MEASURING TOURISM SEASONALITY: APPLICATION AND COMPARISON OF DIFFERENT METHODS

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Abstract
Purpose – Tourism seasonality is a well-known and established phenomenon causing dominantly negative implications. New efforts are required to combat or mitigate tourism seasonality. The aim of this paper is to provide a better understanding of different measurement methods, as proper measurement of seasonality is a prerequisite for further activities. With the application and comparison of different measurement methods, a comprehensive insight will be provided as a background for further application and decision making. Furthermore, this study proposes to quantify seasonality in a Mediterranean country, Croatia.
Methodology – Secondary data on tourist overnights in Croatia, for the period 2005-2016, is acquired from statistical publications of The Croatian Ministry of Tourism. The measurement approach is based on four measurement methods: Seasonality ratio, Seasonality indicator, Seasonality share and Gini coefficient.
Findings – Theoretical findings: the application of tourism seasonality measurement methods is depending on the purpose of measurement, as the cognition of measuring outcomes is varying between measurement methods. A combination of different methods is required to understand the structure of seasonality in certain tourist destination. Not one measurement method is superior to another, they are complementary. Empirical findings: high tourism seasonality is indicated within all measurement methods, Croatia is exposed to extreme tourism seasonality, whereby extreme seasonal concentration of tourist activities is constant over years.
Originality of the research – The theoretical contribution arises from the comprehensive insight into tourism seasonality measurement methods, their application and outcome. In addition, the seasonality share as a new measurement approach is proposed. The empirical contribution derives from the quantification of tourism seasonality strength and dynamics in Croatia. Research findings are a great contribution to future tourism seasonality research in a theoretical and empirical manner.
Keywords tourism seasonality, measurement, quantification of seasonality, Croatia

INTRODUCTION

Despite the fact that almost all tourist destinations are facing seasonality and that seasonality is an identified problem which has to be tackled, surprisingly the general impression is that seasonality is still an incomprehensible phenomenon. A good understanding of tourism seasonality is essential for the efficient operation of tourism facilities and infrastructure. Although there is a disagreement among authors about the adequate representation of tourism seasonality in research, authors are in agreement with the definition, identified causes and implications of tourism seasonality. One of the most cited definition is provided by Hylleberg (1992, p. 4) “seasonality is the systematic,

although not necessarily regular, intra-year movement caused by changes in the weather, the calendar, and timing of decisions, directly or indirectly through the production and consumption decisions made by the agents of the economy. These decisions are influenced by the endowments, the expectations and the preferences of the agents, and the production techniques available in the economy". Natural and institutional factors are recognized as the main causes of tourism seasonality (Baum and Hagen, 1999; Butler, 1994; Hartmann, 1986; BarOn, 1975). Additionally, social pressure, inertia, sporting season and calendar effects are identified as causes of seasonality (Jang, 2004; Baum and Morrison, 2004; Goulding, Higham and Hinch, 2002). The most significant aspect of seasonality is that involves the concentration of tourist flows in relatively short periods of the year, creating overutilization of tourist capacities in one, relatively short part of the year, and underutilization during the rest of the year. Fluctuations of tourist flows are affecting the economy, employment, ecology and socio-cultural carrying capacity (Chung, 2009; Koenig and Bischof, 2004; Jang, 2004; Commons and Page, 2001; Krakover, 2000; Butler, 1994; Allcock, 1989). The references for causes and implications of tourism seasonality are long drawn, suggesting the acceptance of the knowledge and the shortcomings of further efforts directed to understanding this salient and significant characteristic of tourism. In spite of the fact that much effort has been made by both the private and public sectors to reduce seasonality in tourist destinations and that seasonality has also received much attention in the tourism related literature over several decades, it still remains little understood (Butler, 2001). Prerequisite for the application of strategies to combat seasonality is adequate measurement. The identification of causes, analysis of implications as well as examination of applied strategy requires a quality measurement approach. The aim of this paper is to provide a better understanding of different measurement methods by comprehensive insight into tourism seasonality measurement methods, their application and outcome. Research findings will create a background for further application and decision making. The empirical purpose of this study is to quantify seasonality in Croatia, a proxy for Mediterranean countries suffering under extreme seasonality, as a statistical data for tourist overnight stays was obtained for this chosen country.

