# ANALYSIS AND FORECAST OF TOURIST NIGHTS IN CROATIA BY 2022

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**Abstract:** *The tourist nights variable is one of the most popular measures of tourism demand. In accordance the main objective of this paper is to estimate the number of tourist nights in Croatia by 2022. The analysis of the number of tourist nights in Croatia is based on the methods of descriptive statistics. To estimate the number of tourist nights in Croatia the moving averages methods and method of exponential smoothing are used. This methods are efficient and useful in the short run period. The main finding of this paper points to the fact that the number of tourist nights in Croatia will continue to show a growth trend in the coming period. Findings in this paper provides a good starting point to forecast tourism demand and could be helpful to tourist managers of all levels in making business decisions.*

**Key words:** *Croatia, tourism, tourist nights, forecast, moving-averages, exponential smoothing*

## 1. INTRODUCTION

Tourism is a significant source of export revenues for Croatia, it is vital for policymakers to understand the trends and factors that affecting tourism demand. Tourism demand is usually measured in terms of tourists arrivals, in terms of tourist's overnight stays, or in terms of tourist's expenditure. A large number of econometrics studies used, both time series and econometric approaches to forecast tourism demand. Good forecast are of critical in all aspects of tourist business especially for two activities: 1) human resources and 2) capacity.

Subject of this research is tourism demand measured by the number of tourist nights in order to prove the hypothesis that insufficient tourism demand is not a limiting factor for the development of Croatian tourism. Some of the world-famous Croatian tourist destinations such as Dubrovnik, Plitvice Lakes National Park or Krka National Park because of the pronounced seasonality of Croatian tourism have a problem of over-demand. To achieve the purpose and purpose of the research and to prove the set hypothesis in various combinations, several scientific methods were used, from which the method of descriptive statistics and two quantitative forecasting methods are used: moving averages and exponential smoothing method.

This scientific paper has five logically related parts. After the introduction, in the second part of the paper, the theoretical framework of the research, gives a detailed description of the methods of prediction used. The third part of the paper encompasses secondary data that are the subject of analysis in the work and the presentation of the scientific methodology used in the work. After the results of the research and discussion covered by the fourth part of the paper, the conclusion is reached.

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## 2. THEORETICAL FRAMEWORK OF RESEARCH

***Justin Pupavac*** *was born on November 9th, 1992 in the city of Rijeka. He graduated from the Faculty of Economics, University of Rijeka. In 2015. he successfully attended International Summer Schools in Vienna. Currently, he is PhD student at the Faculty of tourism and hospitality management in Opatija. His research and education is focused on Management of sustainable development. He is author of several scientific articles. Since graduation, he has been working in tourism.*

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. Mervar & Payne (2007) in their study provide long-run elasticity estimates associated with the aggregate foreign tourism demand for Croatian destinations in the period 1994 – 2004 using the autoregressive distributed lag (ARDL) approach. Foreign tourism demand is appraised by the aggregate number of foreign overnight stays in Croatia. 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 estimated by total tourist nights. Multiple Regression analysis was applied. Baldigara, Štambuk and Mamula (2013) endeavor to express a theoretical e−tourism demand model, as a mathematical function that indicates the presence of a relationship between the dependent variable, expressed by the number of tourists' overnight stays and a number of commonly used explanatory variables (income, prices, substitute pries). The authors also research the possibilities of adding some additional supplementary independent variables i.e. the number of internet users, the number of overnights stays that were booked online or the number of online reservations.

In this paper two simple but very useful quantitative forecasting methods have been used: moving averages and exponential smoothing which are fall into time-series model. Time-series models predict on the assumption that the future is a function of the past.

### Moving averages

Moving averages are useful if we can assume that market demands will stay fairly steady over time. A 3-years moving average is found by simply summing the demand during the past 3-years and dividing by 3. With each passing year, the most recent year's data are added to the sum of the previous 2 years and the earliest year is dropped. This practice tend to smooth out short-term irregulations into the data series.

Mathematically, the simple moving average (which serves as an estimate of the next period's demand is expressed as

$$\text{Moving average} = \frac{\sum \text{demand in previous n periods}}{n} \quad (1)$$

where n is the number of periods in the moving average.

When a detectable trend or pattern is present, weights can be used to place more emphasis on recent values. This practice makes forecasting techniques more responsive to changes because

more recent periods may be more heavily weighted. Deciding which weights to use requires some experience.

