ANALYSIS AND FORECAST OF TOURIST ARRIVALS IN CROATIA

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Abstract
Purpose – The main objective of this paper is to estimate the number of tourist arrivals in Croatia by 2025. Such estimates may be of value for at least two reasons. The first one considers the importance of the tourism industry in Croatian economy, given that Croatia has comparative advantage in the international environment, and the second reason is to be found in two-digit growth rates of Croatian tourism in the recent period, all of which leads to the fact that Croatia has not used its full tourist potentials yet.
Design – The research relies on a secondary data and quantitative methods.
Methodology – The analysis of the number of tourist arrivals in Croatia is based on methods of descriptive statistics. To estimate the number of tourist arrivals in Croatia, two groups of extrapolation functions were selected: 1) functions without saturation and 2) functions with saturation limitation. The statistical analysis of the collected secondary data in order to choose the most appropriate function is based on data on the movement of tourist arrivals from 1996 to 2017.
Approach – Decision making in tourism always requires an estimate of the number of tourist arrivals. The applied scientific methodology is used to ensure the selection of an extrapolation model that will give the realistic estimate of the number of tourist arrivals to Croatia by 2025.
Findings – The main findings of this paper point to the fact that the number of tourist arrivals in Croatia will continue to grow in the coming period, and that the Croatian tourist market does not show saturation, i.e. that the functions of "S" shape for the modelling and estimation of tourist arrivals by 2025, are inappropriate.
Originality of the research – This study gives the relevant and realistic information about tourist arrivals in Croatia by 2025. So, this information could be helpful to tourist managers of all levels in making business decisions.
Keywords Croatia, tourism, tourist arrivals, extrapolation functions, forecast

INTRODUCTION

Forecasting is the art and science of predicting future events. There are two general approaches to forecasting: 1) quantitative and 2) qualitative. Quantitative forecasts use a variety of mathematical models that rely on historical data and /or causal variables to forecast demand (Heizer and Render 2004). Song and Turner (2006) concluded that the majority of the published studies used quantitative methods to forecast tourism demand. The basic assumption of the forecasting model of a variable in the time function is that it is possible to model the dynamic structure of the time series so as to use only information about the past behaviour of the time series. The assumption is that what happens in the future depends on what has happened in the past. These models have little or no explanation, since they are not tied to economic theory (Barković, Meler and Novak 1986). Their approach to research variables are somewhat mechanical. These models are called naive, extrapolation or mechanical. Naive because any changeable external factor is not taken into consideration to predict the future. They are valid for short term forecasts, and also cheap, simple and easy to apply. However, when more distant future is explored, the conditions of the past are likely to be differ more and more with the passing of time, so that mechanical prognoses become more and more unreliable as they do not take into account the possible change of external conditions.

Accordingly, two sets of extrapolation functions will be used for forecasting the number of tourist arrivals in Croatia by 2025: 1) functions without saturation limitations, and 2) functions with saturation limitations.

1. THEORETICAL FRAMEWORK OF RESEARCH

Decision making in the tourism industry is often based on the forecast of behaviour of a variable, such as the number of tourist arrivals, number of overnight stays, the price of tourist services, etc. Witt, Song and Anhill (2004) refer to the forecast of tourist demand as a key factor for planning and making decisions in tourism. Three levels of organizations require tourism forecasts - the relevant government agencies, national and regional tourism organizations and the individual suppliers of tourist and travel facilities (Sheldon and Var 1985). The tourist arrivals variable has been the most popular measure of tourism demand (Song and Li,) over the past few years. Song and Turner (2006) concluded that the majority of the published studies used quantitative methods to forecast tourism demand. The quantitative forecasting literature is dominated by two subcategories of methods: non-causal time series models and causal econometric approaches (Schroeder 1999, 357). The difference between them is solely in the fact of identifying any causal relationship between the tourism demand variable and its influencing factors.