1. LITERATURE REVIEW

A shortage on attempts was identified in tourism literature to adequately present tourism seasonality measurement methods and their proper application. The most common measurement approach is the Gini coefficient. Kožić, Krešić, and Boranić-Živoder (2013) used Gini coefficient with the intention to quantify tourism seasonality in Croatia considering origin of tourists, inbound market, accommodation capacities and tourist region. The Gini coefficient was applied in Ćorluka, Matošević Radić and Geić (2013) with the intention to measure seasonal concentration differences within selective forms of tourism. Gini coefficient was also used by Kožić (2013) to measure the degree of tourism seasonality within European Mediterranean countries. Halpern (2012) investigated, using Gini coefficient, the seasonal concentration of demand for tourism in Norway, at both national and regional level. Seasonal concentration of demand was decomposed at the national level according to nationality, accommodation and main purpose of visit. Bigović (2012) used the Gini coefficient for the purpose of describing and analysing the seasonal concentration in Montenegrin tourism. Fernandez-Morales

and Mayorga-Toledano (2007) applied the Gini coefficient decomposition of the seasonal concentration by nationalities in Costa del Sol as a mature Mediterranean destination in the South of Spain. Fernandez-Morales (2003) analysed seasonal concentration in tourism demand series for three Spanish Mediterranean destinations by means of the Gini coefficient, decomposing it into inequality between and within seasons. A composite approach based on five measurement methods was provided by Bigović (2012). The author combined the seasonal range, coefficient of seasonal variation, seasonality ratio, seasonality indicator and the Gini coefficient to quantify seasonal variations in tourism demand and to benefit from an understanding of seasonality in Montenegrin tourism. Apart of measuring seasonality by various methods, the research did not provide the interpretation and purpose of a particular indicator. Ćorluka and Matošević Radić (2014) provided a combination of seasonal ratio and Gini coefficient in the analysis of seasonality in inbound tourist demand in Croatia. Seasonality of demand was examined in terms of county, nationality and organization of tourist arrivals. r. The most comprehensive study was provided by Karamustafa and Ulama (2010). Measuring seasonality with the use and comparison of different methods (seasonality ratio, seasonality indicator, Gini coefficient and seasonality index) a great contribution to the understanding of measurement approaches was provided. The authors identified strengths and weaknesses of seasonality measurement methods. The extensive study of Karamustafa and Ulama (2010) contributed to the understanding of measurement approaches but still remained incomplete.

In current research, measurement methods were used for the quantification of tourism seasonality in chosen destination. Findings about proper use of tourism seasonality measurement methods and interpretation of measurement outcomes are still missing. Better understanding of the application of particular methods, with regard to the purpose of the research, and qualitative description of finding outcomes is necessary. Tourism seasonality, as the most determinative and distinctive feature of tourism, is gaining on relevance. With the increase of international tourism, the concentration of tourist flows in high season is growing. Further activities to combat and mitigate tourism seasonality are needed. To approach the problem properly, adequate measurement is required. This paper will contribute to better understanding of different measurement methods, as appropriate measurement of seasonality is a prerequisite for further activities.

The following questions are raised in this paper. Is there a link between measurement methods and the purpose of measurement? What is the intensity and dynamics of tourism seasonality in Croatia?

2. METHODOLOGY

Research survey is done for Croatia, a Mediterranean country, observed data period is from year 2005 till 2016. Evaluations are based on secondary data, tourist overnight stays, acquired from the statistical publications from the Croatian Ministry of Tourism. Croatian Ministry of Tourism collects and publishes the data at monthly intervals based on the monthly report on arrivals and tourist overnight stays. The data is chronologically organized in an interval of 132 months (January 2005 - December 2016), where the unit of measure represents the number of tourist overnight stays spent during one month.

