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   INTRODUCTION

   REVIEW OF LITERATURE

   NEED/IMPORTANCE OF THE STUDY

   STATEMENT OF THE PROBLEM

   OBJECTIVES

   HYPOTHESES

   RESEARCH METHODOLOGY

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DEALING WITH SEASONALITY: MODELLING TOURISM DEMAND IN CROATIA

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ABSTRACT

The aim of the paper is to analyse tourism demand in Croatia and emphasise its seasonal patterns. The Croatian tourism is pronouncedly seasonal sensitive. Due to this fact, in modelling Croatian tourism demand, is necessary to implement quantitative methods that capture its seasonal character. Among the methods that can be used in analysing seasonal data, in this study the ratio-to-moving average method is used. After isolating the seasonal component of tourism demand several extrapolative methods were used with the purpose to model the number of tourist arrivals in Croatia; Naïve 1, Naïve 2, single moving average, weighted moving average, single exponential smoothing, Browns double exponential smoothing and the autoregressive method. The monthly tourist arrivals in Croatia in the period from January 2003 to December 2013 are used as a commonly measure of tourism demand. The analysed data indicate the seasonal character of Croatian tourism demand. Taking this into account, the authors first isolated the seasonal component and emphasised the residual effects on the movement of the tourist demand. The-ratio-to-moving-average method is explained in detail and implemented to tourist arrivals data obtained from the secondary data sources. After modelling the seasonally adjusted values of tourist arrivals, chosen methods were evaluated by forecasting accuracy measure, the mean absolute percentage error – MAPE. Finally, at the end of the paper, the authors point out the importance of analysing seasonal phenomena, such as tourism demand, with the appropriate methods which take into account the seasonal component of the phenomenon itself.

JEL CODE
C22, C53, L83

KEYWORDS
croatian tourism, ratio-to-moving-average, seasonality, tourism demand modelling, extrapolative methods, MAPE.

INTRODUCTION

The tourism turnover growth, experienced in the last few decades, confirms that Croatia is on the path towards making tourism an active generator of its economic development. In order to increase the economic significance of tourism, it is essential to adopt and implement a development tourism strategy focussed on more detailed and systematic both, qualitative and quantitative tourism demand analyses. When analysing tourism, it should be kept in mind that, Croatian tourism, now traditionally, has a pronounced seasonal character.

The aim of this study is to show the seasonal character of Croatian tourism demand. The seasonality is observed through the realized number of tourist arrivals in the period from January 2003 to December 2012. Generally, seasonality as a systematic intra – year fluctuation in data, often occurs in the economic cycle, and given the hypothesis, that it carries mostly negative than positive consequences, it requires to be analysed systematically and more in detail. According to the importance of tourism for the Croatian economic development, it is necessary to conduct systematically and comprehensive researches of tourism demand that take into account its seasonal character.

REVIEW OF LITERATURE

As seasonality is one the main characteristics of tourism demand, it has been ant still is the issue of a wide range of studies and researches. The most of them agree that seasonality is a systematic and regular movement caused by changes of weather, calendar and timing of decisions, directly or indirectly through the production and consumption decisions made by the agents of the economy (Lim and McAleer, 2001). Christine Lim and Michael McAleer (2001) discussed monthly seasonal variations, saying that the seasonality, or intra-year fluctuations in the tourist arrival data, is a widely known but relatively unappreciated facet of tourism time series data. They applied the moving average methods for estimating components of time series of monthly tourism arrivals to Australia.

Nicole Koenig and Eberhard Bischoff (2004) analysed seasonality in Welsh room occupancy data, and made two contributions. Firstly, they demonstrated that the principal component analysis to mean and trend corrected data, provides a valuable insight into various forces shaping the seasonal patterns embedded in the time series. Secondly, they demonstrated that in their area of research, at least in the service accommodation segment, the seasonality of demand is a much more complex phenomenon, than simply a large difference between tourist numbers in summer and winter.

Erdogan Koc and Galip Altiny (2006) in their analysis of seasonality in monthly person tourist spending agreed that seasonality in tourism activity is not a particular feature of a single destination or country, as it is experienced in almost all countries in the world. Starting from that, they founded that there is pronounced seasonality in per person tourist spending data.

R. Cannas (2012) in a paper about key concepts and policies, explored the main characteristics of seasonality, and focused the attention on policies and strategies in order to highlight, how and in which ways tourism destinations can modify tourism seasonality's feature.

The problem of seasonality in Croatian tourism was discussed by Kožić, Krešic and Boranić - Živoder (2013). They analysed Croatian tourism seasonality using the method of the Gini coefficient. They concluded that the seasonality of Croatian tourism increased with the emergence of global economic crisis, but also that domestic tourism recorded less seasonality than foreign.