Bahovec, Dumičić and Čeh Časni (2008) in their work present an econometric model of Croatian tourism demand for the period between 1998 and 2007. Tourism demand is approximated by total tourist overnights. Multiple Regression analysis was aplied. The results of the analysis suggest a high sensitivity of tourist demand for the GDP movement of EU member states and the extremely high sensitivity of tourist demand to the season. Since 2001, the degree of seasonality of Croatian tourism was in a slight decline until the beginning of the Great Recession, when it starts to rise again (Kožić, Krešić and Boranić-Živoder 2013, 172). Smeral and Weber present underlying partial demand models and points out that it make possible to trace the effects of changes in income and prices emanating from each individual country. The new model is used to generate forecasts of tourism imports and exports for 20 countries for the period up to 2010. It allows a more realistic simulation of the impact of political events such as the introduction of the Euro and of changes in framework. Song, Smeral, Li and Chen (2002) evaluate the forecasting accuracy of five alternative econometric models in the context of predicting the quarterly international tourism demand in 25 countries/country groupings. Tourism demand is measured in terms of tourist expenditure by inbound international visitors in a destination. The empirical results show that the time-varying parameter (TVP) model provides the most accurate short-term forecasts, whereas the naïve (nochange) model performs best in long-term forecasting up to two years. This study provides new evidence of the TVP model’s outstanding performance in short-term forecasting. Through the incorporation of a seasonal component into the model, the TVP model forecasts short-run seasonal tourism demand well.

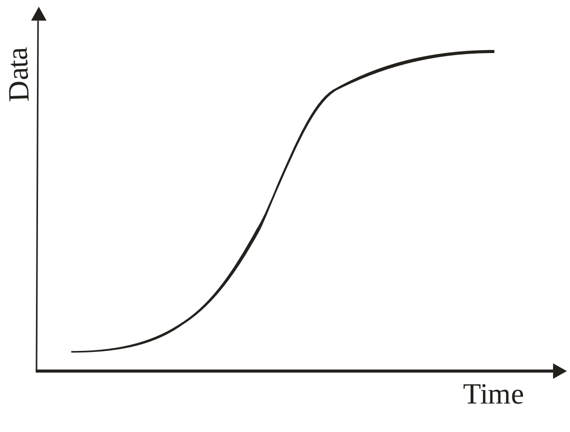
There are models where the observed variable is modelled in time function. Such models are called naive, extrapolation or mechanical because the prognosis depends only on the past values and the specific time function used. There are two groups of extrapolation functions to be applied: 1) functions without saturation limitations and 2) functions with saturation limitations.

1) Functions without saturation limitations – those where the saturation of the tourist market measured by the number of tourist arrivals is growing steadily with time. Such functions are:

   Linear Trend: $Yt = a + bt$ (1)
   Second-degree time trend: $Yt = a + bt + ct2$ (2)
   n-degree time trend: $Yt = a + b_1t + b_2t^2 + ... + b_nt^n$ (3)
   Exponential trends of different forms: $Yt = ae^{bt}$ and $Yt = e^{a + bt}$ (4)

2) Functions with saturation limitations. Market development of virtually all products changes in phases from introduction to saturation, which is why it should be taken into account when the number of tourist arrivals is modelled and forecast. This is allowed by functions in the "S" shape which reflect the saturation limits, or provide information about maximum market exhaustion. The "S" function shows a slow start, a burst of growth and saturation that is bound to happen after a while (cf. graph 1).

Graph 1: **The ''S'' shaped function**



There are several mathematical expressions for the "S" shaped function. The simplest is the following (Barković, Meler and Novak 1986, 43):

$$Yt = e^{a+\frac{b}{t}} \quad (5)$$

Where is:
Y_t – time series at time t
a – free term
b – equivalent slope of the curve, meaning growth rate

