SEASONALITY IN TOURISM DEMAND: PANEL MODELS WITH CENSORED DATA

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Abstract:

Seasonality is a frequent and important occurrence in the tourism economy, with simultaneous effects on supply structure and employment flows in the same industry. This paper studies the seasonality patterns and determinant impact on it across numerous countries in the Europe in 1995-2014. This article estimates panel model with censored data to learn spillover effects of seasonality in tourism demand. Using seasonal rate, this study investigates the seasonal concentration of demand for tourism, assuming that spillover effects of seasonality extend in tourism are linked to various economic problems.

Keywords: seasonality; tourism demand, censored panel regression; countries

JEL Code: Z3, O5

1. Introduction

The following research question is asked in this paper in an effort to analyze the main problem: what determinants explain and predict the probability that a chosen set of country in Europe have unequal tourism seasonality rate.

The paper is organized as follows. The next section begins by mapping out the research strategy, including the conceptual framework, the summary of dataset, the model specification and the variables. The subsequent section presents and discusses the empirical results, and the final section concludes by providing implications for tourism policy and further research.

2. Conceptual Framework
Before a statistical analysis examining the relationship between seasonality and the various economic problems linked to seasonality can be performed, conjointly with the other variables identified as affecting seasonality in our presumption need to be addressed. These control variables which represent covariates in this paper are: capital size, overcrowding, occupancy rate, part time employment, micro-criminality and earning risk.

We start with a narrative from the literature (Candela & Figini, 2012, p.218-238.) and then relate it to a modeling strategy consequent upon. We now discuss the first one of our variables.

The increasing level of inventories during the slack season is impossible in hospitality industry. That is deriving from following consideration: tourism is a service *per excellence* and a service cannot be stored: it is not possible to produce and stock services (like hotel rooms or restaurant seats) in period of low demand to sell them when the demand is higher. Unlike cyclical fluctuations, seasonal fluctuations in tourism flow generally conform to a steady pattern (ski tourism, sun & see tourism are mainly mono-seasonal). Thus, after the investment has been realized and the capital immobilized in the long run, the seasonality places a number of serious issues also in the short run, involving both the production side and profitability. If the size of capital (saying, units of hotel in terms of number of rooms) is chosen according to the high season, it becomes impossible to store production as inventories during low season. This is why many restaurants and hotels often reduce their activity (or even shut down) off-season, when the costs of a running business are not justifiable by the low number of tourists. Similarly, if the size of capital is chosen according to low season, the tourism structure may be facing an excess of demand during the high peaks of the season. Although this may partially compensate the insufficient use of the structure during the low season, it often implies serious problems of overcrowding, overbooking, and higher operational costs and, ultimately, a lower degree of tourist’s satisfaction. The relationship between size and seasonality becomes crucial for the tourist firm’s investment. Thus, countries with higher levels of mono-seasonal tourism tend to construct bigger overall tourism capacity in order to meet swelling seasonal demand. We assume that the destination receives a mono-seasonal typo of tourism, in which the number of stays during the high season is much higher than the number of stays during the rest of the year (low season). In this study, capital size is proxied by: number of room per accommodation object. Therefore, it is hypothesized that:

**H1:** The higher the number of room per accommodation object, the higher the difference between high and low season in terms of overnight stays.
From above considerations, follow the destinations specialized only in a single type of tourism are the ones that are mostly stressed by the effect of seasonality. Namely, seasonality is the systematic, although not necessarily regular, intra-year movement of a variable (Hylleberg, 1992, p.4). For example, the Mediterranean resorts host sea and sun tourism predominantly in the summer months. In these months excessive arrivals of foreign tourists have as a consequence the overcrowding and overbooking. Thus, we can presume, stronger the presence of mass tourism, the higher the impact of seasonality.

H2: The highly involved destination in mass tourism will exhibit more seasonality in tourist overnight stays of non residential tourists.

The small accommodation establishment is possibly suited to address demand in the low season but will face congestion costs and losses for not potential revenue during the high season. Regardless of the decision, the existence of seasonality implies seasonality losses for the entrepreneur in tourism. The aim of the tourism entrepreneur in the investment stage, hence, is to identify the optimal size of the investment in order to minimize the seasonality losses which can be hinder by maximization of occupancy rate. The absence of seasonality is typical for art cities and, more in general for cultural destinations; visits to destinations that offer historical sites, churches, buildings, museums, in the short heritage are less plagued by seasonality problem, and hence tourist stake-holders in cultural destinations enjoy better occupancy rates on hotel investments. According to this standard accommodation occupancy rates, in this paper can be expressed through the relationship between the number of beds occupied by guests and accommodation establishment capacity, which is the number of beds that can be offered to accommodation inmates.