IMPORTANCE OF THE STUDY

The importance of the study can be manifested in the attempt of delineating the lawfulness of the tourism demand behaviour, as a dynamic phenomenon, and predicting future trends based on known past conditions and present observations. The role of tourism in Croatia is undoubtedly great. According to Croatian Bureau Of Statistics in 2012 was achieved 12,3 million arrivals and 70,3 million overnight stays, which makes share of tourism in GDP of almost 20%. Tourism is a significant source of profit for a wide range of activities in Croatia. According to data from the Croatian Bureau of Statistics in the first three months of 2013, the Croatian tourism sector registered an income of 306,9 million of Euro, which is 3,1% of the total Croatian GDP. According to the Croatian Ministry of Tourism in

2012 there were 62.7 million of tourists nights registered and among these 57.5 million were realized by foreign tourists. Since 2009 the number of foreign tourist nights reveals a slightly upward trend with a growth rate of 4.5%. Foreign tourists account for a total of 85% of the total Croatian tourist activity. Table 1 gives an overview of the number of tourist nights, according to the country of residence.

STATEMENT OF THE PROBLEM

The significant role of tourism for the entire Croatian economic development imposes a constant need for monitoring and analysing tourism demand and its characteristics. It also imposes an analysis of seasonality in Croatian tourism demand. Although, there are other economic activities, Croatia's economy is largely based on tourism. Tourism represents a significant source of profit for the Croatian economy. Due to the significance of the tourism sector for the entire Croatian economic development systematic quantitative analyses are the condicio sine qua non for future Croatian tourism development and improvement and its international competitiveness enhancement. Tourism modelling has to take into account the main patterns and the core determinants of the Croatian tourism demand. Among the most significant features of the Croatian tourism demand, is certainly its pronounced seasonal character. It is necessary therefore, in modelling Croatian tourism demand, to use proper quantitative methods that capture this seasonality**.**

OBJECTIVE OF RESEARCH

There are several objectives in this paper:

- to indicate the seasonal character of Croatian tourism
- to use the-ratio-to moving-average method to isolate the seasonal component
- to emphasize the meaning of residual distortion index
- to model Croatian tourism demand using several chosen extrapolative models

HYPOTHESES

The main hypothesis in this study is that Croatian tourism demand is seasonal sensitive and has therefore a pronounced seasonal character. Such a phenomenon requires the implementation of appropriate methods of adjustment in order to enable detail and systematic research of its patterns and determinants.

CONCEPT OF SEASONALITY IN TOURISM AND ITS IMPACT

The monitoring of tourism economic aspects is based on the analysis of the most important tourism demand characteristics, which are: (Pirjevec, 1998)

- demand and supply dislocation
- demand heterogeneity
- demand elasticity
- seasonal character

One of the most dominant characteristics of tourism demand is certainly its seasonal character, and in the literature on seasonality, it is commonly referred as the most important characteristic of the modern tourism market. According to Cannas (2012) seasonality in tourism is a temporal imbalance in the phenomenon of tourism, (which) may be expressed in terms of dimensions of such elements as number of visitors, expenditure of visitors, traffic on highways and other forms of transportations, employment, and admissions to attractions.

Generally, seasonality is the systematic, not necessarily regular, intra – year movement usually caused by weather or calendar influence.

There are two types of seasonality; natural and institutional. The first one is related to regular and recurring temporal changes in natural phenomena at some destination, which are often associated with climate, season of the year, precipitation, day length. The other one, institutional, is result of some religious, cultural and social factors. Well known type of this kind of seasonality is school vacations in the winter and summer.

Considering that seasonality is intra-year movement, there are many negative impacts which are associated to it. Some of them are (Čorak, 2009):

- seasonality of tourism demand affects the occupancy rates
- general tourism infrastructure realizes too low utilization rate out of season;
- to cope with the top of the season, the public sector is faced with high operating business costs;
- in many tourist areas seasonality leads to seasonal employment, and working hours are often extended;
- travel consumers are faced with high prices, an excessive concentration of tourist traffic, traffic jams and often poor service, which negative affect on their satisfaction;
- concentration of demand in a short period of time, usually causes environmental consequences or lead to exceeding of natural or cultural attractions capacities.

The goal of all participants on tourism supply side is to reduce seasonal fluctuations in business, or extend the tourist season in order to achieve better economic effects, in terms of specific tourism forms development that are using a certain resource. The tourism demand analysis and its seasonality researching help emissive and receptive tourist countries to critically analyse their own position in the tourism market. It also helps to realize that changes on tourism market evolve as fast as they can adjust to these changes and allows better cope with the competition.