An exponential function, a considerably more complex than the previous one, but with a greater potential for use in tourism, is the so-called logistic function in the following form (Šošić and Serdar 1995, 190):

$$\frac{1}{Yt} = k + ab^t \quad (6)$$

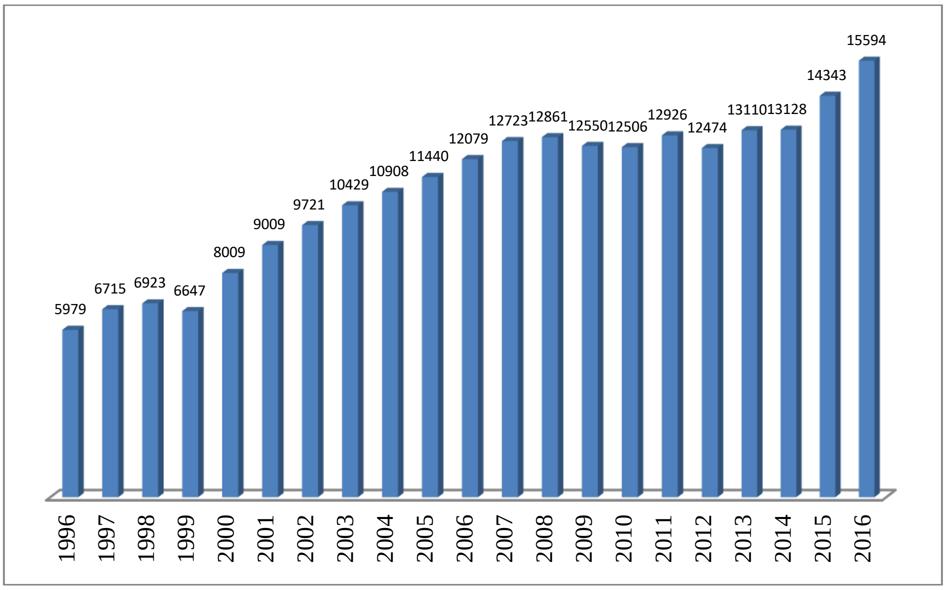
involves three parameters, k, a and b which are calculated.
Or more frequently written as (Cicvarić 1990, 379):

$$Yt = \frac{k}{1+10^{a+bt}} \quad (7)$$

2. DATA AND RESEARCH METHODOLOGY

The results of this paper are based on data on the number of tourist arrivals collected from secondary data sources for the period from 1996 to 2017.

Graph 2: **Number of tourist arrivals to Croatia, 1996 - 2016 (000)**



Source: DZS, Statistical Yearbooks of the Republic of Croatia, different years

According to data in graph 2, there is almost a continuous increase in the number of tourist arrivals. Exceptions to this positive trend occurred only in 1999 because of the military and political conflict in Kosovo, and for three years: 2009, 2010 and 2012, which coincide with the outbreak of the great economic crisis in the world, as well as in Croatia, of course.

Based on the collected statistical data on the number of tourist arrivals, first there will follow a descriptive analysis of the number of tourist arrivals to Croatia for the period from 1996 to 2016, and then certain extrapolation functions will be examined and the most suitable will be chosen to predict the number of tourist arrivals to the Republic of Croatia by 2025. Data were analyzed in *Statistica* program and spreadsheet in MS-Excel. In order to predict the future number of tourist arrivals with more accuracy, projections using the linear trend will be made, followed by the second-degree time trend, then the n-degree time trend, and finally, by the exponential trend. These functions have no saturation limitations. Afterwards, the logistics function will be examined as a function with saturation limitations, which is more suitable as the trend of tourist arrivals in the observed period indicates. The justification for choosing a suitable function in the short term can also be found in recent data on the number of tourist arrivals to the Republic of Croatia.

3. RESEARCH RESULTS AND DISCUSSION

Based on the collected data (cf. Graph 2), a brief descriptive analysis of the number of tourist arrivals was made (cf. Table 1).

Table 1**: Descriptive statistics of the number of tourist arrivals to Croatia, 1996 - 2016. (000)**

	TA
MEAN case 1-21	10956
MEDIAN case 1-21	12079
SD case 1-21	2771
VALID_N case 1-21	21
SUM case 1-21	230074
MIN case 1-21	5979
MAX case 1-21	15594
_25th% case 1-21	9009
_75th% case 1-21	12861

In the observed period, the Republic of Croatia had somewhat more than 230 million tourist arrivals. The average annual number of tourist arrivals in the observed period was 10.9 million (SD = 2.7). The median value (M) was 12,079 million. The lowest number of tourist arrivals in the observed period was recorded in 1996, the first post-war year, amounting to only 5.9 million, while the highest number of tourist arrivals occurred in 2016 with 15.5 million tourists. That is an increase of 2,6 times.