H3. In this connection, an interesting hypothesis that suggests itself is the following: the greater the occupancy rate the lower is seasonality.

The seasonality effects on the labor market should be ascribed to the temporary inflow of workers when the seasonal demand cannot be satisfied by the supply of local workers; migrating workers are usually coming from peripheral labor markets. Those individuals, often take part time job, and can easily find a temporary occupation in the tourism sector (at coastal region or ski resorts) a far distance from they cite of permanent living, just during seasonal duration. Afterwards when the season is terminated they move back.

H4. Hypothesis predict the positive relationship between part time work status proxied by seasonal versus permanent employee ratio and seasonality rate.
Sutherland and Cressey (1978, p.82), states that statistical studies show very uniformly that crimes against property reach a maximum in winter months, and crimes against the person and against morals in the summer months. The excessive seasonality either in tourism or in criminality occurrence also, we assume generates a number of negative effects for residents of a tourism country. In this paper, special attention would be paid to the correlation between tourism overcrowding linked to seasonality, as we mentioned before, and the increase in the level of micro criminality as a negative externality.

H5. Hypotheses allege when more seasonality in a country persist, we except people living there to be more likely victimized by some kind of micro related crime.

In addition to reducing the profitability of the investment, since the hotel is open only 3 month out of 12, that is, one forth of the years, the seasonality also increases its level of risk. Any negative event that may hit the destination during the (short) peak season would not find any compensation during the low periods of low season.

H6. We assume that the risk associated to the tourism activity and subsequently earning from that is higher in the country in which there is higher seasonality.

3. Econometric Model

Censored regression model for panel data was used to estimate the relationship between dependent variable \( y_i \) (seasonality rate) and a vector of explanatory variables \( x_i \) (determinants of seasonality intensity). For the \( i \)th country, the censored regression model for panel data can be defined as follows:

\[
\begin{align*}
    y_{it}^* &= \beta x_{it} + \epsilon_{it} = \beta x_{it} + u_{it} + v_{it} \\
    y_{it} &= \begin{cases} 
        a & \text{if } y_{it}^* \leq a \\
        y_{it} & \text{if } a < y_{it}^* < b \\
        b & \text{if } y_{it}^* \leq b
    \end{cases}
\end{align*}
\]

The dependent variable is the seasonality rate, which is censored at 4 (hence \( a = 6.5 \) times or about the mean of that variable) from below and at 25 (\( b=25 \) times) from above. This motivates the use of the estimation procedures proposed in this paper. If the censored constraints are slightly different (below or left-censored at zero), than for the \( i \)th country, the Tobit model for panel data can be applied:

\[
\begin{align*}
    y_{it} &= \begin{cases} 
        0 & \text{if } y_{it}^* \leq a \\
        y_{it} & \text{if } a < y_{it}^* < b \\
        1 & \text{if } y_{it}^* \leq b
    \end{cases}
\end{align*}
\]
Here the subscript $i = 1,...,N$ indicates the country, subscript $t = 1,..., T_i$ indicates the time period, $T_i$ is the number of time periods observed for the $i$th country, $u_i$ is a time-invariant country effect, and $v_{it}$ is the remaining disturbance.

4. Results

4.1. Data and descriptive statistics

In this study, the censored regression model for panel data are estimated for a sample of 29 countries whose data for years 1995-2014 are completely available from the Eurostat Source Site for the determination of time series that affect seasonality. The countries used in the analysis are based on European countries (incl. AT, BE, BG, CH, CY, CZ, DE, DK, EE, EL, ES, FI, FR, HR, HU, IS, IT, LT, LU, MT, NL, NO, PL, PT, RO, SE, SI, SK, UK). Table 1 & 2 provide a summary of all data used in the analysis and correlation matrix.