Taking into account the mentioned above, in this study the tourism demand in Croatia, is analysed using ratio – to – moving – average method, as a useful and comprehensive quantitative decomposition method for seasonal occurrence measuring.

THE ANALYSIS OF SEASONAL EFFECTS ON TOURISM DEMAND IN CROATIA

Historically, seasonality of the Croatian tourism market is a significant problem; as it is evidenced by data from Croatian Bureau of statistics 94% of overnight stays and 86% of tourism revenues are generated from April to September. The analysis of seasonal effects on tourism demand in Croatia will be shown through data, research methodology and empirical results.

DATA AND RESEARCH METHODOLOGY

Tourist arrivals and tourists' overnight stays are the most commonly used measures and indicators. In this paper, the realized number of tourist arrivals was used for analysing the presence of the seasonal pattern. Secondary data sources were used; data on the number of tourist arrivals were collected from Croatian Bureau of Statistics data (Firs Release). Data are organized chronologically, in the time series of 120 observations (from January 2003 to December 2012). Each observation represents the realized number of arrivals during the month. Figure 1 shows the trends in the total number of realized tourist arrivals in Croatia from January 2003 to December 2012.

FIGURE 1: MONTHLY TOURISM ARRIVALS IN CROATIA (January 2003 – December 2012)

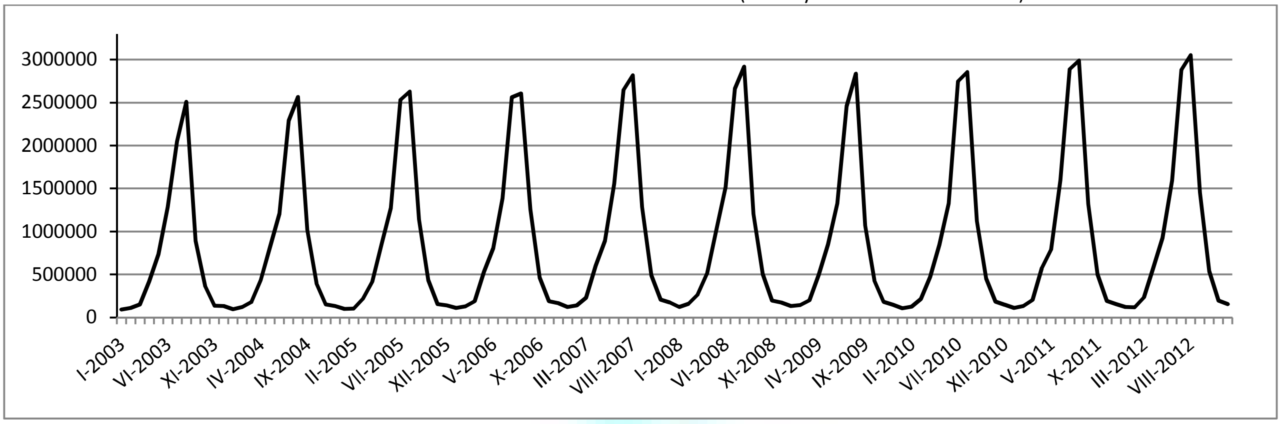


Figure 1, shows that the majority of tourist arrivals, realized in Croatia, are concentrated in the summer months, and that this pattern repeats throughout the whole observed period. It can be concluded that Croatian tourism is characterized by pronounced seasonality, resulting in numerous negative effects on the economy. This fact points out the necessity of further detailed and comprehensive analysis.

EMPIRICAL RESULTS

There are different approaches for dealing with appearance of seasonality. Some forecasters quantify relatively stable recurring pattern in time series, and remove it. Starting from the seasonal character of the empirical tourism arrivals time-series it is necessary to use a method that takes into account the seasonal influences. Therefore, in this study, the-ratio-to-moving-average method, as one of the seasonal adjustment methods, is used to analyse the empirical time-series. In using the-ratio-to-moving-average method, the values of the tourist arrivals time series will be cleared of seasonal influences.

