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TOURISM REVENUE FOR THE NORTH REGION OF PORTUGAL: AN ECONOMETRIC ANALYSIS

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ABSTRACT

The purpose of this study is to build a model that allows estimating the Tourism Revenue for the North Region of Portugal. To achieve the Multiple Linear Regression Model estimated by Ordinary Least Squares Method it was selected 13 economic variables and collected 72 monthly observations for the period between January 2006 and December 2011.

The empirical analysis showed that the model of First difference of LOG is the econometric model that explains better the tourism revenue for the North Region of Portugal. The model as well indicated that the tourism revenue are influenced by variations occurred in the number of national and foreigners tourists, in the available income of the national and foreigners tourists and still in the typology of the hotel establishment. Although of the high increase of foreign tourists in the North Region and hotel investment, the domestic tourism was the main contribution for the tourism revenue.

Keywords: Tourism Revenue, northern region of Portugal, econometric models, economic variables.

INTRODUCTION

The contribution of Tourism to economic development has been well documented in the scientific empirical studies. A large part of these studies have focused on studying the relationship between tourism activity and economic growth of a country, region or tourism destination.

Over the past decades, tourism has continued to enlarge and diversify. It is now one of the largest and fastest-growing economic sectors in the world. According with the data provided by World Tourism Organization from 1980 to 2011, international tourist arrivals more than tripled worldwide, changing from 279 million in 1980 to 996 million in 2011, and corresponding to an average growth of 4,2% a year (WTTC, 2013b). In the same period, the export value of tourism international receipts, including international passenger transport-increased from US$125 billion in 1980 to US$1,240 billion in 2011, this corresponds to an average growth of 4,1% a year, which is almost the same pace as tourist arrivals (WTTC, 2013a).

According to the World Tourism Organization long-term forecast for Global Tourism Towards 2030 (UNWTO, 2011):

- international tourist arrivals are expected to continue to grow at the sustained pace of 3.3% a year on average, reaching 1,8 billion by 2030;
- as an outcome, arrivals in emerging economies are expected to surpass those in advanced economies by 2015;
- in 2030, 57% of international tourist arrivals will occur in emerging-economy destinations (versus 30% in 1980 and 47% in 2010);
- arrivals in advanced-economy destinations will make up 43% of arrivals overall.

The numbers presented above are highly satisfactory. Once again is possible to see the importance of tourism sector.

Tourism sector is one of the leading job creators in the world and the industry employs more than 98 million people directly, representing over 3% of all employment (Blanke & Chiesa, 2013). The annual economic impact research carried out by World Travel and Tourism Council (WTTC) and Oxford Economics found that tourism sector direct employment is expected to grow at an average 1,9% per year over the next 10 years, compared with total employment growth of 1,2% each year through to 2022 (WTTC, 2013a). This statement can be partly explained by the continued rise in tourism demand from emerging markets. Indeed, regarding at the economic impact of travel and tourism as a whole, expects the industry's contribution to GDP to grow at an average annual rate of 4,2% over the next 10 years, stronger than overall global growth predictions of 3,6% (WTTC, 2013a).

Portugal in this sense has not neglected this sector and its contribution to the country's economy. So, according with the Travel and Tourism Competitiveness Index, that aims to measure the factors and policies that make it attractive to develop the travel and the tourism sector in different countries, Portugal

ranked number 20 in 2013 year (Blanke & Chiesa, 2013). Therefore, Portugal is being in the top 20 international destinations in the world, in the year 2013.

As has been happening worldwide and domestic tourism has grown consistently in the North of Portugal. This region has a high potential that can be used to improve the region's economy. The present context of a global economic crisis, where the traditional economic sectors are facing certain difficulties, the tourism sector could become a strategic sector for the sustainability of the economy of the northern region of Portugal given their importance in terms of the share of Gross Domestic Product (GDP). This opinion is supported by several studies on international and national level, as reported in the some research (*e.g.*, Soukiazis & Proença, 2008; Proença & Soukiazis, 2008; Fernandes et al., 2008; Fernandes, Teixeira & Monte, 2009; Santos & Fernandes, 2010, 2011).

The North Region of Portugal as a tourism destination offer a large variety of tourist products, that goes beyond the beach, the mountains, the thermals and not forgetting the rural tourism that has been growing in the last years. This tourism destination offers an interesting alternative to the 'mass tourism' and has becoming more competitive, in the last years.