Table 1: Descriptive statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>min</th>
<th>max</th>
<th>range</th>
<th>mean</th>
<th>std.dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEASON_RATE</td>
<td>2.246</td>
<td>79.738</td>
<td>77.492</td>
<td>6.586</td>
<td>8.235</td>
</tr>
<tr>
<td>OVERNIGHT_NONRES</td>
<td>503519</td>
<td>259635800</td>
<td>259132300</td>
<td>33379400</td>
<td>33379400</td>
</tr>
<tr>
<td>BED_A/OBJECT_A</td>
<td>10.686</td>
<td>548.573</td>
<td>537.887</td>
<td>126.684</td>
<td>88.484</td>
</tr>
<tr>
<td>OVERNIGHT_TOT/BED_A</td>
<td>7.001</td>
<td>201.280</td>
<td>194.279</td>
<td>44.120</td>
<td>37.139</td>
</tr>
<tr>
<td>EMP_P/EMP_F</td>
<td>0.023</td>
<td>1.024</td>
<td>1.004</td>
<td>0.226</td>
<td>0.226</td>
</tr>
<tr>
<td>CRIM</td>
<td>2.100</td>
<td>30.000</td>
<td>27.900</td>
<td>12.981</td>
<td>5.460</td>
</tr>
<tr>
<td>RISK_E</td>
<td>1.002</td>
<td>4.370</td>
<td>3.368</td>
<td>0.224</td>
<td>0.463</td>
</tr>
</tbody>
</table>

Source: Author's calculations based on Eurostat data

Notes: definition of variable. $SEASON_RATE = N_{max}/N_{min}$, where $N_{max}$ is the highest peak in overnight stays and $N_{min}$ referred to the minimum number of overnight stays built on the monthly distribution of tourism flows; $OVERNIGHT_NONRES = $ nights spent by non-residents at tourist accommodation establishments - annually data; $BED_A/OBJECT_A =$ Number of bed-places in hotels, holiday and other short-stay accommodation, camping grounds, recreational vehicle parks and trailer parks - annually data; $OVERNIGHT_TOT/BED_A =$ nights spent by residents and non-residents at tourist accommodation establishments - annually data; $EMP_P/EMP_F =$ Employed persons by full-time activity - annual data for selected tourism industries; $CRIM =$ Crime, violence or vandalism in the area, percentage of total population - annually data; $RISK_E =$ the 3-year rolling standard deviation of expenditure on tourism trip for 4 nights or over in thousand Euro.

Table 2: Correlation matrix

<table>
<thead>
<tr>
<th></th>
<th>SEASON_RATE</th>
<th>OVERNIGHT_NONRES</th>
<th>BED_A/OBJECT_A</th>
<th>OVERNIGHT_TOT/BED_A</th>
<th>EMP_P/EMP_F</th>
<th>CRIM</th>
<th>RISK_E</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEASON_RATE</td>
<td>1</td>
<td>0.11*</td>
<td>-0.23*</td>
<td>0.029</td>
<td>0.192*</td>
<td>-0.101</td>
<td></td>
</tr>
<tr>
<td>OVERNIGHT_NONRES</td>
<td>1</td>
<td>-0.228*</td>
<td>0.167*</td>
<td>0.19*</td>
<td>0.236*</td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td>BED_A/OBJECT_A</td>
<td>1</td>
<td>-0.162*</td>
<td>0.277*</td>
<td>0.136*</td>
<td>-0.076</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OVERNIGHT_TOT/BED_A</td>
<td>1</td>
<td>0.265*</td>
<td>-0.069</td>
<td>-0.087*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EMP_P/EMP_F</td>
<td>1</td>
<td>0.065</td>
<td>-0.334*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CRIM</td>
<td>1</td>
<td>-0.245*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RISK_E</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Author's calculations based on Eurostat data

Notes: italic Spearman's rank correlation rho* indicates significant correlation at 5. Otherwise, Pearson's coefficient of correlation; one of the assumptions of the Pearson measure of correlation is normality and the Jacque-Bera test was used to test the normality of each of the variables and, at the 95% confidence level, some variable were found to be non-normal. Thus, the Spearman rank correlation
4.2. Regression analysis

Our dependent variable – seasonal rate refers to proportion, bounded at 0 to 100. We intuitively reject the assumption that all the SEASON_RATE data fall in the middle portion, say in the 6.5 to 25 range, in which case GLM can give reasonably good results. We use, instead a censored regression because the proportion, or rate measures a continuous entity (proportion of maximum over minimum night spent).

In this section we investigate if the tourist stake-holders minimize the seasonal rate as a response to the changes in control variables. To test the hypotheses, three separate regression models are estimated.

Theoretically, the fixed-effects panel Tobit (as a special kind of censored panel model) is affected by the incidental parameters problem (Neyman and Scott 1948; Lancaster 2000), i.e. the estimated coefficients are inconsistent unless the number of time periods (Ti) approaches infinity for each individual i. So, we choose to estimate the random-effects model instead of fixed in both variants for all specifications. However, primarily, we use the classical linear panel estimations. Following Wooldridge (2010) and Drukker (2003), we test for panel autocorrelation and find no evidence for first order autocorrelation. There could be a concern about heteroskedasticity across countries; we use Breusch-Pagan/Cook-Weisberg test and find no evidence of heteroskedasticity.

