гл. ас. СНЕЖИНКА КОНСТАНТИНОВА
УНИВЕРСИТЕТ ПО ХРАНИТЕЛНИ ТЕХНОЛОГИИ, ПЛОВДИВ

МЕТОДИ ЗА ИЗСЛЕДВАНЕ НА СЕЗОННОСТТА В ТУРИЗМА

METHODS FOR RESEARCH ON SEASONALITY IN TOURISM

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Abstract: This work presents three methods for research on seasonality. Subject of research are the seaside public travel companies. Determined are the advantages and drawbacks of the different methods. Linear and non-linear models of seasonality are built. It is indicated that the method of research using the relations between actual and smoothed up values gives the best results in this specific case.
Key words: tourism, seasonality, seaside public travel companies

INTRODUCTION:

Subject of this research are the seaside public travel companies divided into groups by territorial location. The division is to some extent conditional. Eight public seaside public travel companies [3], [5] have been studied: “Albena” JSC – Albena Resort; “Byalata laguna” JSC – village of Topola; “Grand hotel Varna” JSC – Varna; “Elenite” JSC – Plovdiv; “Zlatni piassaci” JSC – Zlatni piassaci resort; “Sv. Sv. Konstantin i Elena” JSC – Varna; “Slantchev briag” JSC – Slantchev briag resort and “Sunny day” Co – Varna[1] [2], [4].

METHODS AND RESULTS:

The research covers a period of eight years between 2001 and 2008. Three methods of research of seasonality have been used: method of simple medians, method of adjusted medians and method of relation between actual and smoothed up values [1].

I. Study of seasonality by the method of simple medians (seaside public companies):

Table 1. Seasonality measured by the method of simple medians

Quarters	Quarterly median	Seasonal index
1st quarter	2 299	5,64%
2nd quarter	9 097	22,28%
3rd quarter	23 131	56,66%
4th quarter	6 294	15,42%
Total	**40 821**	**100,00%**

[1] Registry Agency, Trade Register: http://www.brra.bg

The method of simple medians is applicable when the dynamic sequence does not contain any development trends. In this way we assume that the variations are due to two groups of reasons:

1st group: reasons of seasonal nature

2nd group: reasons of arbitrary nature

To remove the influence of the arbitrary reasons, I did the following:

1. I calculated a quarterly median for each quarter of the year by adding up the quarterly revenues of the seaside public companies and divided the sum by the number of years. As a result, I obtained the following data:

1st quarter: BGN 11,506 thousand

2nd quarter: BGN 45,451 thousand

3rd quarter: BGN 115,586 thousand

4th quarter: BGN 31,457 thousand

2. I calculated the total quarterly median value for the whole studied period. It shows the total extent of the quarterly revenues of the studied companies. The total quarterly median was calculated by adding up the companies' revenues for the whole studied period and dividing the sum by the number of quarters in the eight years (32 quarters), which gave a result of BGN 51 011 thousand by quarter.

3. Then I calculated the indices of the seasonal variations, which represent the relation between the quarterly medians to the total quarterly median, and obtained the following results:

1st quarter: 22,53

2nd quarter: 89,14

3rd quarter: 226,66

4th quarter: 61,67

The studied indices show that the seasonal factors contribute to the increase of revenue for the third quarter, which is quite normal in this case. However, the differences are huge and they are hiding some reserves. The seasonal indices are shown as graphic on Figure 1.