A weighted moving average may be expressed mathematically as

$$\text{Weighted moving average} = \frac{\sum(\text{weight for period n})(\text{demand in previous n periods})}{\sum weights} \quad (2)$$

**Exponential Smoothing**

Exponential smoothing is a sophisticated weighted moving-average forecasting method. The basic exponential smoothing formula can be shown as follows:

*New forecast=last period's forecast + α(last period's actual demand–last period's forecast)* (3)

Where α is a weight or smoothing constant, chosen by the forecaster, that has a value between 0 and 1. Equitation (3) can also be written mathematically as

$$F_t = F_{t-1} + \alpha (A_{t-1} - F_{t-1}) \quad (4)$$

Where:
$F_t$ – new forecast
$F_{t-1}$ – previous forecast
$\alpha$ – smoothing constant ($0 \leq \alpha \leq 1$)
$A_{t-1}$ – previous period's actual demand

The smoothing constant, α, is generally in the range from 0,05 to 0,5 for business applications. It can be changed to give more weight to recent data (when α is high) or more weight to past data (when α is low).

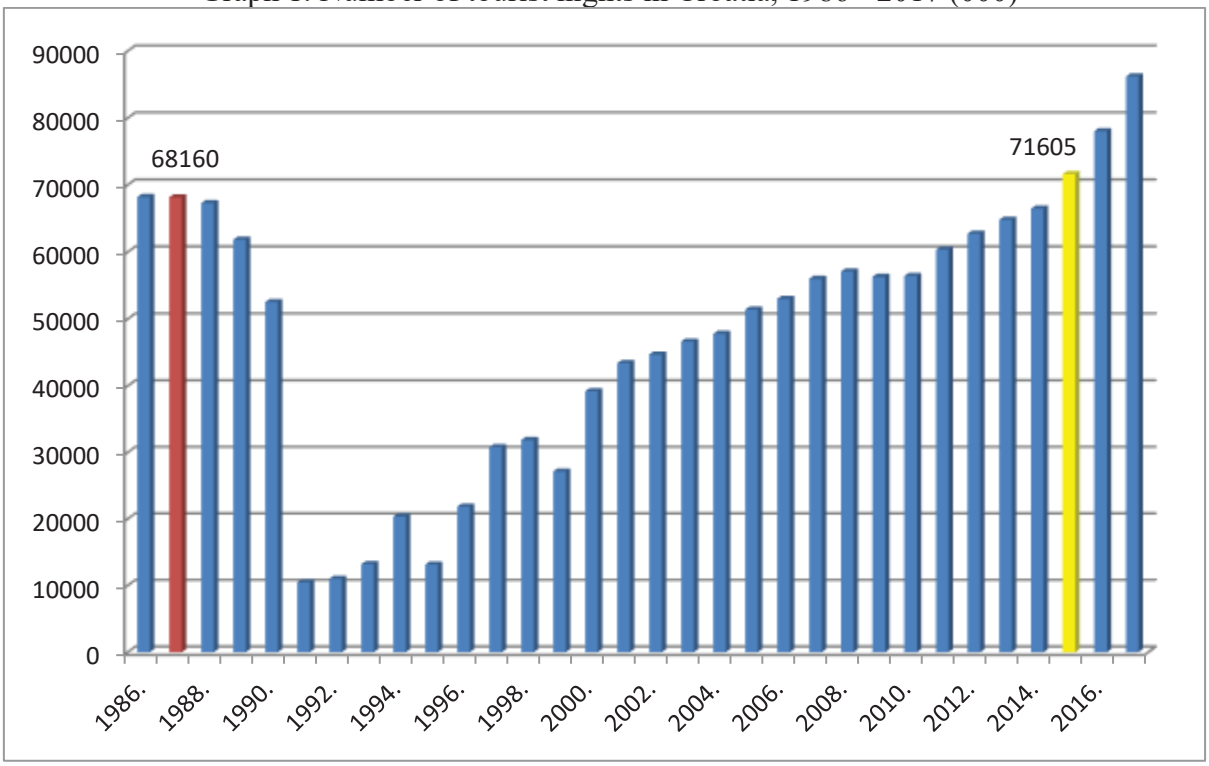
The overall accuracy of any forecasting model-moving average, exponential smoothing, or other – can be determined by comparing the forecast values with the actual or observed values. One of the most popular measures is mean absolute deviation (MAD). This value is computed by taking the sum of absolute values of the individual forecast errors and dividing by the number of periods of data (n):

$$\text{MAD} = \frac{\sum(\text{actual} - \text{forecast})}{n}$$

## 3. DATA AND RESEARCH METHODOLOGY

According to collected data, regarding the number of tourist nights, it is visible that the Republic of Croatia, in the year of 2015., has not only reached the results from the year 1987. but the number of tourist nights has been increased. (cf. Graph 1).