The linear trend function based on data from Graph 1 is the following:

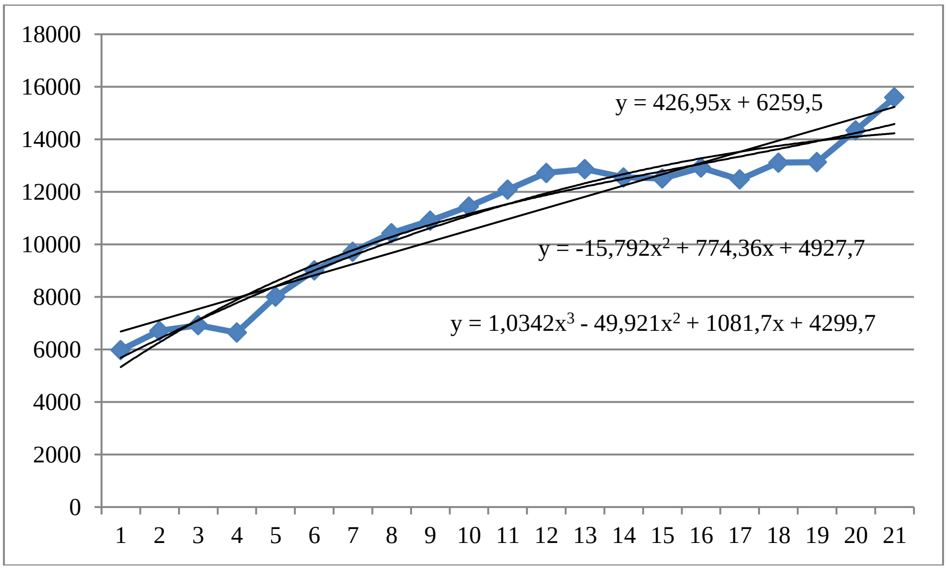
$Y_t = 6259{,}476 + 426{,}98t$ ($r^2 = 0{,}91$)

The trend obtained can be used to forecast the future number of tourist arrivals.

Given the fact that the functions of the Y= f (t) form are generally not linear, time trends of the second degree and of the higher degrees can be used in the forecast. There is a greater possibility for applying lower degree time trends, e.g. the second (square trend), since trend levels of the higher degrees require a larger sample to make the estimation precise enough.

If a linear trend model is used, coefficient *b* is the constant for which the time series grows (or lessens if *b* is negative) at all times. In the previous example, b = 426.98 was obtained, meaning that the number of tourist arrivals will increase by about 427 thousand each year. However, it is more reasonable to assume that not only the number of tourist arrivals will change, but also the rate of change. Model that allows a change in the number of tourist arrivals over time, with rate of change itself changing, is the square trend:

Graph 3: **Linear, square and third-degree trend of tourist arrivals in the Republic of Croatia**



Based on data in Graph 2, the method of smallest squares was used to estimate the parameters of the square trend. The following square trend was obtained:

$Y_t = 4927{,}7 + 774{,}36t - 15{,}792t^2$ ($r^2 = 0{,}95$)

Based on the same data, third-degree trend parameters were forecast and the following third-degree trend was obtained:

$Y_t = 1{,}0342t^3 - 49{,}921t^2 + 1081{,}7t + 4299{,}7$ ($r^2 = 0{,}95$)

Forecasts of the number of tourist arrivals by 2025 on the basis of the linear, square and third-degree trends are presented in Table 2.

Table 2: **Estimation of number of tourist arrivals based on linear, quadratic and third level trends (000)**

Year	Linear trend estimation	Square trend estimation	Third degree trend estimation
2025.	19068	13945,7	19745,2

Estimates on the number of tourist arrivals are significantly different, but the choice of an assessment method certainly excludes the estimation based on the square trend.

