Assessing the Impact of Domestic Economic Crises on Foreign Travel Data Recording: The Greek Case

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Abstract:

Purpose: *We assess whether statistical recording of international travel activity towards a country in financial crisis environment underestimates the actual picture of its tourism receipts.*
Design/Methodology/Approach: *Considering the case of Greece and using data during a period including the financial crisis, a VECM estimation highlights the factors endogenously affecting the recorded international travel receipts.*
Findings: *The performance of international travel receipts during the Greek crisis cannot be explained only by changes in variables proposed in the appropriate theoretical background like foreign demand and relative prices. In addition, inward travel activity in the country has been adversely affected by the rise in domestic turmoil following the crisis, while travel receipts indicators underestimate actual tourism performance during periods of intense turbulence in the financial system.*
Practical Implications: *Accounting for such under recording, policy makers can more accurately assess the performance and actual contribution of the tourism sector to an economy under stress, upon designing the appropriate sectoral policy interventions. In parallel, tourism sector stakeholders can form a better-informed view about the sector's actual trends and prospects.*
Originality/Value: *In the case of the Greek financial crisis we find that the effective income contribution of the tourism sector to Greek service providers was considerably higher than recorded international receipts, by circa 4.6% of annual revenues and cumulatively by €2.8 billion during the four-year period following the imposition of capital controls.*

Keywords: *Tourism statistics, VECM, data collection, economic crisis.*

JEL codes: *C51, C83, Z38.*

Paper type: *Research article.*

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1. Introduction

Amidst increasing uncertainty about the likelihood of Greece exiting the currency union, a bank run took place in Greece in the summer of 2015. To contain deposit outflows from domestic banks and prevent their collapse, the authorities imposed capital controls on 28 June 2015. The restrictions affected cash withdrawals and outgoing cross-border transfers. The restrictions were lifted gradually over a period of four years, along with the public's progressive recovery of confidence vis-à-vis the banking system. This case can hence be considered as a period of significant financial turbulence, the effects of which on recording tourism performance merit to be assessed, for at least two reasons: First, because the tourism sector continued to play a leading role in the Greek economy during the crisis[4] and second, because severe crises have been found to affect travel flows as these are reflected in the quality of the data recorded (Lim, 1997; Prideaux and Witt, 200; Chu, 2008; Wang, 2009; Tsangari, 2012). However, all these contributions consider an environment in which crises are exogenous with regard to the host country.

Assessing the performance of the Greek tourism sector relies heavily on data by the Bank of Greece (BoG - Frontier Survey) and the Hellenic Statistical Authority (Elstat). To complete the picture of the travel activity in Greece additional sources stem from the Civil Aviation Authority, while information is also gathered in various land border checkpoints and ports (INSETE, 2016). The diversity of sources used to record the performance of the sector has been extensively referred to in the literature, along with the challenges involved.

The reliability of the various sources used in assessing travel activity seems to be a very specialized issue while the available literature on this is limited, rather selective and to a certain extent technical. Contributions on this issue can be traced even since the beginning of the eighties e.g., White and Walker (1982). Much later, Atilgan *et al.* (2003), suggested a new approach using correspondence analysis which can be applied effectively to evaluate the service-quality and display the differences in the expectations/perceptions of distinct consumer groups. Finally, Laimer and Weiß (2006) underline the need to focus on consumption expenditure in order to assess the role that tourism is playing in the economy. Focusing on consumption requires relying on surveys while according to Frechtling (2006) only visitor surveys pass the relevance, coverage, and accuracy tests among all methods and models examined[5].

