ARE SHOCKS IN THE TOURISM OF V4 COUNTRIES PERMANENT?

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Abstract

We study the persistence properties of seasonally adjusted number of nights spent (NNS) in four Central and Eastern European Countries (CEE): Poland, Czech Republic, Slovakia, and Hungary. If the resulting time series show presence of a unit-root, it has far reaching consequences for tourism policy making, as shocks (policies) can have permanent effects on the tourism. For that purpose we test the seasonally adjusted time-series for the presence of a unit root, through the KPSS stationary test with two breaks using monthly data from 2003 to 2015, and allowing for the presence of deterministic structural breaks. We show, that taking account structural breaks in time-series of tourism activity might be crucial when deciding whether the series is stationary or not. First, our results have suggested, that the first breaks occurred around the financial crisis in 2008 and 2009 (except Slovak Republic). The second break in the series occurred latter, after the economies started to make a fast recovery. Second, when structural breaks were not taken into account, we found that each of the tourism activities appears to be non-stationary.

Key words: tourism, nights spent, Central and Eastern Europe, stationarity, structural breaks

JEL Code: C32, Z32

Introduction

In the present paper, we are exploring whether nights spent, a key variable measuring the overall tourism activity, appear to be stationary or non-stationary. Our goal is to answer a simple, yet important question. Will policies, oriented towards tourism activity have only short-term effects? If we find evidence, that the resulting series are non-stationary, it will have far reaching consequences as it will imply that tourism policies might have permanent effect on the economy of tourism in a given country.

Using a variety of models based on fractional integration and seasonal autoregressions Assaf et al. (2011) examined whether international monthly tourist arrivals to Australia are persistent. Their results showed that both, shocks affecting the seasonal structure of

Australian tourism arrivals and shocks related to the long run evolution of the Australian tourism arrivals will have a transitory effect, although compared to the latter, the former time series shows higher persistence (longer mean reversion).

In a similar study, Gil-Alana (2011) examined tourism in South Africa. The results indicated that the eight series examined are all mean reverting, implying that shocks have transitory though long-lasting effects.

Gil-Alana, et al. (2015) measured persistence in Croatian tourism using foreign tourist arrivals and overnight stays for seven Croatian coastal counties from January 1998 to December 2013. The results revealed that tourism indicators exhibit seasonal unit roots which require seasonal first differences to render the respective time series stationary.

A number of other studies provided further inconclusive results. For example Andraz and Rodrigues (2009) studied the persistence of tourism inflows from the UK, Germany, the Netherlands, Ireland, Portugal and Spain in Portugal. Stationarity of tourist arrivals in Singapore was studied in Lee (2009). The tests provide evidence of stationarity for nine out of twelve source countries. The results in Tan and Tan (2014) indicated that the tourist arrivals to Singapore are stationary with multiple structural breaks, implying any shocks will have only a transitory effect.

Lim and Pan (2005) studied inbound tourism development in China. Apart from other results, they presented evidence, that arrivals from Japan to China are non-stationary.

The remainder of the paper is structured as follows. Section 1 presents the data. Section 2 describes the methodology. Section 3 discusses results and Section 4 concludes.

1 Data

In our empirical study, we test the stationarity hypothesis of nights spent at tourist accommodation establishments (such as: hotels, holiday and other short-stay accommodation, camping grounds, recreational vehicle park and trailer parks) by residents and non- residents (total) in V4 countries, namely: Slovakia (SK), Czech Republic (CZ), Poland (PL) and Hungary (HU). Data with monthly frequency were obtained from Eurostat and start in January 2003 while end in December 2015.

Due to the significant seasonal pattern in the data, we have first removed the seasonal component, by using a simple annualization principle, i.e. we summed observations over the past twelve months. To be more specific, our first observation corresponds to the December 2003 and it is the sum of total monthly nights spent from January 2003 to December 2003.

Next observation corresponds to January 2004 and corresponds to the sum of total monthly nights spent from February 2003 to January 2004, etc. Although this approach ensures that a known 12 month seasonal pattern is removed, we have introduced significant autocorrelation into our time series. However, the levels of autocorrelation are comparable across other macro-economic time series, which are often studied for the presence of non-stationarity.