Table 3: Random Effects Censored Regression Estimates Of The Seasonality Rate

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th></th>
<th>Model 2</th>
<th></th>
<th>Model 3</th>
<th></th>
<th>Model 4</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tobit</td>
<td>Panel</td>
<td>Tobit</td>
<td>Panel</td>
<td>Tobit</td>
<td>Panel</td>
<td>Tobit</td>
<td>Panel</td>
</tr>
<tr>
<td>Intercept</td>
<td>-6.70***</td>
<td>(-3.95)</td>
<td>0.76</td>
<td>(0.02)</td>
<td>2.27</td>
<td>(0.03)</td>
<td>12.27*</td>
<td>(0.97)</td>
</tr>
<tr>
<td></td>
<td>[0.00]</td>
<td>[0.98]</td>
<td>[0.99]</td>
<td>[0.97]</td>
<td>[0.00]</td>
<td>[0.97]</td>
<td>[0.97]</td>
<td>[0.97]</td>
</tr>
<tr>
<td>OVERNIGHT_NONRES</td>
<td>0.25**</td>
<td>(3.16)</td>
<td>0.08</td>
<td>(0.05)</td>
<td>0.04</td>
<td>(0.00)</td>
<td>0.43**</td>
<td>(0.83)</td>
</tr>
<tr>
<td></td>
<td>[0.00]</td>
<td>[0.96]</td>
<td>[0.99]</td>
<td>[0.99]</td>
<td>[0.00]</td>
<td>[0.99]</td>
<td>[0.97]</td>
<td>[0.97]</td>
</tr>
<tr>
<td>BED_A/OBJECT_A</td>
<td>0.35**</td>
<td>(2.71)</td>
<td>0.19</td>
<td>(0.44)</td>
<td>0.09</td>
<td>(0.01)</td>
<td>0.29</td>
<td>(0.63)</td>
</tr>
<tr>
<td></td>
<td>[0.00]</td>
<td>[0.65]</td>
<td>[0.98]</td>
<td>[0.98]</td>
<td>[0.00]</td>
<td>[0.91]</td>
<td>[0.99]</td>
<td>[0.97]</td>
</tr>
<tr>
<td>OVERNIGHT_TOT/BED_A</td>
<td>-0.75**</td>
<td>(-2.58)</td>
<td>-0.07</td>
<td>(-0.03)</td>
<td>0.29</td>
<td>(0.14)</td>
<td>0.51</td>
<td>(0.88)</td>
</tr>
<tr>
<td></td>
<td>[0.00]</td>
<td>[0.98]</td>
<td>[0.98]</td>
<td>[0.98]</td>
<td>[0.00]</td>
<td>[0.98]</td>
<td>[0.98]</td>
<td>[0.98]</td>
</tr>
<tr>
<td>EMP_P/EMP_F</td>
<td>-0.55</td>
<td>-0.54**</td>
<td>-0.02</td>
<td>-0.02</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The first regression, or baseline model, is a regression of control variables on seasonal rate and is defined

\[ \text{SEASON \_ RATE}_i = \beta_0 + \beta_1 \log(\text{BED \_ A/OBJECT \_ A}) + \beta_2 \log(\text{OVERNIGHT \_ NONRES}_i) + u_i + v_i \]  

(1)

Table 3 presents the parameter estimates from estimating random effects Tobit and random effects censored regression models for the ratio of seasonal rate. We have regressed seasonal rate on the number of logged bed places per accommodation establishment, and the overnight spend by non-residents. The coefficients of correlation between variables SEASON_RATE vs. BED_A/OBJECT_A (Pearson's r = 0.14), SEASON_RATE vs. OVERNIGHT_NONRES (Spearman’s rho = 0.11) point to a very weak direct linear relationship between pairs of variables. Yet, the estimated parameter on the logged bed places per accommodation establishment is positive and significant when it is Tobit regression run. The higher the accommodation capacity in the chosen set of country, the higher the difference between high and low season in terms of overnight stays, e.g. seasonality rate. Regression analysis estimated the dependence of seasonality rate on selected mass tourism independent variable – logged number of nights spent in accommodation establishments; we find by estimating random effects Tobit as expected in theoretical considerations a positive link among those variables, also. Pointed
original model was re-estimated according to the results obtained and estimated anew by Panel random effects censored regression. In the present form of the same proposed model an individual coefficients of the regression were not statistically significant and that was the reason why finding with only those variables should take into account with suspicion. The significance level to test the parameters was set at 0.05 p-values.