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[4]*According to latest estimates (INSETE, 2019; IOBE, 2012), the tourism sector contributes directly and indirectly more than 11.7% and 25% respectively of Greece's annual GDP. Travel receipts account for nearly half of total receipts from services thus financing around ¾ of the trade deficit. Greece ranks 13th and 22nd among 50 countries (UNWTO, 2018) concerning international arrivals and receipts, respectively.*

[5]*The UNWTO guidelines insist on dimensions of quality travel statistics like relevance, credibility, accuracy, coherence, and accessibility which would contribute to facing the recording problems caused by the so-called "hidden tourism" (Volo and Giambalvo, 2008).*

A relevant issue frequently raised in the literature is the selection of the series that best measures travel demand and, in our case, best reflects the actual performance in the Greek tourism industry. Looking into the matter in detail, the various sources in the literature suggest that tourism demand can be measured in a variety of ways, the most popular ones being the doer criterion (arrivals) and pecuniary criterion (receipts), (Song *et al.,* 2010). The issue has been raised during 2016 when the arrivals data to Greece pointed to a generous increase while the revenue figures, by contrast, showed a decline. The Bank of Greece (2017) attempts to explain the opposing trend of arrivals as compared to receipts by arguing that the reduction of the latter is due to lower prices or to lower growth rates in the Eurozone and the US. They also question the reliability of arrivals as reflecting travel activity pointing to a preference for overnight stays data.

In the framework outlined above, this paper uses a Vector-Error-Correction-Model to test our central hypothesis, namely, to evaluate the extent to which a domestic financial crisis environment affects the travel activity data recorded in the host country. To this end the paper is structured as follows: Following this brief introduction, section II offers an overview of the data and model specification, while section III presents the main empirical results, followed by the section devoted to robustness checks and, finally, the conclusions in the last section of the paper.

2. Data and Model Specification

The most frequently used measures of foreign tourism performance are tourist arrivals and international receipts both of which, however, display fundamentally different characteristics (Frechtling, 1987; Sheldon, 1993; Witt and Witt, 1995; García-Ferrer and Queralt, 1997). We opt for travel receipts as the dependent variable as it appears more relevant for macroeconomic activity forecasting (Song *et al.,* 2010).

Foreign demand as proxied by origin countries' income together with relative prices are regarded as leading determinants of tourism demand (Crouch, 1994; Dritsakis and Agorastos, 1999; Dritsakis, 2004; Gazopoulou, 2012). The income variable is composed of the weighted average of income growth rates of the top nine countries of origin for arrivals in Greece, the time-varying weights representing the share of each of these countries in total arrivals in Greece. Relative prices are introduced as the ratio of the price of a typical travel package to Greece over the prices of competitors. The domestic travel package price index is calculated following

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The relevance principle requires the method to distinguish foreign transactions generated by international visitors from all other transactions. The coverage principle demands that all transactions undertaken by international visitors are included, while the accuracy principle ensures that the transactions are recorded, identified, and transmitted accurately to the Central Bank.

Gazopoulou (2012) on a quarterly basis between 2000 and 2019, as the weighted average of the Greek CPI (representing tourists' expenditure patterns in the arrivals market), the prices offered by the Greek hotels and the international oil prices (to capture the transportation cost of the package). The variable measuring the prices of competitors is calculated through the weighted average of the CPI of four main competitor countries, namely Italy, Spain, Portugal, and Turkey. Using the lagged dependent variable describes tourists' expectations, habit persistence, the "word-of-mouth" effect and supply constraints (Song *et al.,* 2010), while lagged explanatory variables are also often included in demand models to capture the dynamic effects of various influencing factors on tourism demand (Lim, 1997).

The degree of domestic turbulence during the Greek international support program era, i.e. between 2010 Q2 and 2018 Q3, is proxied by the deviations of the Greek government bond yield from that of the German Bund. In addition, we construct a measure for possible under-recording of tourism activity through the discrepancy of the number of overnight stays recorded by two distinct sources, during the program period. The variable DISCRd reflects the difference in the recorded number of overnight stays between BoG and Elstat after controlling for the growth of "bnb-type" platforms. BoG estimates overnight stays based on responses from travelers (Frontiers Survey), while Elstat conducts a survey on accommodation providers. A widening gap or systematically positive difference not attributable to bnb-type platforms can hence be viewed as a proxy for partial under-recording of tourism activity based on responses by domestic service providers, compared to evidence from international travelers. [6]