Chosen measurement methods are the seasonality ration, seasonality indicator, seasonality share and Gini coefficient.

The *seasonality ratio* represents the relation of the highest number of tourist overnight stays and the average number of tourist overnight stays per month. Seasonality ratio is calculated by dividing the month with the highest number of tourist overnight stays with the average number of tourist overnight stays per month. The seasonality ratio is varying between 1 and 12 (i.e. 1≤Seasonality ration≥12). In case of equal distribution within the year, the seasonality ratio would be 1, while in case all tourist overnight stays would be realized in one month seasonality, ratio would be 12. Therefore, the ratio is increasing with the seasonal variation increase. Seasonality ratio ≥ 2 is indicating extreme seasonality.

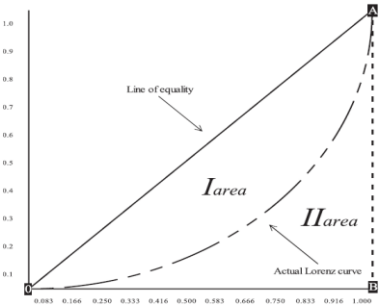
The *seasonality indicator* represents the relation of the average number of tourist overnight stays and the highest number of tourist overnight stays per month (i.e. the inverse value of the ratio used in calculating the seasonal ratio). The seasonality indicator is calculated by dividing the average number of tourist overnight stays per month with highest number of tourist overnight stays. The seasonality indicator is varying between 0.08333 and 1 (i.e. 1/12≤Seasonality indicator≥1). Having the same number of tourist overnights every month the seasonality indicator would be 1, having all tourists overnight stays in one month seasonality indicator would be 0.083332. The seasonality index is decreasing with the increase in seasonal variation. Seasonality indicator ≤ 0,5 is indicating extreme seasonality.

The *seasonality share* is a newly introduced measurement approach. The method is indicating the average share of tourist overnight stays per tourist season, with regard to the classification of tourist season into low season (January, February, March, November and December), mid-season (April, May, October) and high season (June, July, August and September) (Ćorluka, Mikinac and Milenkovska, 2016). The seasonal share is calculated by dividing the total tourist overnight stays per season with total annual tourist overnight stays. The seasonal concentration of tourist overnight stays is increasing with the increase of high season share. High season share ≥ 0,5 is indicating extreme seasonality.

The *Gini coefficient* represents the most common measure of inequality. The coefficient is varying between 0, reflecting complete equality, in which case every month would have the same number of tourist overnight stays, and 1, indicating complete inequality, in which case all annual tourist overnight stays would be realized in one month (i.e. 0≤ Gini coefficient ≥1). The larger the Gini coefficient, the greater is the inequality of distribution of tourist overnight stays, i.e. seasonality. Gini coefficient ≥ 0,5 is indicating extreme seasonality. Graphically represented (Figure 1) is the Gini coefficient the area between the Lorenz curve and the line of equality, i.e. the Gini coefficient is the proportion of the area A to the total of areas A and B, formulized as $G = I_{area}/(I_{area}+II_{area})$. If complete equality of tourist overnight stays would occur, with the same numbers of tourists overnight stays every month, the Lorenz curve would be a straight line (i.e., represents 45˚ equality line). The more unequal the seasonal distribution of tourist overnight stays, the larger will be the area between the Lorenz curve and the line of equality. The Gini coefficient can be calculated through the Lorenz curve or an analytic

formula without referring to the Lorenz curve $G = \frac{2\sum_{i=1}^{n} i * x_i - (N+1)\sum_{i=1}^{n} x_i}{N\sum_{i=1}^{n} x_i}$, where n represent the number of months in year (in this case number of months = 12), i month (i.e. 1,2,3…12), x_i monthly tourist overnight stays.