This competitiveness can be linked to the investment that was done in Portugal and in North Region of Portugal, over the last years, due to some regional development programs. For example, and in accordance with of the POPH (2012), POFC (2012) and PRODER (2012) data, in Portugal, since 2007 there were approved 496 million euros of public and private investment, of which 190 millions been intended for the construction or requalification of four and five stars hotels. The number of the guest was increased in 498 thousand (23,2 %), so it is an annual growth rate of 4,3 % and the overnight reached 4,5 million, more 702,6 thousand overnight than 2006. In 2011, the North Region reached 223,8 million euros of tourism revenue, of which 179,4 million euros are from hotels. The Overnight Average Stays of the national and foreign tourists was 1,5 and 1,9 overnights, respectively. These numbers are satisfactory and allow putting this activity sector to the proof in a context of crisis we are experiencing.

Based on that tourism is a sector that comprehends a range of economic activities responding to differentiated demands with particular features at the national and international levels. The combination of demand and supply characteristics at the national and international levels generates some difficulties in modelling the tourism activity. Though, the snowballing importance of the tourism sector in Portuguese economy and in terms of its contribution to the gross domestic product (GDP), the employment and the balance of payments justifies the interest to carry out this study. Therefore, the objective was to build a model that would allow estimate tourist revenue for the North Region and evaluate if the typology of hotel establishments, the GDP *per capita* of Portugal, Spain, France and the UK have effects in capturing tourism revenue as well as the number of domestic and foreign overnights. In the construction and modelling tourism revenue it was used a sample of monthly data for the period between January 2006 to December 2011, collected from the National Statistical Institute, EUROSTAT and Bank of Portugal.

In order to answer the main goal of this study, the paper is organized as follows. In the first section, it is established the econometric model used and its assumptions. In the second section, shows the variables included in the model and its behaviour over the period of analysis. The next section explains the main results founded for the used models and the last section summarizes the entire study and recommendations and policy implications are highlighted.

METHODOLOGY

Identification of the Theoretical Model

Several and different models have been used to analyse the significance of tourism sector for an economy for the North Region of Portugal, by using from the simplest to the most complex. The modelling and forecasts of the tourism revenue for the North Region of Portugal is important for future strategic planning and evaluation of the objectives established for the development of the Tourism sector. This study aims to estimate the tourism revenue for the North Region using an econometric model. For that, the methodology proposed enwrap the collection data and estimation of the Multiple Linear Regression Model, which is an econometric model. According to Johnston and DiNardo (2000), Maroco (2003), Pestana and Gageiro (2008) and Zhihua and Qihua (2009), Kairat (2010), the last goal of the econometrics is the analysis of systems of simultaneous equations how there is the case of the Multiple Linear Regression Model (GLM). In multiple linear regression there are *p* independent variables (X_1, X_2,.., X_p), and the relationship between the dependent variable and the independent variables is represented by the following equation (Johnston & DiNardo, 2000):

$$Y_t = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + \mathrm{K} + \beta_p X_{pt} + \mu_t \qquad t = 1,\mathrm{K}\ ,n$$

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \cdots + \beta_p X_{pi} + \mu_i \qquad i = 1, \ldots, n \qquad [1]$$

Where: $\beta_0 \beta_0$ is the constant term and β_1 to β_p are the coefficients relating the *p* explanatory variables to the variables of interest. Consequently, multiple linear regression can be thought of an extension of simple linear regression, where there are *p* explanatory variables, or simple linear regression can be thought of as a special case of multiple linear regression, where *p*=1. The term 'linear' is used because in multiple linear regression it was assume that *Y* is directly related to a linear combination of the explanatory variables.

It should be remember that the quantitative models always rest on assumptions about the way the world works, and regression models are no exception. Therefore, in order to work with this model it's needed to make some assumptions about the behaviour of the error term. So, there are four major assumptions which justify the use of linear regression models for purposes of forecast (Zhihua & Qihua, 2009):

(*i*) linearity of the relationship between dependent and independent variables;

(*ii*) independence of the errors (no serial correlation);

(*iii*) homoscedasticity (constant variance) of the errors;

(a) versus time;

(b) versus the predictions (or versus any independent variable);

(*iv*) normality of the error distribution.