The data set consists of variables on a quarterly frequency during the period 2002-2019, presented in Table 1. Descriptive statistics for the main variables are presented in Table 2. For the purpose of the empirical estimation, and correcting for seasonality, the variables are annualized through calculating the 4-quarter rolling value, then their quarterly percentage change (q-o-q) was used, measured by the first difference of their logarithmic values. For the government bond spread (GGB variable), the first difference of its percentage level across quarters was used.

The choice of the econometric model for the empirical estimation builds upon existing literature on Vector Error Correction Model estimation (VECM) calibration to a country's macroeconomic outlook, including Anderson *et al.* (2002) on the US economy, Christofides *et al.* (2006) on Cyprus, Lyhagen *et al.* (2015) on Sweden, Adamopoulos and Thalassinos (2020) on G-6 leaders and Kazanas (2017) on Greece. The model assumes that all macroeconomic variables are endogenously determined and allows exogenous shocks to affect each endogenous variable in the short-term. In the context of tourism sector, we explore long-term relationships among variables, such as international travel receipts, number of overnight stays, relative prices, and

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[6]*The methodology for computing DISCRd is presented in Appendix I.*

number of bnb-type listings. The exogenous shocks on these relationships stem from foreign demand.

Table 1. *Variable Definitions*

Variable	Abbreviation	Definition	Source
Foreign demand	FD	Weighted GDP of countries of origin	Eurostat, Authors' calculations
Domestic prices	PG	Weighted Greek Package price	Elstat, Authors' calculations
Foreign prices		Weighted Competitors' Package price	Eurostat, Authors' calculations
Relative prices	PR	Domestic prices / Foreign prices	Authors' calculations
Receipts	REC	International travel receipts, current prices	BoG
Nights	NI	Number of overnight stays	BoG
BNB-type accommodation	BNB	Number of BNB listings in Athens (2010-2019)	Airdna
Recording discrepancy	DISCR	Nights (BoG) – Number of nights (Elstat)	BoG, Elstat,
GG Bond Spread	GGB	Spread of 10-year GGB over Bund	ECB
Dummy program	Dumpr	Time dummy equals 1 for program period, during 2010 q2 -2018 q3	Authors' calculations
GG Bond Spread during program period	GGBd	Dumpr*GGB	Authors' calculations
Recording discrepancy during program period	DISCRd	Dumpr*DISCR after orthogonalization with BNB impact	Authors' calculations Appendix I

Source: Authors' calculations.

Table 2. *Data Descriptive Statistics*

Variable	Units	Mean (level)	Mean (q-o-q)	Std. Dev. (level
FD	Index 2010=100	114.8	0.85%	9.7
PR	Index 2010=100	102.8	0.17%	6.1
REC	€ mil. (current)	12,624	1.43%	2,296
NI	Number of nights	179,214	1.33%	31,728
BNB	Number of listings	4,242	15.6%	4,229
DISCR	Number of nights	116,958	1.48%	22,439
GGBd	Percent	8.62%	0.02 ppt	4.95

Note: Variables are available on a quarterly frequency. For all variables we compute the difference of logarithms of their 4-q rolling value.
Source: Authors' calculations.

The degree of domestic turbulence during the Greek international support program era is tested as part of the long-term relationship affecting tourism performance variables. Besides, the measure for possible under-recording of tourism activity (discrepancy of the number of overnight stays recorded by the two distinct sources), during the program period, is tested as part of the long-term relationship affecting tourism performance variables. For the VECM estimation to be well specified, a necessary condition is for the endogenous variables to be cointegrated. The general formulation of a VECM expresses a dynamic relationship between the vector Y_t of endogenous variables that are cointegrated (long run relationship) and the vector of exogenous variables X_t affecting the endogenous variables[7]. Indicatively, a VECM can be written in the following algebraic form:

$$\Delta y_t = c + A y_{t-1} + B \sum_{i=1}^{p} \Delta y_{t-i} + \Gamma \Delta X_t + e_t \qquad (1)$$

where $A y_{t-1}$ depicts one or more cointegration relationships among the endogenous variables, $B \sum_{i=1}^{p} \Delta y_{t-i}$ expresses the short-term adjustment coefficients and ΓX_t represents the contemporaneous impact of exogenous variables.