Graph 1. Number of tourist nights in Croatia, 1986 - 2017 (000)




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

Based on the chart data, there is a great fragility of tourism on political, war and economic factors. Tourism demand is negatively affected by the political conflicts in the 1990s. In the post-war period from 1996 to 2017, almost continuous increase in the number of realized tourist nights has been observed. Exceptions to this positive trend occurred only in 1999 because of the military and political conflict in Kosovo, and for two years: 2009 and 2010, which coincide with the outbreak of the great economic crisis in the world as well as in Croatia, of course.

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The results of this paper are based on data on the number of tourist nights for the period from 1996 to 2017. Based on this data, first there will be a descriptive analysis of the number of tourist nights in Croatia for the period 1996 to 2017, and then will be used by 2022 in moving averages and model of exponential smoothing to predict the number of tourist nights in the Republic of Croatia.

## 4. RESEARCH RESULTS AND DISCUSION

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

Table 1. Descriptive statistics of the number of tourist nights to Croatia, 1996 - 2017. (000)

| | |
|---|---|
| **Mean** | **52446,86** |
| **Standard Error** | 3478,60 |
| **Median** | 54506,00 |
| **Standard Deviation** | 16316,07 |
| **Kurtosis** | -0,20 |
| **Skewness** | 0,01 |
| **Range** | 64340,00 |
| **Minimum** | 21860,00 |
| **Maximum** | 86200,00 |
| **Sum** | 1153831,00 |
| **Count** | 22,00 |

In the observed period, the Republic of Croatia had somewhat more than 1,15 billion tourist nights. The average annual number of tourist nights in the observed period was 52.4 million (SD = 16.3). The median value (M) was 54,5 million. The lowest number of tourist nights in the observed period was recorded in 1996, the first post-war year, amounting to only 21,86 million, while the highest number of tourist nights occurred in 2017 with 86.2 million tourist nights. That is an increase of 3,94 times.

Based on formula (1) moving averages are calculated. A 3-year moving average appears on the right (cf. Table 2).

Table 2. Estimate the number of tourist nights with moving average model (000)

| Year | Actual tourist nights | 3-year moving average | Forecast error |
|---|---|---|---|
| **1996** | 21860 | | |
| **1997** | 30775 | | |
| **1998** | 31852 | | |
| **1999** | 27126 | 28162,33 | -1036,33 |
| **2000** | 39183 | 29917,67 | 9265,333 |
| **2001** | 43405 | 32720,33 | 10684,67 |
| **2002** | 44692 | 36571,33 | 8120,667 |
| **2003** | 46635 | 42426,67 | 4208,333 |
| **2004** | 47797 | 44910,67 | 2886,333 |
| **2005** | 51421 | 46374,67 | 5046,333 |
| **2006** | 53007 | 48617,67 | 4389,333 |
| **2007** | 56005 | 50741,67 | 5263,333 |
| **2008** | 57103 | 53477,67 | 3625,333 |
| **2009** | 56300 | 55371,67 | 928,3333 |
| **2010** | 56416 | 56469,33 | -53,3333 |
| **2011** | 60354 | 56606,33 | 3747,667 |
| **2012** | 62743 | 57690 | 5053 |
| **2013** | 64818 | 59837,67 | 4980,333 |
| **2014** | 66484 | 62638,33 | 3845,667 |
| **2015** | 71605 | 64681,67 | 6923,333 |
| **2016** | 78050 | 67635,67 | 10414,33 |
| **2017** | 86200 | 72046,33 | 14153,67 |

| | |
|---|---|
| **2018** | 78618,33 |
| **2019** | 80956,11 |
| **2020** | 81924,81 |
| **2021** | 80499,48 |
| **2022** | 81126,53 |

**MAD = 5691,46**

Thus we see that forecast for 2018 is 78 618,33 mil. tourist nights. To project demand for tourist nights in the 2018 we sum the 2015, 2016, 2017 and divide by 3.

Based on formula (2) we decided to forecast tourist nights by weighting the past 3 years as follows: 3-last year, 2-two years ago and 1-three years' age. Sum of weights are 6. The results of this weighted-average forecast are as follows:

Table 3. Estimate the number of tourist nights with weighted moving average model (000)