Figure 1: **The Lorenz curve**



Source: Author

3. RESULTS AND DISSCUSION

Measurement of tourism seasonality in Croatia and the comparison of measurement methods: Seasonality ratio, Seasonality indicator, Seasonality share and Gini coefficient are presented in the continuation of the section.

Tables 1: **Seasonality ratio for tourist overnight stays in Croatia (2005-2016)**

	2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Seasonality ratio	4,01	3,85	3,85	3,76	3,97	4,04	4,02	3,96	3,96	4,06
	2015	**2016**								
	3,98	3,92								

Source: Author

Seasonality ratio is indicating the relation of highest monthly value and the annual average. Obtained results reveal extreme high coefficient values ranging from 3,76 to 4,06, meaning that, for instance, in 2016 Croatia had in the month with the highest value of tourist overnight stays 3,92 times more overnights than the annual average. The indicator points out the extreme deviation of the month with the highest value from the annual average and measures its intensity of seasonal concentration. The seasonality ratio does not provide an insight in the dispersion of distribution of tourist overnight stays during the length of a tourist season and is influenced by extreme values in the peak month. Its main purpose is to quantify the deviation of the leading month in tourist overnight stays from the annual average. This measure points out pronounced and constant seasonality in Croatian tourism.

Tables 2: **Seasonality indicator for tourist overnight stays in Croatia (2005-2016)**

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Seasonality indicator	0,25	0,26	0,26	0,27	0,25	0,25	0,25	0,25	0,25	0,25
	2015	**2016**								
	0,25	0,26								

Source: Author

Seasonality indicator as the invers version of the Seasonality ratio is presenting the utilization of available accommodation capacities. In this case, the month with the largest number of overnight stays stands for the maximum capacity. Large deviations of average utilization from the annual maximum indicate a high degree of demand concentration, by number of overnight stays, in the leading month. The value for the year 2016 presented in Table 2 is 0,26, meaning that 26% of available capacities are occupied. The Seasonality indicator, as a measure method, has its strengths in indicating the average use of accommodation capacities, but is limited with interpretation of the unevenness of distribution of tourist overnight stay. All calculated values in Table 2 are very low, which is a clear sign of low occupancy use and seasonal pattern of tourist overnight stays. The indicator is constantly of the approximately same value in the observed period.

Tables 3: **Seasonality share for tourist overnight stays in Croatia (2005-2016)**

Seasonality share Low season	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
	0,036	0,037	0,038	0,040	0,035	0,034	0,031	0,031	0,033	0,032
	2015	**2016**								
	0,033	0,037								
Seasonality share Mid-season	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
	0,109	0,108	0,109	0,108	0,103	0,101	0,096	0,105	0,109	0,104
	2015	**2016**								
	0,107	0,105								
Seasonality share High season	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
	0,855	0,856	0,854	0,851	0,862	0,866	0,873	0,864	0,857	0,864
	2015	**2016**								
	0,859	0,858								

Source: Author

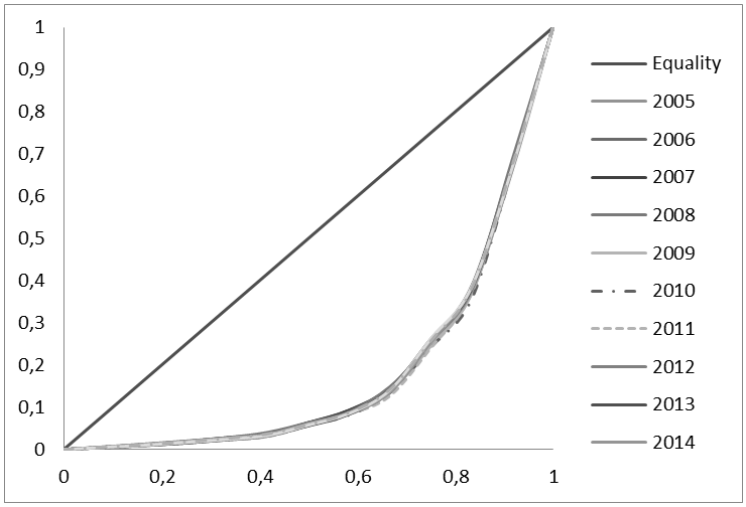
The calculation in the Table 3 points out the share of tourist overnight stays per season. In the case of year 2016 the high season share of tourist overnight stays is 85,8%, the mid-season share 10,5% and the low season share 3,7%. The indicator is not affected by extreme values and gives a more comprehensive insight of tourist overnight stays distribution. This approach provides comparison of indicators between seasons. Results in Table 3 demonstrate extreme seasonal concentration of tourist overnight stays in high season, ranging from 85,1% to 87,3%, insufficient share of mid-season ranging from 9,6% to 10,9% and consequently acute small share in low season ranging from 3,1% to 4%. All coefficients are stable over the years, implying that seasonality has not changed over time.