If any of these assumptions is violated (*e.g.*, if there is nonlinearity, serial correlation, heteroscedasticity, and/or non-normality), then the forecasts, confidence intervals, and economic insights yielded by a regression model may be (at best) inefficient or (at worst) seriously biased or misleading.

Empirical Model

This study aims to build an econometric model that defines the main variables that influence or explain the Tourism Revenue for the North Region of Portugal. Analysing tourism revenue through tourism supply (number of establishments, number of rooms and accommodation capacity…) and tourism demand (number of beds per establishment, number of guests, average length of stay of tourists, etc.), it was identified the following variables that was included in the original model (see Table 1):

Table 1: Variables under Study

Dependent variable	Total of Tourism Revenue
Independent variables	Domestic overnights tourism
	Foreigner overnights tourism
	Portuguese GDP *per capita*
	Spanish GDP *per capita*
	France GDP *per capita*
	United Kingdom GDP *per capita*
	Domestic occupancy rate
	Foreign occupancy rate
	Number of accommodation establishments-hotels
	Number of accommodation establishments-others
	Domestic overnight average length of stay
	Foreign overnight average length of stay
	Tourist function rate

The data variables: overnights, occupancy rate-bed places, number of accommodation establishments, average length of stay and tourism revenue were collected through the Tourism Statistics from the Portuguese National Institute of Statistics (INE) for the years 2006 to 2011. Data collected for the variables GDP *per capita* of Spain, Portugal, France and the United Kingdom (UK) were by EUROSTAT, while the variable population, to calculate the Tourist function rate, was used the Statistical Yearbook for the North Region of INE.

The selection of Spain, France and the UK tourism destinations were selected because they are the markets with the main market share for years under study. The data correspond to 72 monthly observations between January 2006 and December 2011. Noticed that not all values of the variables were available collected in monthly values. It was necessary to make secondary transformations and calculations that enabled display monthly data without loss of its significant value and it's eventually variability.

It was selected the total tourism revenue as dependent variable because it is one of the tourism indicators that directly quantifies the spending incurred by the domestic and foreign tourists in the region.

Thus, the empirical model for this study has been developed considering those previous information. The following model was developed using an econometric approach to measure the impact of tourism on real total revenue.

DATA ANALYSIS

Total Tourism Revenue in the North of Portugal

Analysing the behaviour of total tourism revenue between 2006 and 2011, it may be observed that registered positive percentage changes almost every year, especially in hotels. Tourism revenue registered a growth rate of 4,1%. The Hotels are the most significant weight to the total tourism revenue (Figure 1) and can be pointed three reasons: *i)* the number of hotels and hotel capacity installed (number of beds) it is clearly more than other types of establishments; *ii)* a Revenue per Available Room (*RevPar*) high due to the high number of guests and overnights and *iii)* the acquisition of a greater number of complementary services associated with the overnight stay. Thus, the hotels increased their weight from 72,2% in 2006 to 80,2% in 2011.