As mentioned above, data have a strong seasonal character, and the analysis is based on the multiplicative model:

$$A_t = T_t \cdot C_t \cdot S_t \cdot I_t \qquad (1)$$

where

A – the actual value in time series

T – the trend component

C – the cyclical component

S – the seasonal component

I – the irregular component

T – some time periods less than one year 1

The challenge of the-ratio-to-moving-average method is to distinguish these components, and isolating the seasonal one. The-ratio-to-moving-average method is implemented in several steps:

1. Developing a moving average series as long as the number of data point's time series has in a year

Time series to be analysed is monthly, so a twelve – month moving averages are calculated. Such moving averages represent the trend – cycle component of the equation under (1) (they contain no effects by definition). The twelve – month moving averages need to be transformed to centred moving averages. The seasonal and error components are averaged out, leaving a series containing mostly the trend and cycle:

$$CMA(12)_t = T_t \cdot C_t \qquad (2)$$

2. Calculating the adjusted seasonal factor

First step in calculating adjusted seasonal factors is calculating of seasonal ratios. Seasonal ratios are calculated by dividing each actual value of tourist arrivals by the twelve- month centred moving average, concretely:

$$S_t \cdot I_t = \frac{A_t}{CMA_t} \qquad (3)$$

The meaning of components is the same as in equation (2). This way the seasonal – irregular component is isolated. After calculating seasonal ratios, raw seasonal factors can be calculated as averages for each month in time series. These seasonal ratios are ˝raw˝ in the sense that they do necessarily sum to even number of observations they are calculated for (in this case twelve because the observed data are monthly). They are forced to sum to twelve by dividing their raw sum into twelve and multiplying the resulting ˝adjustment factor˝ by each of the raw seasonal factors. This way the adjusted seasonal factors are calculated.

3. Calculating the seasonal adjusted series

In this step each of the monthly values of time series were divided by appropriate adjusted seasonal factors, and series stripped of its seasonal component is obtained. Here is important to highlight that by averaging the seasonal ratios (in step 3) not only seasonal pattern was isolated, but also irregular component as well. Since this component is assumed to be random, its mean is zero. In averaging the seasonal ratios, we assume the irregular pattern approximates this mean (Frechtling, 76)

4. Calculating the residual factors

Residual factors are determined by dividing seasonal adjusted series values by centred moving averages as estimations of trend. Residual factors are used in calculating of the residual distortion index which is obtained by multiplying the residual factors by 100.

Previously described procedure is applied to the time series of realized tourist arrivals in Croatia in the period 2003 (January) -2012 (December). The results are shown in the table below.

1 More about four constituent parts: trend, cycle, seasonal and an irregular component see in Frechtling, 69.

TABLE 1: PRODUCING SEASONALLY ADJUSTED TIME SERIES OF TOURIST ARRIVALS IN CROATIA (JANUARY 2003 – DECEMBER 2012)

Observation	Tourist arrivals	Centred Moving Averages (12)	Seasonal Ratios	Adjusted Seasonal Factors	Seasonally Adjusted Series	Residual Factors	Residual Distortion Index
I-2003	90622	*	*	0,1252	723562	*	*
II-2003	109550	*	*	0,1438	761818	*	*
III-2003	151439	*	*	0,2354	643266	*	*
IV-2003	420251	*	*	0,5597	750800	*	*
V-2003	735684	*	*	0,9515	773170	*	*
VI-2003	1285366	*	*	1,5518	828295	*	*
VII-2003	2049213	739950,71	2,7694	3,1465	651259	0,8801	88,01
VIII-2003	2511454	740532,75	3,3914	3,1075	808192	1,0914	109,14
IX-2003	890474	742168,63	1,1998	1,2884	691135	0,9312	93,12
X-2003	364029	743893,33	0,4894	0,5049	720933	0,9691	96,91
XI-2003	137260	748180,92	0,1835	0,2154	637170	0,8516	85,16
XII-2003	132636	748688,42	0,1772	0,1696	781892	1,0443	104,43
…[2]	…	…	…	…	…	…	…
I-2006	111133	849468,50	0,1308	0,1252	887330	1,0446	104,46
II-2006	127609	849578,00	0,1502	0,1438	887401	1,0445	104,45
III-2006	189341	853314,79	0,2219	0,2354	804262	0,9425	94,25
IV-2006	529900	859314,25	0,6167	0,5597	946694	1,1017	110,17
V-2006	804076	861938,00	0,9329	0,9515	845047	0,9804	98,04
VI-2006	1387747	864436,17	1,6054	1,5518	894269	1,0345	103,45
VII-2006	2560938	865970,13	2,9573	3,1465	813890	0,9399	93,99
VIII-2006	2605066	866950,83	3,0049	3,1075	838316	0,9670	96,70
IX-2006	1254370	869076,17	1,4433	1,2884	973570	1,1202	112,02
X-2006	464653	873639,13	0,5319	0,5049	920212	1,0533	105,33
XI-2006	187196	880298,75	0,2127	0,2154	868976	0,9871	98,71
XII-2006	164387	891114,96	0,1845	0,1696	969065	1,0875	108,75
…[3]	…	…	…	…	…	…	…
I-2012	119765	967432,63	0,1238	0,1252	956251	0,9884	98,84
II-2012	117325	969684,92	0,1210	0,1438	815886	0,8414	84,14
III-2012	232981	977781,79	0,2383	0,2354	989632	1,0121	101,21
IV-2012	575333	984754,83	0,5842	0,5597	1027862	1,0438	104,38
V-2012	923520	986339,25	0,9363	0,9515	970577	0,9840	98,40
VI-2012	1594451	986378,63	1,6165	1,5518	1027470	1,0417	104,17
VII-2012	2882654	986263,33	2,9228	3,1465	916135	0,9289	92,89
VIII-2012	3051943	*	*	3,1075	982123	*	*
IX-2012	1452988	*	*	1,2884	1127726	*	*
X-2012	536148	*	*	0,5049	1061802	*	*
XI-2012	195203	*	*	0,2154	906145	*	*
XII-2012	152849	*	*	0,1696	901048	*	*