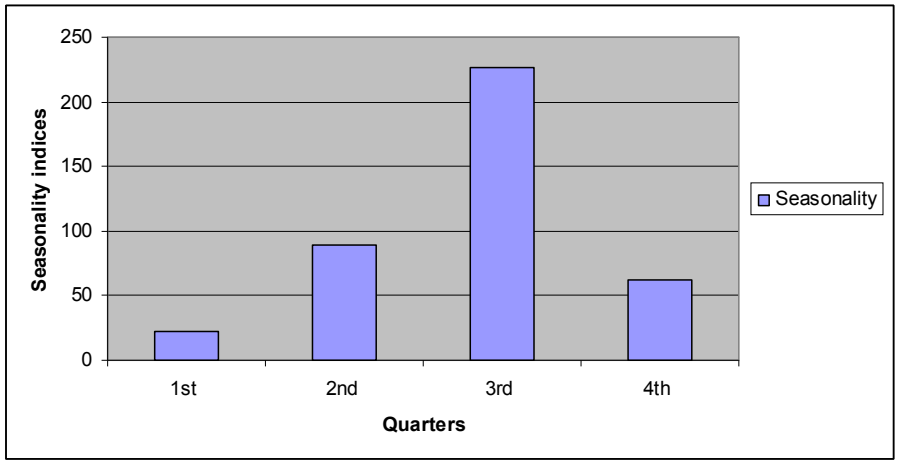

Figure 1: Seasonal indices of the seaside public travel companies (method of simple medians)

II. Study of seasonality by the method of adjusted medians

The method of simple medians is not suitable for our study because the revenues of the travel companies are actually increasing over the analyzed period. Should we approximate this trend to the simplest (linear) model, we would obtain the following regression:

(1) $Y = b_0 + b_1 t$, where

Y – annual revenue of the companies

t – number of years within the analyzed period

b_0, b_1 – recession indexes

Assuming the presence of a linear trend, we should adopt the method of adjusted medians. In the application of this method I followed these stages:

1. I calculated the median for each quarter (this stage was already presented for the previous method). This is done to remove the effect of arbitrary reasons.

2. Then I determine the quarterly variation (increase or decrease) of seasonality measured through the total revenue. This is done with the purpose of removing the variation (trend) in view of obtaining revenue that contains the effect of the seasonal factors only. To do that, the parameter b_1 from the straight line equation ($Y: b_0 + b_1 t$) is divided by 16 to obtain the value of the quarterly variation:

$$(2)\ b_{1quarter} = \frac{b_{1year}}{4.4} = 1{,}516$$

The denominator contains the product 4×4 because:

a) Once we divide by 4 to obtain the annual variation for the quarter;

b) Then we divide by 4 for a second time to reveal the quarterly variation in comparison to the previous quarter.

3. The quarterly medians are treated using the quarterly variation ($b_{1quarter}$) in the following way:

– the quarterly median for the first quarter is not adjusted;

– from the median for the second quarter is deducted (or is added in the case of decreasing trend) one quarterly variation ($b_{1quarter}$);

– from the median for the third quarter is deducted (or added) twice the quarterly variation ($b_{1quarter}$);

– from the median for the forth quarter is deducted (or added) three times the quarterly variation ($b_{1quarter}$).

In this case, I obtained the following results:

1st quarter: BGN 11,506 thousand

2nd quarter: BGN 43,935 thousand

3rd quarter: BGN 112,554 thousand

4th quarter: BGN 26,909 thousand

Using the above calculations, I removed the effect of arbitrary factors and the trend for increase of the revenues of the seaside public travel companies. The presented adjusted quarterly medians now contain the effect of seasonal factors only.

4. Based on the adjusted quarterly medians is determined a general adjusted median:(3) $\overline{Y_{adj.}} = \frac{\sum_{i=1}^{n} Y_{adj.i}}{n}$,

where:

$\overline{Y_{adj}}$ – general adjusted median;

$Y_{adj.i}$ – adjusted median for the 1st quarter;

n – number of quarters

The general adjusted median represents the revenues of the specified travel companies in the absence of development, seasonal or arbitrary variations. I obtain the following result: $\overline{Y_{adj}}$ = BGN 48 726 thousand.

5. Calculation of the seasonal variation indices by comparing the quarterly adjusted medians to the general adjusted median:

$$(4)\ J_i = \frac{Y_{adj.i}}{\overline{Y_{adj.}}}.100,$$

where:

J_i – is the index of seasonal variations for the 1st quarter;

The results for the seaside public companies are as follows:

1st quarter: 23,61

2nd quarter: 90,17

3rd quarter: 230,99

4th quarter: 55,67

The seasonal indices are shown in a graphic on Figure 2.