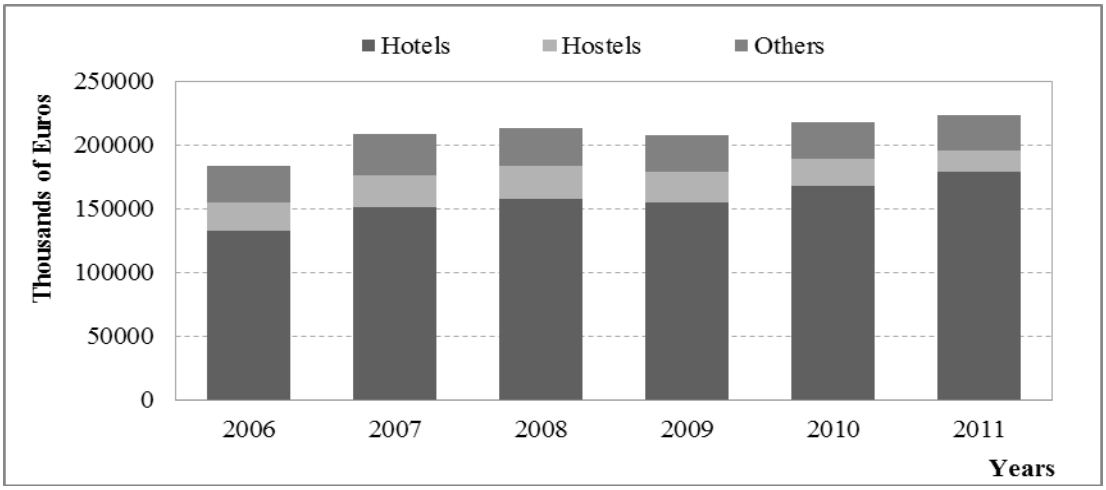

Figure 1: Total Tourism Revenue in Accommodation Establishments

The Figure 2 shows that total tourism revenue, in Accommodation Establishments in the North of Portugal, will increase during the study period and found an increased size of the intervals of seasonality from 2009, *i.e.*, a higher concentration of total tourism revenue during the summer, reaching the maximum value in August 2011 with 28,7 million. This increase may be the result of the policy of public and private investment undertaken in four and five star hotels and advertising campaigns to national and international tourists, which may be based on appropriate and adjusted marketing strategies to the new preferences of tourism consumers, based on unique and differentiators tourism resources, such as the cultural-historical heritage, landscape, nature and gastronomy.

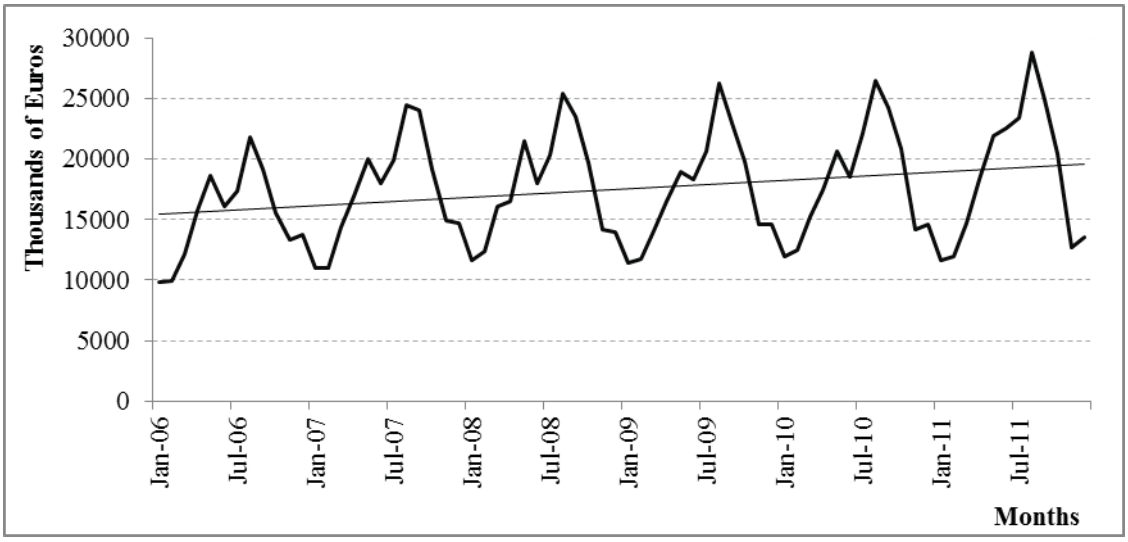

Figure 2: Total monthly Tourism Revenue in Accommodation Establishments

Domestic and Foreigner Overnights Tourism

The Figure 3 showed an increase in domestic and foreign overnights over time. The effect of seasonality it was obvious in the summer months, with 338,600 domestic (national) overnight stays registered in August 2009, while foreign overnight stays was 184,000 in August 2011. The foreign overnight stays increased every year, except 2009, which recorded a strong decrease compared to 2008 of 5,34%.