Table 1, shows the adjusted tourist arrival seasonal time series values in Croatia in the period from January 2003 to December 2012. The first column in the table is the name of each observation in the year (for example, I – 2003 means January in 2003). The second column shows original data of tourist arrivals in mentioned period. There were 120 observations of tourist arrivals. For calculating each of the adjusted values firstly centred moving averages (twelve – month) needed to be calculated (column 3). The calculated centred moving averages enable the calculation of seasonal ratios (column 4). The seasonal ratios were used for the calculation of seasonal factors and adjusted seasonal factors (detailed calculation is in Table 2.). The calculated adjusted seasonal factors (column 5) were used in the computation of seasonally adjusted series (column 6). The last two columns show the residual factors and residual distortion index.

The distortion index allows to the estimation of the residual effects, and the determination of the value for which is the observed phenomenon lower or greater due to the residual effects. Namely, the residual distortion index in July 2003 is 88,01, which means that the seasonally adjusted value of tourist arrivals in July 2003 is for 11,9% smaller because of residual influences.

As described, when implementing the-ratio-to-moving-average method, the adjusted seasonal factors have to be calculated. The following table shows monthly seasonal ratios which were used in calculation of seasonal factors and adjusted seasonal factors.

TABLE 2: SEASONAL FACTORS AND ADJUSTED SEASONAL FACTORS

	January	February	March	April	May	June	July	August	September	October	November	December
2003	*	*	*	*	*	*	2,7694	3,3914	1,1998	0,4894	0,1835	0,1772
2004	0,1237	0,1572	0,2316	0,5543	1,0530	1,5400	2,9186	3,2732	1,2986	0,5024	0,1907	0,1679
2005	0,1215	0,1249	0,2639	0,5023	1,0236	1,5282	3,0422	3,1520	1,3661	0,5195	0,1827	0,1636
2006	0,1308	0,1502	0,2219	0,6167	0,9329	1,6054	2,9573	3,0049	1,4433	0,5319	0,2127	0,1845
2007	0,1348	0,1539	0,2458	0,6490	0,9608	1,6766	2,8446	3,0284	1,3757	0,5273	0,2231	0,1836
2008	0,1301	0,1683	0,2831	0,5408	1,0853	1,6186	2,8404	3,1129	1,2886	0,5431	0,2131	0,1884
2009	0,1475	0,1643	0,2282	0,5770	0,9894	1,5492	2,8731	3,3247	1,2560	0,5063	0,2100	0,1732
2010	0,1240	0,1436	0,2421	0,5332	0,9596	1,5004	3,1095	3,2307	1,2704	0,5114	0,2088	0,1646
2011	0,1184	0,1420	0,2154	0,6030	0,8306	1,6738	3,0257	3,1316	1,3812	0,5244	0,1990	0,1608
2012	0,1238	0,1210	0,2383	0,5842	0,9363	1,6165	2,9228	*	*	*	*	*
Total	1,1546	1,3254	2,1704	5,1606	8,7715	14,3087	29,3036	28,6499	11,8799	4,6556	1,8236	1,5638
Seasonal Factors	0,1283	0,1473	0,2412	0,5734	0,9746	1,5899	2,9304	3,1833	1,3200	0,5173	0,2026	0,1738
Adjusted Seasonal Factor	0,1285	0,1475	0,2415	0,5743	0,9761	1,5923	2,9348	3,1881	1,3220	0,5181	0,2029	0,1740

[2] Due to the large number of data intermediate data are omitted.
[3] Due to the large number of data intermediate data are omitted.

In order to compare original and adjusted data of tourist arrivals, data are shown graphically (Figure 2).