Tables 4: **Gini coefficient for tourist overnight stays in Croatia (2005-2016)**

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Gini coefficient	0,64	0,63	0,63	0,63	0,64	0,65	0,65	0,64	0,64	0,64
	2015	**2016**								
	0,64	0,63								

Source: Author

Figure 2: **The Lorenz curve for tourist overnight stays in Croatia (2005-2016)**



Source: Author

The Gini coefficient together with the Lorenz curve is indicating the inequality in the distribution of tourist overnight stays. Large values of Gini coefficient express the seasonal concentration of tourist flows, correspondingly unequal distribution. The visual interpretation of inequality is provided with the Lorenz curve in the Figure 2. The slope of the curve is indicating seasonal concentration of tourist overnight stays. Gini coefficient has the advantage in taking into consideration seasonal fluctuations of tourist overnight stays and revealing the seasonal concentration, but is insufficient in determining the monthly distribution. The calculated values of the Gini coefficient are pointing out the extreme seasonal concentration and are very stable, implying constancy in seasonality, as well as the Lorenz curve having the acutely pronounced shape over years.

Comparing different seasonality measurement methods significant differences are identified. The Seasonality ratio is diagnosing the extremity of the deviation from the top performing month in a relation to the annual average. This method is not suitable for the analysis of the season length or dispersion of tourist flows tough out the year. It is applicative for the purpose of showing the concentration of tourist flows in the top performing month and its deviation form annual average. The Seasonality ratio is relevant for highlighting the overuse of tourist facilities in a very short period, a month, and it is an indicator of the carrying capacity problem. The Seasonality indicator is

describing the utilization of capacities. Seasonal concentration or dispersion of tourist flow are not identified with this approach, but it convenient for the analysis of capacity utilization and the interpretation of top performing month deviation from the annual average. The application of the Seasonality indicator is suggested if no data for accommodation establishment capacities is available. The approach of Seasonal share as a measurement method was newly introduced in the application of seasonality measurement. The method is providing a comprehensive inside into the performance of annual seasonal intervals. Concentration, as well as the dispersion of tourist flows is pointed out. The method is particularly applicative in research aimed to prolong the tourist season or increased demand in the off-season. The Gini coefficient, as the most common measurement approach for inequality of distribution has its strengths in determining seasonal concentration but is insufficient in determining the monthly distribution of tourist flows.

4. CONCLUSION

Based on the comparative analysis it can be concluded that the information, as a measurement outcome, is varying between measurement methods. No measurement method is superior to another, they are complementary. Each measurement approach has its purpose with advantages and disadvantages. A combination of different measurement methods is required to understand the structure and to get a full insight into the pattern.

Used measurement approaches indicate high values of seasonality in tourist overnights stays in Croatia. The values are stable over the observed period. It can be remarked that Croatia is suffering under extreme seasonality, while the seasonal concentration of tourist flows is constant over years. Strategies and measures to expand the tourist season and to lower the pressure of tourist flows in the peaks are desirable.

The paper provided a background for the future application and decision-making. Proper measurement of tourism seasonality is a prerequisite for further activities.

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