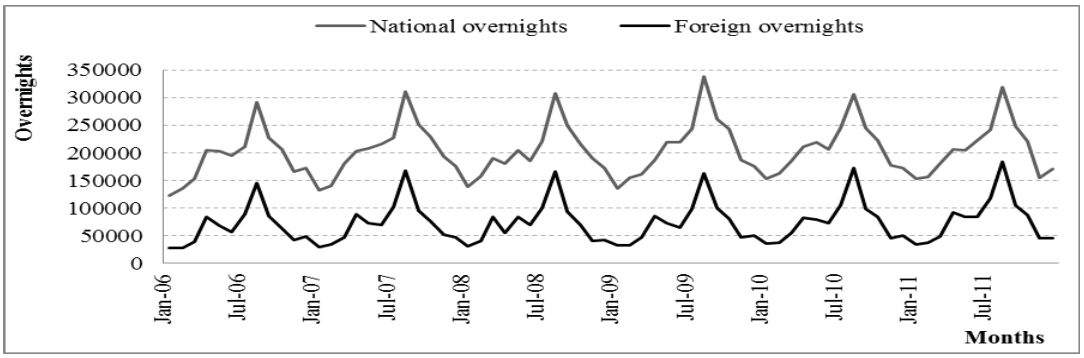

Figure 3: Monthly Overnight of Domestic and Foreign Tourists

Gross Domestic Product *per Capita*

The Gross Domestic Product *per capita* (GDP *per capita*) is the average wealth created *per capita* in a given period of time, *i.e.*, the average income that every citizen was able to produce over a given time period (monthly, quarterly or yearly). The Figure 4 demonstrates that the Portuguese GDP *per capita* increased from € 1,167 to € 1,367 between January 2006 to December 2011, but had 7 quarters with negative effect associated "Q1" (see Figure 5). This shortfall is due to lower tourism consumption of goods and services in the months of January and February that are associated with the period balances in sectors such as clothing and footwear or less disposable income due to high spending Christmas season. For Spain, Figure 4 shows a slight increase for the period under analysis but with several periods of alternation. The positive growth monthly of Spanish GDP *per capita* was close to 1% between September 2006 and September 2010. Thereafter notices a slowdown, which also occurred between January 2008 and July 2009 (financial crisis) and thought to increase over the coming years.

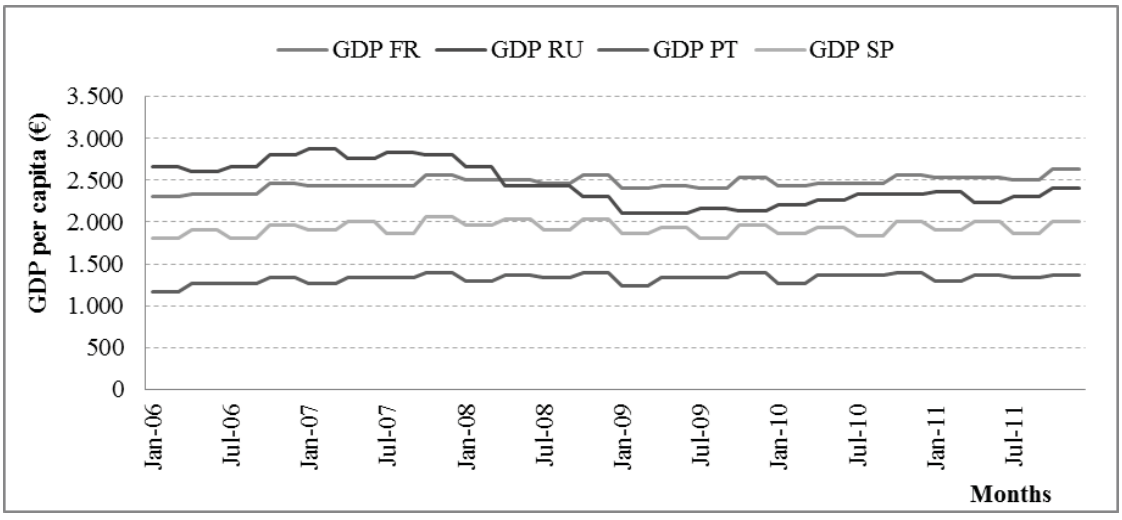

Figure 4: GDP per capita of Spain, Portugal, France and the UK

The figure above shows that France had a positive trend of growth that because its' GDP *per capita* rose from € 2,300 in January 2006 to € 2,633 in December 2011, i.e., an annual average growth rate of 2.9%. The period of larger oscillations and falls in GDP of France also coincided with that occurred to Spain (January 2008 to July 2009).

Finally, UK GDP *per capita* was one that grew less during the period under review. Figures 4 display a clear downward trend for the period October 2007 to January 2009. This period was critical for all countries, especially Spain and the UK, due to the financial collapse that happened in the United States with the Subprime which quickly spread to other countries who were too exposed to financial markets. Thus, it may be concluded that one of the main causes that led to a significant drop in foreign tourism revenue in accommodations establishments and the number of overnight stays in 2009, was the fall in GDP *per capita* of the countries under review.