FIGURE 2: MONTHLY TOURISM ARRIVALS IN CROATIA – ORIGINAL AND ADJUSTED VALUES (JANUARY 2003 – DECEMBER 2012)

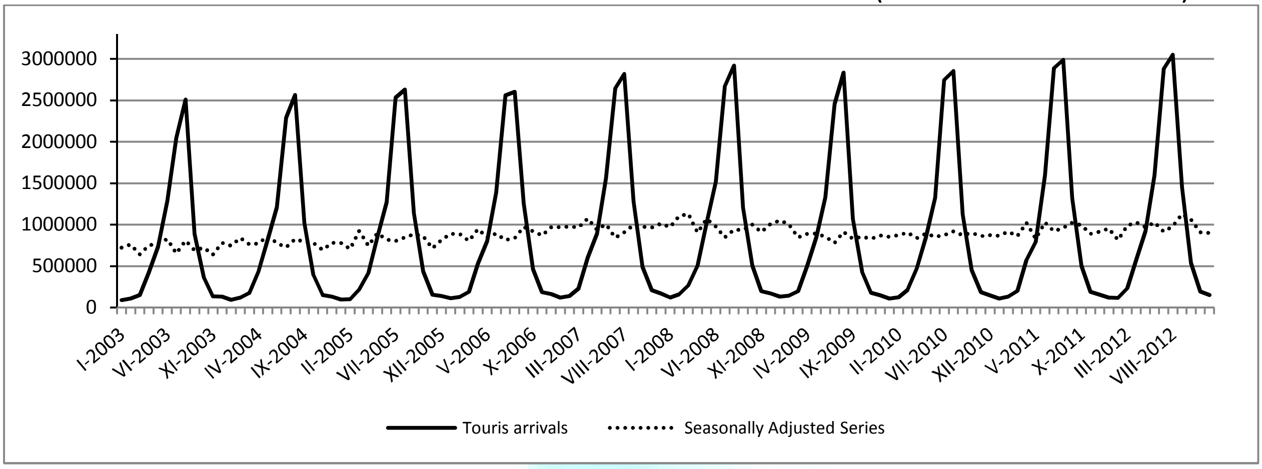


Figure 2, shows the original and adjusted data on tourist arrivals. The curve of seasonally adjusted values indicates that the original values are cleared of seasonal effects. After obtaining the seasonally adjusted values, the empirical time-series can be used in modelling the number of tourist arrivals. The methods used in this paper are as follows:

- Naïve 1
- Naïve 2
- Single moving average
- Weighted moving average
- Single exponential smoothing
- Browns double exponential smoothing
- An autoregressive method

The basic theoretical concepts of the chosen techniques used in this study are described below.

The Naïve 1

According to the Naïve 1 method the value for the period to be forecast is equal to the actual value of the last period available. This method is also called ˝no change method˝, and it´s calculated as follows:

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

Where
F – forecast value
A – actual value
T – some time period

The Naïve 2

This method as also one of the ˝no change method.˝ We can define the Naïve 2 forecast value as the current value multiplied by the growth rate between the current value and the previous value, or:(Frechtling, 66)

$$F_t = A_{t-1} \cdot \frac{A_{t-1}}{A_{t-2}} \quad (5)$$

The meaning of the components is the same as in equation (4).

The Single Moving Average

This method averages any number of periods to produce a forecast. The general equation of this method is as follows:

$$F_t = \frac{A_{t-1}+A_{t-2}+A_{t-1}}{n} \quad (6)$$

Where
F – forecast value
A – actual value
T – some time period
N – number of past periods

The Weighted Moving Average

In modelling time series trend or some other principle weights can be used. The stronger weight emphasis that data are fresh and for older data (which are considered as less important) weight is smaller. According to Weighted moving average method to each data is given different weight, and these multiplied factors are averaged. The equation for calculating Weighted moving average is:

$$F_t^* = \sum_{s=-m}^{m} W_s A_{t+s} \quad (7)$$

Where
F – forecast value
A – actual value
W – weight
T – some tome period

The Single Exponential Smoothing

This method is very similar to Single moving average, but instead of creating simple average it gives more weight to the most recent measurement. This method is used in tourism often, as good short-term forecast. Equation for calculating single exponential smoothing values is:

$$F_t = F_{t-1} + \alpha(A_{t-1} - F_{t-1}) \quad (8)$$

Where
F – forecast value
α – smoothing constant (between 0 and 1)
A – actual value
T – some tome period

The Browns Double Exponential Smoothing

Double exponential smoothing technique should be used when time-series data has only trend and no seasonality. The following equations are used in double exponential smoothing with Brown's method (Baldigara, 2013):