Given the support for the baseline model, a second regression that include the occupancy rate as an additional regressor, is defined as:

\[
SEASON\_RATE_{it} = \beta_0 + \beta_1 \log(BED\_A_{it} - OBJECT\_A_{it}) + \beta_2 \log(OVERNIGHT\_NONRES_{it}) + \beta_3 \log(OVERNIGHT\_TOT_{it} - BED\_A_{it}) + u_i + v_{it}
\]

(2)

Although the inverse relationship displayed in Table 2 is far from perfect (Spearman's rank correlation rho = −0.23), one can discern a general tendency toward lower occupancy rates as the seasonality rate per country increases. This relationship has an interesting implication. The demand for hospitality accommodations generated by a destination area can be met more economically if beds are concentrated in a few large hotel companies than if they are dispersed in a bunch of small tourist companies. To bring the impact of occupancy rate on seasonality rate into clearer focus, the result given by Tobit estimation in Table 3 displays the occupancy rate parameter consistent with our theory that country with lower seasonality problem has successively higher average occupancy rates.

To reflect employment in tourism sector issue we use the part-full time employment ratio.

\[
SEASON\_RATE_{it} = \beta_0 + \beta_1 \log(BED\_A_{it} - OBJECT\_A_{it}) + \\
\beta_2 \log(OVERNIGHT\_NONRES_{it}) + \beta_3 \log(OVERNIGHT\_TOT_{it} - BED\_A_{it}) + \\
\beta_4 \log(EMPTU\_F_{it} - EMPTU\_P_{it}) + u_i + v_{it}
\]

(3)

We consider a country that experiences seasonal influx and outflow of part-time worker because a country is a resort area, vacation spot, or because it relies heavily on seasonal occupations such as tourism, traveling and so on. We except that the demand for tourism trip generated by such a country will, no doubt, exhibit considerable seasonal fluctuations. Yet, our empirical test result by Tobit with significant value that is in contrary to our prediction and that is in opposite to aforementioned conventional wisdom.

A testing of working hypothesis for this paper, taking the totality of our knowledge of the seasonality of crime and tourism into account, as well as earning risk, might be the following.
\[ \text{SEASON\_RATE}_{it} = \beta_0 + \beta_1 \log(\text{BED\_A}_{it} - \text{OBJECT\_A}_{it}) + \\
\beta_2 \log(\text{OVERNIGHT\_NONRES}_{it}) + \beta_3 \log(\text{OVERNIGHT\_TOT}_{it} - \text{BED\_A}_{it}) + \\
\beta_4 \log(\text{EMPTU\_F}_{it} - \text{EMPTU\_P}_{it}) + \beta_5 \log(\text{CRIM}_{it}) + \beta_6 \log(\text{RISK\_E}_{it}) + u_i + v_{it} \]  

(4)

The seasons are related to the likelihood that less serious crimes will become publicly known, in particular, known to the police or statistical authority. Hence, the direct effect of the number of micro crimes occurring on the seasonal rate is nonexistent for our set of countries, because CRIM parameter is insignificant. A strong statistically significant positive correlation coefficient of (0.101) between SEASON\_RATE and RISK\_E as the two variables is one which the values of one variables increases so as the other variable. By Tobit result it was proved that the country with a higher volatility of tourism earning have sharper tourism fluctuations within a year.

5. CONCLUSION

Seasonal fluctuations not only affect fixed capital requirement but also create operating problems for the tourism industry. A tourism industry can’t follow a policy of level production, irrespective of seasonal changes in order to utilize its resources to the fullest extend. Such a policy will mean accumulation of inventories during off-season and their quick disposal during the peak season. In this paper we find that the higher the accommodation capacity and overcrowding in the peak season are linked to the higher seasonality rate in our sample. Those spillover effects of tourism seasonality transmit profitability problem. If the destination country builds a tourist supply that is big enough to face tourism flows in the peak season, it must also bear higher costs during the low season, that is, when the hotels, auto-camps remains substantially empty, with very low occupancy rates. We find that the occupancy rate as an indicator of profitability is consistent with our theory that country with lower seasonality problem has successively higher average occupancy rates. That brings us to end and we find that the country in our sample with a higher volatility of tourism earning may have the higher seasonality rate. Prolonging the tourism season is often viewed as being important for reducing the challenges associated with seasonal demand for tourism but in order to develop counter-seasonal strategies, it is necessary to have an understanding of the seasonal concentration of demand for tourism and its significant spillover effects described in this paper.

REFERENCES

Candela, G., Figini, P. (2012). The Economics of Tourism Destinations, Heidelberg: Springer


Eurostat Source Site  http://ec.europa.eu/eurostat