We test whether there is a co-integrating relationship between six variables: international receipts (REC), relative prices (PR), number of overnight stays (NI), number of bnb-type listings (BNB), the Greek Government Bond spread during the program period (defined as the product of Dumpr*GGB and denoted as GGBd) and the degree of recording discrepancy of the number of overnight stays during the program (defined as the product of Dumpr*DISCR and denoted as DISCRd). We use one exogenous variable, namely foreign demand (FD). Following Johansen's (1991) cointegration rank test, we find that our set of endogenous variables exhibits two cointegrating relationships at the 95% confidence level (for both Trace and maximum eigenvalue criteria). We choose one as the number of optimal lags for the endogenous variables following a combination of information criteria Akaike, Schwarz, Hannan – Quinn). Hence, the VECM specification including two cointegrating relationships among the endogenous variables and one lag, consists of the following vectors:

$$y = (REC, PR, NI, BNB, DISCRd, GGBd), \qquad X = (FD) \qquad (2)$$

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[7]*For the appropriate VEC model specification, a stability test was applied on the underlying VAR specification, White test for the heteroscedasticity of residuals, and LM test for autocorrelation.*

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3. Empirical Results

The model's estimation output is presented in Table 3. In relation to the endogenous variables, the cointegrating equations reveal a positive long-term relationship between international travel receipts (REC) and the number of overnight stays (NI) and number of bnb-type listings (BNB), a negative long-term relationship between REC and domestic turbulence proxied by the government bond spread during the program period (GGBd), as well as a negative relationship between REC and the recording discrepancy DISCRd during the program period. Besides, there is evidence of a negative long-term relationship between relative prices (PR) and the number of bnb-type listings (BNB), the degree of domestic turbulence (GGBd), as well as a positive relationship with the discrepancy proxy (DISCRd). In relation to the exogenous variable, a rise in foreign demand (FD) has a significant positive impact on international travel receipts (REC), relative prices (PR), overnight stays (NI) and bnb-type listings (BNB).[8]

Figure 1 shows how shocks of one standard deviation magnitude on some of the endogenous variables of the VECM, affect REC and DISCRd over 16 quarters ahead. The results in relation to the impulse response of international receipts (REC) reveal that a rise of domestic turbulence reflected through shocks increasing the bond spreads (GGBd) or the recording discrepancy (DISCRd) negatively affect international travel receipts. Unsurprisingly, during the programs period, the recording discrepancy DISCRd increases following shocks in domestic turbulence.

On the basis of the accumulated response of REC over 16 quarters following one standard deviation shocks of DISCRd, one can estimate the impact that the actual increase in the recorded discrepancy during 2010-2015 (by circa 1 standard deviation) had on international travel receipts[9]. As a result, we estimate that recorded receipts dropped cumulatively by circa €2.8 billion (or 4.6% of total revenues) over a 4-year period due to the increase observed in the recording discrepancy, which would correspond to an under-estimation of the contribution of tourism sector on domestic providers' income. The Variance Decomposition Analysis reveals that a rise of domestic turbulence during the program period reflected through government spreads (GGBd) explain a significant and increasing share of REC, NI, and DISCRd variance over time, accounting for up to 50, 41 and 5 percent respectively after 16 quarters (Figure 2). Shocks in the statistical discrepancy (DISCRd) explain up to 7 percent of REC variance within the first years following the shock. The share of