Level $\alpha A_t + (1-\alpha)(L_{t-1} + b_{t-1})$
Trend $b_t = \alpha(L_t - L_{t-1}) + (1-\alpha)b_{t-1}$ (9)
Forecast $F_{t+h} = L_t + hb_t$
Where
L – level of the series
α – level and trend smoothing constant (between 0 and 1)
A – actual value
B – trend of the series
T – some time period
H – number of time periods ahead to be forecast

The Autoregressive Method

Autoregression is best applied to seasonally adjusted series (Frechtling, 2001). This is an application of regression, but independent variables are lagged. An autoregressive model follows the form:

$$F_t = \alpha + \beta_1 A_{t-1} + \beta_2 A_{t-2} + \cdots + \beta_n A_{t-n} \quad (10)$$

Where F – forecast value
α – estimated constant
β – estimated coefficients
A – actual value in time series
t – some time period
n – number of past values included

After the short overview of the used methods, the modelling results are given.

TABLE 3: SELECTED MODELS COMPUTING RESULTS

	Seasonally Adjusted Series	Naive 1	Naive 2	Single Moving Average	Weighted Moving Average	Single Exponential Smoothing	Browns Double Exponential Smoothing	Auto-regression
I-2003	723562	*	*	*	*	*	761818	*
II-2003	761818	723562	*	*	*	723562	800074	*
III-2003	643266	761818	*	*	*	742690	720724	*
IV-2003	750800	643266	*	709549	696166	692978	742335	784119
V-2003	773170	750800	*	718628	716792	721889	772034	749598
VI-2003	828295	773170	*	722412	744063	747529	828511	751979
VII-2003	651259	828295	*	784088	797004	787912	723919	798087
VIII-2003	808192	651259	*	750908	730590	719586	771158	827994
IX-2003	691135	808192	*	762582	759232	763889	716242	775753
X-2003	720933	691135	*	716862	723508	727512	704857	777839
XI-2003	637170	720933	*	740087	725543	724222	640361	784867
XII-2003	781892	637170	*	683079	674085	680696	715857	756473
…[4]	…	…	…	…	…	…	…	…
I-2006	887330	813648	564050	796240	788176	800127	838131	812261
II-2006	887401	887330	914257	804673	833721	843729	885089	801352
III-2006	804262	887401	961012	862793	875086	865565	846791	865724
IV-2006	946694	804262	887473	859665	845820	834914	923834	891175
V-2006	845047	946694	721123	879452	889334	890804	891835	857734
VI-2006	894269	845047	1089125	865334	872132	867925	901055	886381
VII-2006	813890	894269	743400	895337	886599	881097	843685	894609
VIII-2006	838316	813890	943492	851069	845876	847494	825871	879351
IX-2006	973570	838316	733511	848825	839500	842905	921515	863980
X-2006	920212	973570	862743	875259	901872	908237	942332	846078
XI-2006	868976	920212	1108823	910699	924348	914225	908784	908949
XII-2006	969065	868976	866854	920919	903487	891600	957125	934138
…[5]	…	…	…	…	…	…	…	…
I-2012	956251	917360	783982	933373	920625	928603	919914	928536
II-2012	815886	956251	945805	920842	932065	942427	831819	903781
III-2012	989632	815886	995143	896499	879587	879157	914098	929251
IV-2012	1027862	989632	675520	920590	926153	934394	1002793	886169
V-2012	970577	1027862	1163378	944460	979789	981128	1010445	907675
VI-2012	1027470	970577	1066092	996024	992848	975852	1046973	983012
VII-2012	916135	1027470	913292	1008636	1008571	1001661	976860	973144
VIII-2012	982123	916135	1084364	971394	962320	958898	976113	976280
IX-2012	1127726	982123	804799	975243	967685	970510	1086444	951094
X-2012	1061802	1127726	1048110	1008661	1043926	1049118	1102488	939242
XI-2012	906145	1061802	1273328	1057217	1070497	1055460	983595	1020619
XII-2012	901048	906145	995879	1031891	994961	980803	900964	1044321

After modelling seasonally adjusted tourist arrivals, it was necessary to examine the forecast accuracy of the chosen techniques. For this purpose, the Mean Absolute Percentage Error was used. The Mean Absolute Percentage Error is expressed in generic percentage terms and it is computed by the following formula: (Baldigara, 2013)

$$MAPE = \frac{1}{n}\sum_t^n \frac{|(A_t - F_t)|}{A_t} \cdot 100 \quad (11)$$

MAPE is measure which permits the comparison of different models, with different time periods and number of observations.