| Year | Actual tourist nights | 3-year weighted moving average | Forecast error |
|---|---|---|---|
| **1996** | 21860 | | |
| **1997** | 30775 | | |
| **1998** | 31852 | | |
| **1999** | 27126 | 29827,67 | -2701,67 |
| **2000** | 39183 | 29309,5 | 9873,5 |
| **2001** | 43405 | 33942,17 | 9462,833 |
| **2002** | 44692 | 39284,5 | 5407,5 |
| **2003** | 46635 | 43344,83 | 3290,167 |
| **2004** | 47797 | 45449 | 2348 |
| **2005** | 51421 | 46892,17 | 4528,833 |
| **2006** | 53007 | 49415,33 | 3591,667 |
| **2007** | 56005 | 51610 | 4395 |
| **2008** | 57103 | 54241,67 | 2861,333 |
| **2009** | 56300 | 56054,33 | 245,6667 |
| **2010** | 56416 | 56518,5 | -102,5 |
| **2011** | 60354 | 56491,83 | 3862,167 |
| **2012** | 62743 | 58365,67 | 4377,333 |
| **2013** | 64818 | 60892,17 | 3925,833 |
| **2014** | 66484 | 63382,33 | 3101,667 |
| **2015** | 71605 | 65305,17 | 6299,833 |
| **2016** | 78050 | 68766,83 | 9283,167 |
| **2017** | 86200 | 73974 | 12226 |
| **2018** | | 81050,83 | |
| **2019** | | 82266,83 | |
| **2020** | | 82516,86 | |
| **2021** | | 82189,1 | |
| **2022** | | 82307,31 | |

MAD = 4793,13

Moving averages, however, present three problems: 1) Increasing the size of n (the number of periods averaged) does smooth out fluctuations better, but it makes the method less sensitive to real changes in data; 2) Moving averages cannot pick up trends very well. Because they are averages, they will always stay within past levels and will not predict changes to either higher or lower levels. This is, they lag the actual values; 3) Moving averages require extensive records of past data.

Based on formula (4) we estimate the tourist nights with exponential smoothing model. The following table shows the results for $\alpha = 0,8$.

Table 4. Estimate the number of tourist nights with exponential smoothing model (000)

| Year | Actual tourist nights | Rounded forecast with =0.8 | Forecast error |
|---|---|---|---|
| **1996** | 21860 | 20000 | 1860 |
| **1997** | 30775 | 21488 | 9287 |
| **1998** | 31852 | 28917,6 | 2934,4 |
| **1999** | 27126 | 31265,12 | -4139,12 |
| **2000** | 39183 | 27953,82 | 11229,18 |
| **2001** | 43405 | 36937,16 | 6467,835 |
| **2002** | 44692 | 42111,43 | 2580,567 |
| **2003** | 46635 | 44175,89 | 2459,113 |
| **2004** | 47797 | 46143,18 | 1653,823 |
| **2005** | 51421 | 47466,24 | 3954,765 |
| **2006** | 53007 | 50630,05 | 2376,953 |
| **2007** | 56005 | 52531,61 | 3473,391 |
| **2008** | 57103 | 55310,32 | 1792,678 |
| **2009** | 56300 | 56744,46 | -444,464 |
| **2010** | 56416 | 56388,89 | 27,10712 |
| **2011** | 60354 | 56410,58 | 3943,421 |
| **2012** | 62743 | 59565,32 | 3177,684 |
| **2013** | 64818 | 62107,46 | 2710,537 |
| **2014** | 66484 | 64275,89 | 2208,107 |
| **2015** | 71605 | 66042,38 | 5562,621 |
| **2016** | 78050 | 70492,48 | 7557,524 |
| **2017** | 86200 | 76538,5 | 9661,505 |
| **2018** | | 84267,7 | |

MAD = 3651,57

On the basis of analysis, an exponential smoothing forecast model is preferred because its MAD is smaller. Based on the forecasts made, a further increase in the number of realized tourist nights in the Republic of Croatia is visible. Presented models show the highest accuracy of the forecast at a time of slowed or unsettled growth, as it was during the time of the global economic crisis in 2009 and 2010. The reasons should be sought in the gap between actual and forecast values. Specifically, the projected values are almost always lagging behind for current values (usually one year). Thus, the forecast values can be taken with reserve, or as a pessimistic variant of the forecast of the number of tourist nights spent.

## 5. CONCLUSION

Tourism demand in the Republic of Croatia measured by the number of overnight stays has been growing steadily. The number of tourist nights spent over the last twenty years has increased almost four times. According to current knowledge and estimates made in this paper, tourism demand will certainly not be a limiting factor for the development of Croatian tourism. Progress made in this work suggests a further tendency of growth of tourist demand measured by the number of realized tourist nights. The increase of realized tourist nights by 2022 will be higher than the estimated number in this work. Estimated made in this paper represent pessimistic variant of the forecast. Croatia has an invaluable wealth of natural beauty that creates demand for itself. Consequently, the task of tourist workers is increasingly reduced to the management of tourist offer in order to exploit natural beauty in a quality, economic and ecologically sustainable way. The economy of natural beauty should be supported by quality tourism products based on tradition, culture, knowledge and creativity with the full respect and encouragement of entrepreneurship in tourism. Cultural and creative tourism should become a fundamental part of the tourist offer of the Republic of Croatia.

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