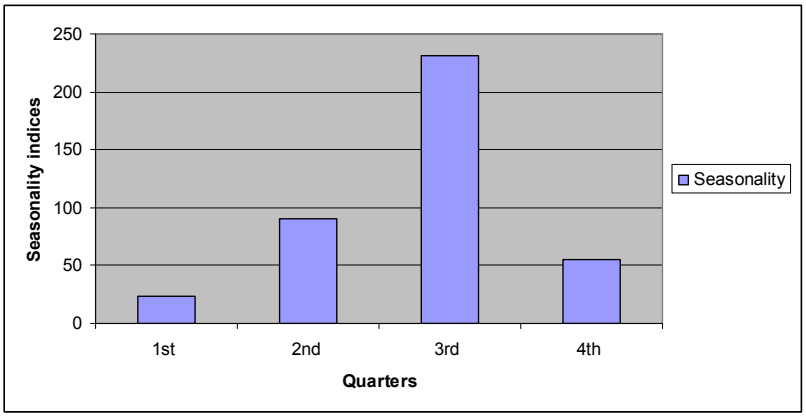

Figure 2: Seasonal indices of the seaside public companies (method of adjusted medians)

III. Study of seasonality by the method of relation between actual and smoothed up values

As mentioned before, the presented method of adjusted medians is suitable for the study of seasonality in time sequences containing a linear trend. The calculations have shown the seasonality in the operations of seaside public companies may be approximated using the following three models:

1. Linear model:

(5) $y = 24250x + 52861$; $R^2 = 0,68$

2. Third degree polynomial:

(6) $y = 23114x^3 – 38405x^2 + 204521x – 145841$; $R^2 = 0,83$

3. Sixth degree polynomial:

(7) $y = –112,78x^6 – 3218,6x^5 – 36426x^4 + 211512x^3 – 678072x^2 + 1E + 0,6x – 666331$; $R^2 = 0,97$

The obtained results show that the non-linear models present the trends in the studied phenomenon in a much better way. When seasonality must be studied in time sequences containing both linear and non-linear trends it is expedient to use the method of relation between actual and smoothed up values. It is for this reason that this method is widely used in the practice [1].

The application of this method follows these steps:

1. Smoothing up the sequence using four quarterly centered sliding median values to eliminate the effect of seasonal and arbitrary causes and to express the trend;

I start by calculating the smoothed up value for the 3rd quarter of the first year of the period between 2001 and 2008. It is determined by starting with 50% of the value of revenues for the first quarter of 2001. The calculation formula looks like this:

(8) $$\overline{Y_{III}^{2001}} = \frac{\frac{1}{2}Y_I^{2001} + Y_{II}^{2001} + Y_{III}^{2001} + Y_{IV}^{2001} + \frac{1}{2}Y_I^{2002}}{4} =$$

BGN 11 384

In the same way we calculate the smoothed up value for the 4th quarter of 2001:

(9) $$\overline{Y_{IV}^{2001}} = \frac{\frac{1}{2}Y_{II}^{2001} + Y_{III}^{2001} + Y_{IV}^{2001} + Y_{I}^{2002} + \frac{1}{2}Y_{II}^{2002}}{4} =$$

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I continue in this way up to the 2nd quarter of the last year 2008 and we arrive to drawing up the following Table 2. The drawback of this method is that the information about the first two quarters of 2008, i.e. the data of one year, is lost.

Table 2. Four quarterly centered sliding medians $\overline{Y_i^t}$

Year / Quarter	2001	2002	2003	2004	2005	2006	2007	2008
1st quarter	–	12 260	10 631	8 564	9 274	9 409	10 301	11 206
2nd quarter	–	12 266	9 246	8 596	9 286	9 762	10 706	10 910
3rd quarter	11 384	12 497	8 584	8 583	9 253	10 030	11 653	–
4th quarter	11 974	11 941	8 525	8 934	9 233	10 083	11 185	–

2. In the second step are calculated the relations between the actual value of revenues for the relevant quarter and the smoothed up value for the same quarter:

(10) $$Q_i^t = \frac{Y_i^t}{\overline{Y_i^t}}.100,$$

where

Q_i^t – is the relation between actual and smoothed up values for quarter "i" of year "t"

Y_i^t – actual value for quarter "i" of year "t"

$\overline{Y_i^t}$ – smoothed up values for the same quarter of the same year

The results of calculation are given in Table 3.