Exponential growth models are suitable for long-term forecasts when growth rates are constant over time. Thus there is a burst of growth over a longer time period. Such a concept of exponential growth is subject to numerous discussions. Many are quick to prove that there are limits to growth as exponential growth is limited by the finite space and resources. Regardless of this, exponential growth can happen within a certain time period, so a model that takes it into consideration is needed. Exponential growth can occur on account of new destinations, or rebranded ones, new forms of tourism, but also as a result of political, terrorist and military conflicts in competitive destinations.

Based on data in Graph 2, the following exponential function the non-logarithmic form was obtained:

$Y_t = 6624,5e^{0,0425t}$ ($r^2 = 0,87$)

The linear transformed model has the following form:

$\ln Y_t = \ln 8,7985 + 0,0425t$

With estimates of the parameters (a = 8.7985; b = 0.425) the function can be written as following:

$Y_t = e^{8,7985+0,0425t}$

and be used for the prognosis. Thus the number of tourist arrivals in the year 2025 is 23 706 392. For the estimated exponential function, the growth rate is 4.25% per annum, which leads to doubling the number of tourist arrivals in the next seventeen years.

To estimate the number of tourist arrivals by 2025, a logistic exponential function will be used. The justification for the application of logistic function is indicated by the trend of arrivals and overnight stays of tourists from 1996 to 2016. The development in the initial period in this case was 1996, as the first post-war year, and it shows a certain vacillation in tourist arrivals, while 2006 is the period of intense development, and 2016 shows a stable period of development with indications of mild saturation.

Because of all this, the following logistic function was selected:

$$Yt = \frac{k}{1 + 10^{a+bt}}$$

Estimated parameters based on data from Graph 2 are of the following values:

k = 16,98804012   a = 0,26500882   b = -0,065616765 n=10

From this the following results:

$$Yt = \frac{16{,}98804012}{1 + 10^{0{,}26500882 - 0{,}65616765t}}$$

Estimated number of tourists arrivals by 2025 based on logistic function is 16 605 760. However, as there were 15.5 million foreign tourist arrivals and 17.4 total tourist arrivals (www.hrturizam.hr) in 2017, it is obvious that the logistic function is not suitable for estimating the number tourist arrivals by 2025.

The forecasts for the number of tourist arrivals to the Republic of Croatia are summarized in Table 3.

Table 3: **Various estimates of tourist arrivals to the Republic of Croatia in 2025.**

Functions without saturation limitations	**Estimated number of tourist arrivals in 2025 (000)**
Functions without saturation limitations	
Linear trend function $Y_t = 6259{,}476 + 426{,}98t$	19 068
Square trend $Y_t = 4927{,}7 + 774{,}36t - 15{,}792t^2$	13 946
Third degree function $Y_t = 1{,}0342t^3 - 49{,}921t^2 + 1081{,}7t + 4299{,}7$	19 745
Exponential functions $Y_t = 6624{,}5e^{0{,}0425t}$ $Y_t = e^{8{,}7985+0{,}0425t}$	23 707
Functions with saturation limitations	
Logistic function $Yt = \frac{16{,}98804012}{1 + 10^{0{,}26500882 - 0{,}65616765t}}$	16 606

The use of different prediction methods has resulted in different forecasts. The forecast based on the square trend method can be discarded.

CONCLUSION

From 1996 until today, the number of tourist arrivals to the Republic of Croatia has shown almost continuous growth. An exception to this trend was evident at the time of the world economic crisis when the number of tourist arrivals to Croatia stagnated. However, in the period from 1996 to 2016, the number of tourist arrivals increased by 2.6 times. Based calculated estimates, it is evident that the number of tourist arrivals will continue to show a growth trend. Tourism demand measured by the number of tourist arrivals shows no sign of lessening or stagnation, meaning that functions with saturation limitations are unsuitable for predicting tourist arrivals for the upcoming period until 2025. The functions without saturation limitations thus have more applicability in this case. The given results can be helpful to tourist managers on all levels to improve business decision-making process. As all the estimates should have three values, an optimistic, realistic and pessimistic one, it seems to be appropriate to deem the logistic function as pessimistic, those of the linear and the third degree trend realistic, and the exponential function optimistic.

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