2 Methodology

2.1 The KPSS stationary test with two breaks

We follow Carrion-i-Silvestre and Sansó (2007), who proposed a Kwiatkowski et al. (1992) type test with two breaks. Let denote y_t as our series of interest. The test is performed by selecting a suitable deterministic component $\mu(.)$ of y_t, and estimating the resulting model via OLS:

$$y_t = \mu(.) + v_t \tag{1}$$

where v_t are error terms. The test statistics is given by:

$$\hat{\eta}_m = \hat{\sigma}^{-2} T^{-2} \sum_{t=1}^{T} \sum_{i=1}^{t} \hat{v}_t \tag{2}$$

where m denotes the selected deterministic function, T is the number of observations, $\hat{v}_t$ denotes the estimated residuals, and $\hat{\sigma}^2$ is the long-run variance. Based on their previous work (Carrion-i-Silvestre and Sansó, 2006), Carrion-i-Silvestre and Sansó (2007) have proposed to estimate the long-run variance via the boundary rule of Sul et al. (2005). First, the estimated residuals are fitted with an autoregressive model:

$$\hat{v}_t = \rho_1 \hat{v}_{t-1} + \ldots + \rho_p \hat{v}_{t-p} + \psi_t \tag{3}$$

where p denotes the lag order. In our empirical application, we tested for different values of p = 1,… up until the resulting residuals $\hat{\psi}_t$ were not showing presence of autocorrelation up to the 5th order. For that purpose, we have utilized the Peña and Rodríguez (2006) test with Monte Carlo critical values (see Lin and McLeod, 2006). Our initial estimator of the long-run variance was calculated as:

$$\tilde{\sigma}_\psi^2 = T^{-1} \sum_{t=1}^{T} \hat{\psi}_t^2 + 2T^{-1} \sum_{s=1}^{l} k_{QS}(s, M) \sum_{t=s+1}^{T} \hat{\psi}_t \hat{\psi}_{t-s} \tag{4}$$

where k_{QS} is the Quadratic Spectral kernel weighting scheme with bandwidth parameter M. The value of the bandwidth parameter was chosen based on the Newey and West (1994) bandwidth automatic procedure. The long-run variance in (4) is recolored to:

$$\hat{\sigma}^{2*} = \frac{\tilde{\sigma}_{\psi}^{2}}{\tilde{\delta}(1)^{2}} \quad (5)$$

where $\tilde{\delta}(1)$ is the autoregressive polynomial from (3) evaluated at 1. The boundary condition proposed in Sul et al. (2005), leads to the final estimate of the long-run variance employed in the test statistic:

$$\hat{\sigma}^{2} = \min\left\{T\tilde{\sigma}_{\psi}^{2}, \hat{\sigma}^{2*}\right\} \quad (6)$$

Finally, we should specify the deterministic component $\mu(.)$. We follow Carrion-i-Silvestre and Sansó (2007) and consider the following seven model specifications:

Tab. 1: Deterministic functions

Model	$\mu(.)$
AAN	$\theta_0 + \sum_{i=1}^{2} \theta_i DU_{i,t}$
AA	$\theta_0 + \gamma_0 t + \sum_{i=1}^{2} \theta_i DU_{i,t}$
BB	$\theta_0 + \gamma_0 t + \sum_{i=1}^{2} \gamma_i DT_{i,t}$
CC	$\theta_0 + \gamma_0 t + \sum_{i=1}^{2} \theta_i DU_{i,t} + \sum_{i=1}^{2} \gamma_i DT_{i,t}$
AB-BA	$\theta_0 + \gamma_0 t + \theta_1 DU_{1,t} + \gamma_2 DT_{2,t}$
AC-CA	$\theta_0 + \gamma_0 t + \sum_{i=1}^{2} \theta_i DU_{i,t} + \gamma_2 DT_{2,t}$
BC-CB	$\theta_0 + \gamma_0 t + \theta_2 DU_{2,t} + \sum_{i=1}^{2} \gamma_i DT_{i,t}$

Source: based on Carrion-i-Silvestre and Sansó (2007)

where $DU_{i,t} = 1$ and $DT_{i,t} = (t - T_{bi})$ if $t > T_{bi}$ and 0 otherwise, where T_{bi} denotes the date of the break in the deterministic component, $i = 1, 2$, and $T_{b1} \neq T_{b2} \pm 1$.

The critical values of the stationarity test were used from Carrion-i-Silvestre and Sansó (2007), who used an extensive Monte Carlo simulation to approximate asymptotic critical values. It is worth noting, that the critical values depend on the location of the break dates.

2.2 Estimation of the breaks and model selection

The break dates were estimated using the *RSS* (residual sum of squares) minimization algorithm. The selection of the preferred specification was performed using the Modified Bayesian Information Criterion (*MBIC*) as proposed by Hall et al. (2013). More specifically, we selected (and reported) model with a specification for which the following value was the lowest:

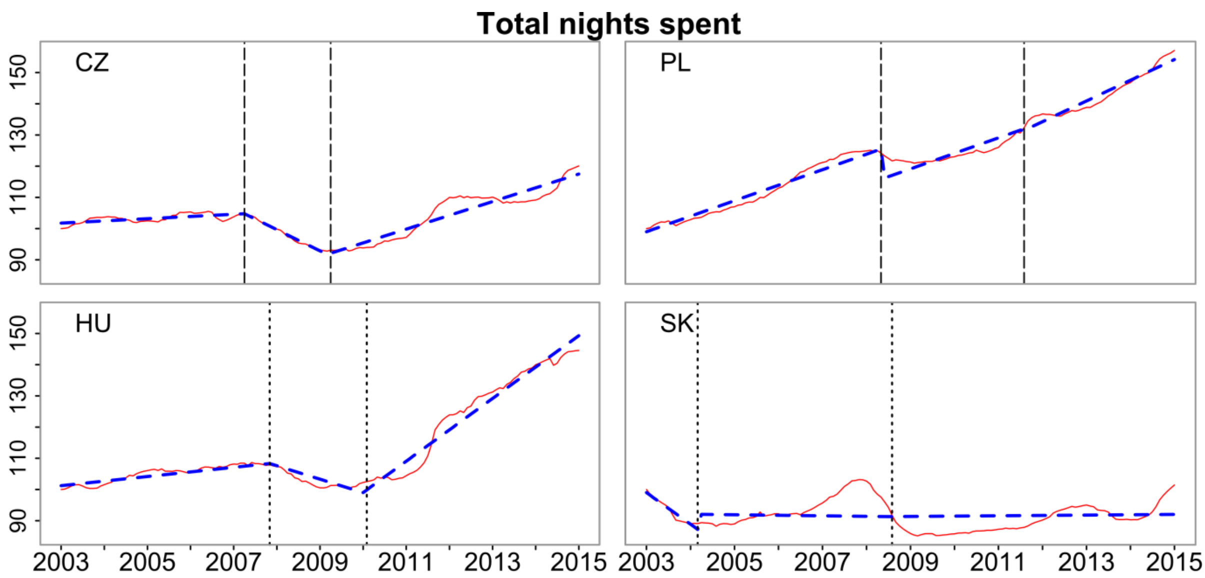
$$MBIC_m = \ln(RSS_m) + (q(n+1)+3n)\ln(T)T^{-1} \quad (7)$$

where q is the number of model parameters, and n is the number of breaks.

3 Results

The tourism activities with estimated structural breaks are plotted in Figure 1 and we can clearly see that for several series, structural breaks in the series are evidence. For all but Slovakia, the date of the first structural break occurred in 2008 and 2009, i.e. around the period when the financial crisis started to hit the real economies. From Figure 1 it appears that taking into account structural breaks might be a correct approach for testing stationarity.

Fig. 1: Total nights spend (de-seasonalized values with base at December 2003)



Source: Author's own calculations in R
Notes: Vertical lines correspond to break dates.

Our results reported in Table 2 provide strong evidence, that if we do not take structural breaks into account, tourism activity across V4 countries appear to be non-stationary. This is already an interesting finding, as most of the empirical studies are using this type of no-break stationarity tests.

However, if we take structural breaks into account, the evidence for non-stationarity is weaker. The results for the Czech Republic and Hungary still suggest non-stationary. The results for Slovakia and Poland suggest that if we take structural breaks into account, the series might be stationary after all.

Tab. 2: KPSS test statistics with up to two structural breaks (nights spent)

Country	No break models		Breaks models						
	Level Test	Level + Trend Test	Model	Test	Level Break 1	Break 2	Trend Break 1	Break 2	MBIC
CZ	6.975^{c}	3.626^{c}	BB	0.059^{b}			March 2008	March 2010	6.994
HU	33.622^{c}	3.912^{c}	ACCA	0.073^{a}	Apr. 2009	July 2012		July 2012	6.330
PL	150.053^{c}	0.663	BB	0.029			Oct. 2008	Jan. 2011	6.382
SK	0.655^{c}	0.591	BCCB	0.013	Feb. 2005		July 2009		7.260

Source: Author's own calculations in R
Note: Subscripts "*a*", "*b*" and "*c*" denote statistical significance at the 10% , 5% and 1% significance level. MBIC denotes the modified Bayesian Information Criterion.

Conclusion

We show, that taking account structural breaks in time-series of tourism activity might be crucial when deciding whether the series is stationary or not. First, our results have suggested, that the first breaks occurred around the financial crisis in 2008 and 2009 (except Slovak Republic). The second break in the series occurred latter, after the economies started to make a fast recovery. However, the breaks occurred in different years, which suggest, that tourism activity in the region recovered with different pace. Second, when structural breaks were not taken into account, we found that each of the tourism activities appears to be non-stationary. Thus policies might have permanent effects on the tourism activity in these economies. However, when we took structural breaks into account, the stationarity hypothesis was not rejected for Poland and Slovakia, where it appears, that policies (shocks) are transitory, i.e. are reverting to the long-run trends.

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