Accommodations establishments

Figure 5 show that the numbers of hotels increase 118 in January 2006 to 205 in 2011 representing an increase of 74% in 6 years. Instead, the other collective accommodation establishments decreased substantially from 332 to 248, representing a decrease of 25%. This tourism indicator is important to calculate the net bed occupancy rate.

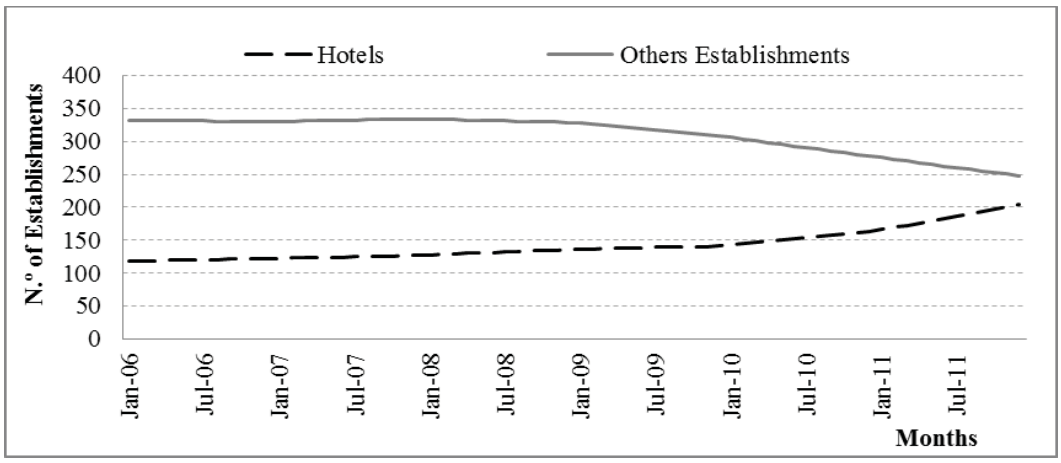

Figure 5: Number of accommodation establishments in the Northern Region

Average length of stay

Analysing graphically the average length of stay of tourists in hotels, it is observed that the domestic tourists spent 1,5 nights and that value has remained stable over time. This research also concluded that the average stay increase during periods of summer (June-September) due to the seasonality effect 'holiday season'. In the months of August 2006 and 2008 reached the highest value with 1,8 overnights. In turn, according to Figure 6, the foreign tourists are on average more nights in hotels than domestic

tourists (1,9 nights). It can be observed also that from July 2009 until the end of 2011 there is a trend towards increasing the number of days of stay of foreigners in the North and greater distribution of overnight stays throughout the year.

The introduction of the variable "average length of stay" in the model is justified with the importance that it has for the local, regional or national economy development (Santos & Fernandes, 2011). Therefore stay longer in a region, normally induces higher spending from tourists, *i.e.*, it may represent more tourism revenue for commercial and hotels establishments, which can generate increased wealth or GDP to region where the tourists are carrying their trip.