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[8]*The VECM estimation shows only the one-off short-term impact of the exogenous variables and does not capture their dynamic effects.*

[9]*According to the impulse response function, 1 standard deviation increase in DISCRd (circa 0.034) leads to an average 4.6% drop in REC during the 4 years following the shock. Therefore, the observed increase in DISCRd by circa 1 standard deviation during 2010-2015 (as indicated by the HP filter values in Appendix I), translates into an estimated average drop of REC by about €2.8 billion or 4.6% of total receipts during 2016-2019, equivalent to circa €700 million per annum.*

REC variance, which is due to shocks in its lagged values dissipates over time, to reach below 45 percent after 8 quarters.

Table 3. *VECM Estimation Output*

Cointegration Relationships

REC(-1)	1		0	
PR(-1)	0		1	
NI(-1)	-0.288	*	0.50	
BNB(-1)	-0.044	***	0.240	***
GGBd(-1)	0.007	***	0.024	***
DISCRd(-1)	0.075	***	-0.415	***
c	-5.747		-7.062	

Error correction	REC		PR		NI		BNB		GGBd		DISCRd	
Cointegr. Rel. 1	-0.33	***	-0.16	***	-0.19	**	-13.52	***	-5.72		-11.61	**
Cointegr. Rel. 2	-0.06	***	-0.03	***	-0.04	**	-1.93	*	-1.90	*	-1.07	
REC(-1)	0.57	***	0.02		0.05		-0.95		3.97		-0.81	
PR(-1)	-0.09		0.58	***	-0.05		-10.2		-1.75		-9.22	
NI(-1)	-0.28	*	-0.01		0.04		1.33		3.29		1.00	
BNB(-1)	0.05	**	0.01		0.06	***	-0.15		-0.96		0.22	
GGBd(-1)	-0.01	***	-0.01		-0.01	***	0.24	*	0.75	***	0.21	*
DISCRd(-1)	-0.06	***	-0.01		-0.07	**	0.01		0.95		-0.31	
c	-1.64	***	-0.72	***	-0.98	***	-61.6	***	-26.2		-48.9	**
FD	0.35	***	0.16	***	0.21	***	13.3	***	5.65		10.58	***
Adj. R^2	38.7%		64.2%		31.5%		4.9%		52.1%		5.3%	
LogL	466.2											

*Note: The asterisks *, **, *** denote the parameters' statistical significance at the 90%, 95% and 99% confidence levels, respectively.*
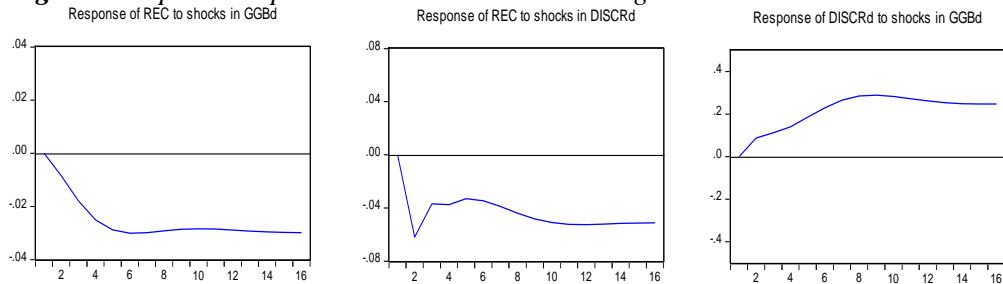*Source: Authors' calculations.*

In relation to our research question, which aims at evaluating the extent to which domestic turbulence in the financial markets affected the recording of tourism revenues, the empirical results highlight the significant long-term impact of domestic turbulence on travel revenues since the beginning of the Greek sovereign debt crisis in 2010. In particular, a rise in GGB spreads during the program period negatively affected international travel receipts (REC), relative prices (PR) and the

number of overnight stays (NI), but also resulted in an increase of the recording discrepancy in the number of stays (DISCRd) during the program period.