Table 3. Seasonal indices and adjusted seasonal indices for the seaside public travel companies

Years and indices	Relation Q_i^t			
	1st quarter	**2nd quarter**	**3rd quarter**	**4th quarter**
2001	–	–	241,26	70,62
2002	15,20	98,61	206,34	85,23
2003	18,73	81,48	231,10	58,92
2004	22,55	82,00	240,54	50,30
2005	25,45	102,31	225,26	47,51
2006	23,44	97,23	221,98	57,37
2007	28,70	85,59	208,83	62,18
2008	35,36	89,97	–	–
Seasonal indices *(S_i)*	23,77	90,68	225,54	59,88
Adjusted seasonal indices	23,77	90,72	225,63	59,90

3. To avoid the influence of arbitrary factors, in the third step the obtained relations Q_i^t are leveled by quarters according to the following formula:

(11) $$S_i = \frac{1}{n-1}\sum_{t=1}^{n} Q_i^t ,$$

where:

S_i – is the mean sum for quarter "i"

n – number of years within the period (in our case 8 years)

The mean sums S_i are given in Table 3. To determine them it is expedient to remove the extreme relations (relations with the highest and the lowest value). Therefore, the formula for the mean sum by quarter is transformed as follows:

$$(12)\ S_i = \frac{1}{n-3}\sum_{t=1}^{n} Q_i^t - Q_{i_{\max}}^t - Q_{i_{\min}}^t$$

The results of this step are given in the relevant line in Table 3.

4. The fourth step consists in determining the so-called "adjusted means of the two substages":

4.1 In the first substage is determined the mean of means according to the following formula:

$$(13)\ \overline{S} = \frac{\sum_{i=1}^{4} S_i}{4},$$

where:

$\overline{S}$ – is the mean of means for the whole analyzed period

S_i – is the mean for quarter "i" of the analyzed period

4.2 At the second substage, the adjusted means are calculated as follows:

$$(14)\ Y_i = \frac{S_i}{S},$$

Where:

Y_i – is the adjusted mean for quarter "i" of the analyzed period

The mean values (S_i) and the adjusted mean values (Y_i) express the mean deviation from the development trend for each quarter under the influence of seasonal causes. Hence, these are the indices of seasonal variations.

CONCLUSIONS:

The results of the research using the three methods that were presented show very close levels of seasonality in the operations of the seaside public travel companies in Bulgaria.

The following conclusions can be made after analysis of the information:

a. Over the studied period (2001–2008) is observed a trend that is of non-linear nature.

b. In the present study, the method for measuring seasonality through the relation between actual and smoothed-up values gives the best possible results.

REFERENCES:

1. Kaloyanov, T. Statistics, Sofia, 2004.
2. Konstantinova, S. Differentiated Research on Seasonality in Tourism. – In: International Scientific Conference "Trends in the Development of Modern Tourism", "Paisii Hilendarski" University of Plovdiv, College of Smolyan, 2009.
3. Konstantinova, S. and Konarev, A. Seasonality in the Operation of Accommodation Equipment and Facilities in Bulgaria. – In: International Scientific Conference "Food Science, Engineering and Technologies 2009", University of Food Technologies, Plovdiv, Vol. LVI, Issue 2, p. 9-14, 2009.
4. Konstantinova, S. Research on Seasonality in Tourism (Case Study of Public Tourism Companies in Bulgaria). – In: International Scientific Conference "Food Science, Engineering and Technologies 2009", University of Food Technologies, Plovdiv, Vol. LVI, Issue 2, p. 15-21, 2009.
5. Law on Public Offering of Securities. – Promulgated State Gazette in effect as of 42 of 5 June, 2009.