[4] Due to the large number of data intermediate data are omitted.
[5] Due to the large number of data intermediate data are omitted.

TABLE 4: MAPE AND FORECASTING ACCURACY

MAPE	Forecasting accuracy
Less than 10%	Highly accurate
10 – 20%	Good
20 – 50%	Reasonable
Greater than 50%	Inaccurate

Source: Baggio, R, and Koblas, J. (2011)

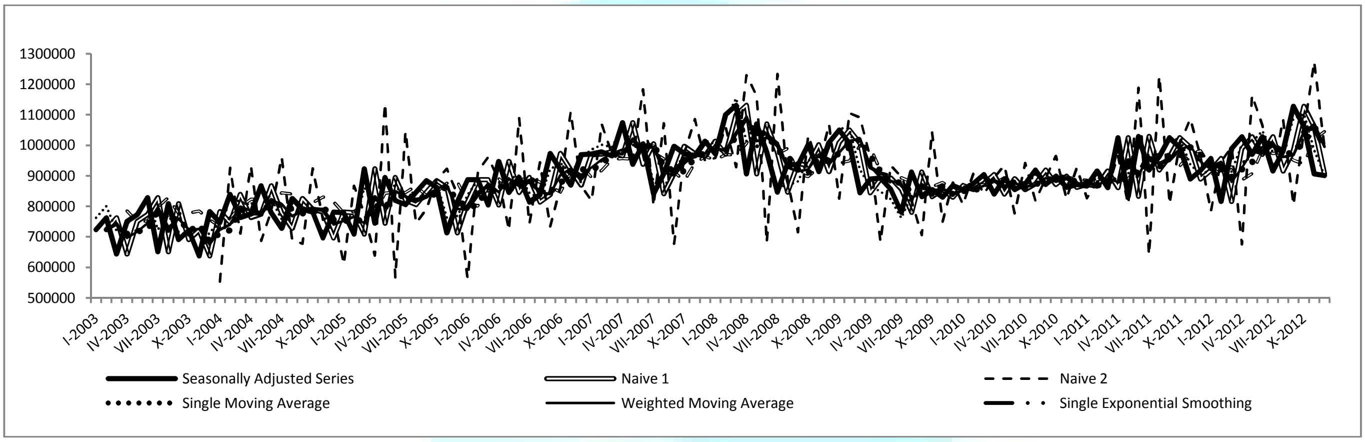
The calculated MAPE values for the used models are given in table below.

TABLE 5: MAPE OF SELECTED MODELS

	MAPE
Naive 1	8,5673
Naive 2	14,3285
Single Moving Average	6,6054
Weighted Moving Average	6,6999
Single Exponential Smoothing	6,6924
Browns Double Exponential Smoothing	**3,2570**
Autoregression	6,4731

According to the computed MAPE values, represented in the table above, it can be concluded that almost all of used models are highly accurate (six of seven models have MAPE less than 10%). One model, naïve 2, has good forecasting accuracy (with MAPE ≈ 14%).

FIGURE 3: FORECAST OF SEASONALLY ADJUSTED SERIES: COMPARISON OF FORECASTING MODELS



The model which best fits the seasonally adjusted series of tourist arrivals in period from January 2003 to December 2012 is Browns Double Exponential Smoothing (calculated MAPE is the smallest, MAPE = 3,25%).

CONCLUSIONS

Due to the growing importance of the tourism sector worldwide, recently there has been an increasing interest in researching tourism demand determinants and its modelling. One of the primary challenges facing tourism management and development is to produce systematic, prompt and accurate tourism demand forecasts. Accurate forecasts should be considered a tool for explaining, researching and forecasting tourist demand in Croatia. The paper investigates the application of time-series based quantitative methods in Croatian tourism demand modelling and forecasting. The aim of the paper is to model and analyse tourism demand in Croatia. For this purpose the ratio-to-moving-average method is applied in order to capture the essence of tourists' arrival patterns in Croatia. The time-series of tourist arrivals from January 2003 to December 2012 was seasonally adjusted using the-ratio-to-moving-average method. The-ratio-to-moving-average method is a powerful tool which allows the isolation of the seasonal component, but also indicates the extent of the residual factors influencing the observed values of the analysed tourism demand. After seasonal adjustment, seven basic quantitative extrapolative methods were chosen, and seasonally adjusted tourist arrivals were modelled and evaluated with the MAPE forecasting accuracy measure. The obtained results showed that Browns double exponential smoothing fits the best the seasonally adjusted values. The analysis of tourism demand patterns should be considered crucial for forecasting and modelling, decision-making and all other activities that support tourism development.

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