In turn, higher recording discrepancy in the number of stays resulted into lower recording of international receipts REC, during the programs era. These effects hold after controlling for the long-term interaction between REC, NI and relative prices. In addition, shocks in GGB spreads explain a significant part of the variability of international receipts.
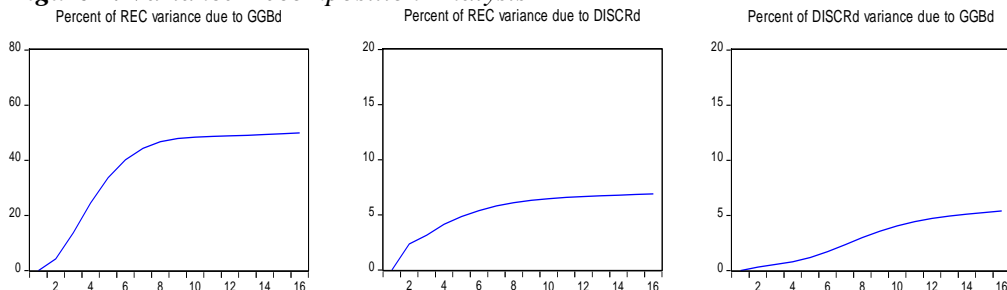
Figure 1. *Impulse Response to Shocks on Main Endogenous Variables*

Note: Impulse responses are estimated during an interval of 16 quarters (4 years), following one standard deviation shock on each of the endogenous variables.
Source: *Authors' calculations.*

Figure 2. *Variance Decomposition Analysis*

Note: Variance decomposition is presented during an interval of 16 quarters (4 years)
Source: *Authors' calculations.*

Hence, the case study of Greece provides evidence that intense domestic turbulence leads to both a persistent drop in international travel receipts of a country but also to partial under-estimation of its actual tourism revenues, possibly because a higher share of them remains abroad. In the latter case, a plausible explanation would be that tourism service providers exploit fully legitimate options of receiving payments from clients abroad, which translates into lower recorded inflow of travel receipts in the balance of payments and hence in the international receipts indicator recorded by the Bank of Greece. Such business practice naturally becomes more attractive following a rise in domestic financial turbulence, and is in line with the observed

negative relationship between DISCRd and REC, as well as between GGBd and REC.

In a snapshot, the results suggest that part of the performance of international travel receipts during the Greek crisis cannot be explained only by changes in relative prices, the high penetration of bnb-type platforms or by trends in the number of overnight stays. Tourism performance is negatively affected by the rise in domestic turmoil, while at the same time recorded travel receipts indicators may under-estimate actual tourism performance during periods of intense turbulence in the financial system. In the case of the Greek financial crisis, we find that the effective income contribution of the tourism sector to Greek service providers was considerably higher than what has been recorded by travel receipts data during the sovereign debt crisis period. Indicatively, during the 4-year period following the imposition of capital controls in 2015, the effective income contribution of tourism is estimated on average around 4.6% (or €700 million) per annum higher than recorded receipts, and cumulatively by circa €2.8 billion.

4. Robustness Checks

In the context of robustness checks, we estimated the model using alternative proxies for domestic turbulence, through replacing government bond spreads (GGB) by the stock of private sector banking deposits, but the results do not change substantially. We also checked the possible impact of time dummies proxying for regional tensions, such as political instability in Turkey or the Arab spring but did not find a significant effect. We also estimated an alternative VECM specification replacing the two variables REC and NI by their ratio, measuring international receipts per overnight stay (RPN). We find that shocks in domestic turbulence have a persistent negative effect on RPN, like our main specification. We further used an alternative specification where the recording discrepancy (DISCR) is part of the set of exogenous variables. We find that a rise of the recording discrepancy leads to a significant drop in either REC or RPN. This confirms evidence supporting the explanation that an increase of the under-recording practice translates into lower travel receipts, also in the short-term horizon.

