DUMMY	-191192.4	21341.93	-8.958533	0.0000
AR(1)	0.787363	0.165950	4.744591	0.0000
MA(1)	-0.423157	0.241562	-1.751749	0.0862
R <sup>2</sup>	0.650544	Akaike info criterion		23.66973
Adjusted R <sup>2</sup>	0.635984	Schwarz criterion		23.78337
S.E. of regression	32448.72	Durbin-Watson stat		2.089552
Inverted AR roots	0.79			
Inverted MA roots	0.42			

From Table 5 it can be concluded that the AR term is highly significant with value 0.8, which suggests a high level of persistence in the series. The second term is not significant at the level of 5%, but having in mind the relatively small sample, we decided to work with the model, because of its significance at 10%. In the same line, the coefficient before the dummy is highly significant. The adjusted R<sup>2</sup> is satisfactorily

high (0.64) due to the fact that we have modelled the first difference of the series. The values of the inverted roots of the AR and MA terms are within the unit root, which, once again, confirms that the chosen model is appropriate.

The good performances of the chosen model allow its application in estimation of tourism demand. The forecasted values are presented in Table 6.

**Table 6** Estimating tourism demand with ARIMA(1.1.1) model, 2009-2014

Year	2009	2010	2011	2012	2013	2014
Arrivals	269 897	281 660	290 922	298 214	303 956	308 477

The results of the dynamic forecasts of the number of foreign tourists using ARIMA(1.1.1) with a dummy, point out that in the period 2009-2014, the number of foreign tourists will increase for about 10 000 tourists in the first years, and then a moderate growth can be expected, leading to the forecast of 308 477 foreign tourists in 2014. Although the projections obtained by the Box-Jenkins methodology cannot explain the factors behind these trends, they can serve as a base for the preparation of tourism development plan in the FYROM.

## EVALUATION OF MODELS

Due to the fact that the primary purpose of creating a forecasting model is to clearly discern the future of a phenomenon, the most important criterion is how accurately a model does this. Moreover, it is extremely important to identify how closely the estimations provided by the model conform to the actual events being forecasted. Consequently, in order to define which of implemented models is the most accurate in estimation of tourism demand in the FYROM, the forecasts are evaluated by means of standard indicators: the Root Mean Squared Error (RMSE), the Mean Absolute Error (MAE), the Mean Absolute Percentage Error (MAPE) and the Theil Inequality Coefficient (TIC).

**Table 7** Evaluation of applied models

	RMSE	MAE	MAPE	TIC
DES	6 090.83	9 986.78	4.79	0.0134
HWS	9 920.87	13 150.95	5.94	0.0217
ARIMA(1.1.1)	16 305.65	15 675.99	7.23	0.0375

Table 7 presents very defeating results of the ARIMA(1.1.1) model in consideration of its forecasting procedure complexity as well as the usage of considerably longest time series (starting from 1956). Despite the fact that the Box-Jenkins methodology is commonly applied on regular basis when dealing with tourism demand estimation, the evaluated results perform its poorest accuracy among the implemented models.

Comparing the values of calculated errors of the DES and the HWS model, it can easily be concluded that the DES model is more accurate model of exponential smoothing. Having in mind that the DES model is very simple for implementation, leads us to additional advantage for its choice as a leading model for estimating tourism demand in the FYROM. According to the DES model, the number of foreign tourists for 2009-2014 will be in the interval from 280 000 - 390 000 tourists. Put side by side to 2008 when 255 000 foreign tourists visited the FYROM, it means 10-50% expected increase. Furthermore, it should be pointed out that the anticipated values must be taken in consideration with a large doze of precaution, because the model does not indicate the reasons which affect the estimated results. This is very important, as these indicators have great influence on identifying and implementing measures and activities in order to create appropriate tourism policy of the country.

## **CONCLUSION**

Estimating tourism demand is important as it is the base for creating achievable tourism policy, creating adequate regional development policy, formulating and implementing tourism strategy etc. Forecasting accuracy depends on characteristics of applied methods and models. The projected results from different models may be compared to the realistic data, thus ensuring retrospective measurement of accuracy of the applied model.

This paper provided a medium-term estimation of foreign tourism demand for tourist destinations in the FYROM. From the variety of quantitative methods, the paper addressed the possibility, but at the same time, the precondition of practical appliance of two methods: the exponential smoothing method (through DES and HWS model) and the Box-Jenkins method (through ARIMA (1.1.1) as the most appropriate alternative specification). The number of foreign tourists was the basic variable for estimating tourism demand in the FYROM for the period 2009-2014.

On the basis of the evaluated results from the dynamic forecast, the study found that the DES model is the most accurate and because of the

simplicity in its implementation is recommended for estimating tourism demand in the FYROM. Additionally, the paper explains that the recommended model does not indicate the reasons which may affect the projected results, which on the other hand, have high influence on identifying measures and activities necessary for creating tourism policy.

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