5. Conclusions

This paper has focused on assessing the performance of travel activity in Greece during the crisis years through the use of a VECM model and evaluating the extent to which domestic turbulence in the financial markets has affected the recording of tourism revenues.

We conclude that domestic turbulence leads to a persistent drop in international tourism receipts of a country. Notwithstanding, recorded travel receipts may under-estimate actual tourism performance during periods of intense turbulence in the

domestic financial system, possibly because a higher share of actual receipts represents payments to tourism service providers abroad. This, in its turn, translates into lower recorded inflows of travel receipts. In the case of Greece, following the imposition of capital control measures after the second quarter of 2015 and until the end of the period under consideration, we estimate that the effective income contribution of the tourism sector was higher than what has been recorded by travel receipts data, cumulatively by circa €2.8 billion (or 4.6% of average annual revenues). This can be largely due to a reasonable reaction from the part of exporters of tourism services, who hedged against the prevailing uncertainty during that period concerning the possibility to settle financial obligations abroad. As per avenues of further research, similar methodologies can be applied to gauge the impact of global exogenous shocks, such as the Covid-19 crisis, on the tourism sector.

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Appendix I. Estimating the recording discrepancy variable DISCRd

BoG estimates overnight stays based on responses from travelers (Frontiers Survey), while Elstat conducts a survey on accommodation providers. The latter excludes bnb-type providers. The difference between the two surveys is denoted as DISCR. Such difference has been increasing during the program period 2010-2018. At the same time, the use of bnb-type platforms offering tourism accommodation has exploded, as portrayed by Airdnd data for Athens area during 2010-2019.
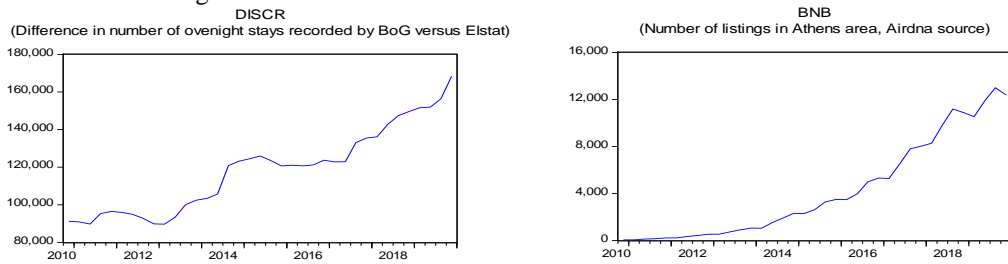
In a first step, we regress DISCR on BNB, using an AR(1) specification during 2010-2019, for which BNB data is available:

$$DISCR_t = c + \alpha_t DISCR_{t-1} + \beta_t BNB_t + \varepsilon_t \qquad (3)$$

$$DISCR_t = 11.33 + 0.97\ DISCR_{t-1} + 0.05\ BNB_t + \widehat{\varepsilon}_t, \text{ where adjusted } R^2 = 95\%$$
$$(***) \quad (***) \qquad\qquad (**)$$

In a second step, we extract the residual series and define it as $\widehat{\varepsilon}_t \equiv DISCRd_t$. We apply an HP filter to illustrate the trend of the DISCRd variable. The increasing trend of DISCRd during 2010-2019 illustrates a widening gap and systematically positive difference between the two sources (BoG and Elstat), which is not attributable to bnb-type platforms. This gap can be viewed as a proxy for partial under-recording of tourism activity based on responses by domestic service providers, compared to evidence from international travelers. Literature has questioned the accuracy of similar surveys on the basis of likely reluctance on behalf of hotel managers and owners to share such information (Carlsen 1995; Vaughan et al. 2000) with possible explanations relating to fear of competition and tax audits. Youssefzadeh (2003) has further pointed out that respondents cannot accurately recall expenditures after the end of their visit or the season, respectively.