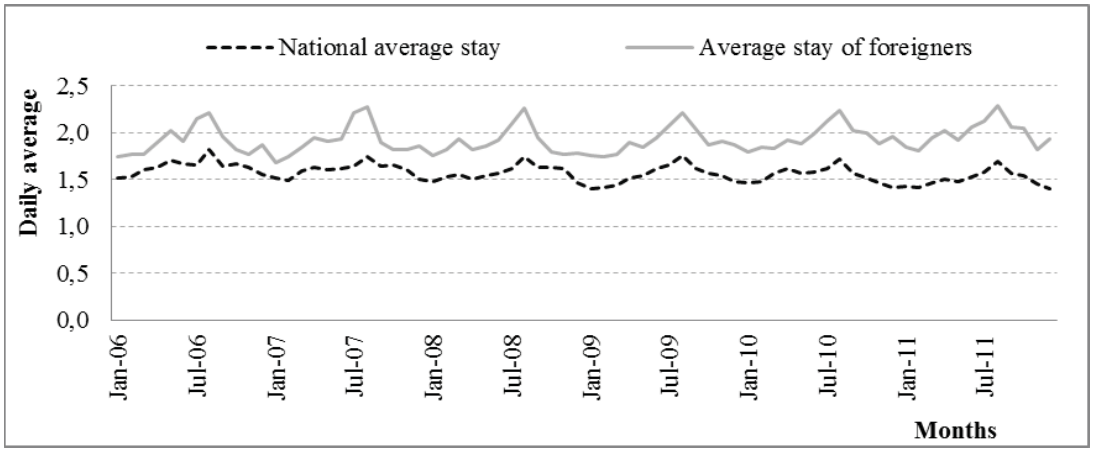

Figure 6: Tourist average length of stay

Tourist Function Rate

The tourist function rate proposed by Defert (1966) to determine areas receiving tourists and tourism dimension of the regions which relates the capacity of tourist accommodation with the number people living in region.

This rate indicates the number of beds available or the maximum number of tourists per 100 residents. So let's evaluate the maximum increase of tourists and their potential impact on the ability of the infrastructure and space available for tourism. In the North Region, the Tourist Function Rate had a positive growth over time, increasing from 0,93% in 2006 to 1,09% in 2011. Comparing this rate with the recorded in Portugal (2,9%), it may be concluded that there is still a huge potential for increased accommodation capacity and hence the need to invest further in tourism establishments in the North Region of Portugal.

In future research it shall be able to perform this analysis by county and tourist destination in order to verify the potential capacity of each municipality in the Northern Region. Simultaneously with the definition of tourism products to these regions shall be able to encourage or discourage further investment in accommodation.

MODELLING TOURISM REVENUE FOR THE NORTH REGION OF PORTUGAL

To estimate the Tourism Revenue from North Region of Portugal it was used the Multiple Linear Regression Model and the mathematical model can be written as follows:

$$TUR_t = \beta_0 + \beta_1 DP_t + \beta_2 DE_t + \beta_3 PIBPT_t + \beta_4 PIBSP_t + \beta_5 PIBFR_t + \\ + \beta_6 PIBUK_t + \beta_7 TON_t + \beta_8 TOE_t + \beta_9 NE_t + \beta_{10} NER_t + \beta_{11} PMN_t + \\ + \beta_{12} PME_t + \beta_{13} TFT_t + \mu_t \quad [3]$$

where,

Y_t $\mathbf{Y_t}$ - Tourism Revenue at time *t* $[TUR_t]$ $[\mathbf{TUR_t}]$;

X_{1t} $\mathbf{X_{1t}}$ - Domestic overnights tourism at time *t* $[DP_t]$ $[\mathbf{DO_t}]$;

X_{2t} $\mathbf{X_{2t}}$ - Foreigner overnights tourism at time *t* $[DE_t]$ $[\mathbf{DE_t}]$;

X_{3t} $\mathbf{X_{3t}}$ - Portugal GDP *per capita* at time *t* $[PIBPT_t]$ $[\mathbf{PIBPT_t}]$;

X_{4t} $\mathbf{X_{4t}}$ - Spain GDP *per capita* at the time *t* $[PIBSP_t]$ $[\mathbf{PIBSP_t}]$;

X_{5t} $\mathbf{X_{5t}}$ - France GDP *per capita* at the time *t* $[PIBFR_t]$ $[\mathbf{PIBFR_t}]$;

X_{6t} $\mathbf{X_{6t}}$ - UK GDP *per capita* at time *t* $[PIBUK_t]$ $[\mathbf{PIBUK_t}]$;

X_{7t} $\mathbf{X_{7t}}$ - Domestic occupancy rate-bed places at the moment *t* $[TON_t]$ $[\mathbf{TON_t}]$;

X_{8t} $\mathbf{X_{8t}}$ - Foreigner occupancy rate-bed places at the moment *t* $[TOE_t]$ $[\mathbf{TOE_t}]$;

X_{9t} $\mathbf{X_{9t}}$ - Number of accommodation establishments-hotels at the moment *t* $[NE_t]$ $[\mathbf{NE_t}]$;

X_{10t} $\mathbf{X_{10t}}$ - Number of accommodation establishments-others at the moment *t* $[NER_t]$ $[\mathbf{NER_t}]$;

X_{11t} $\mathbf{X_{11t}}$ - Domestic overnight average length of stay at time *t* $[PMN_t]$ $[\mathbf{PMN_t}]$;

X_{12t} $\mathbf{X_{12t}}$ - Foreign overnight average length of stay at time *t* $[PME_t]$ $[\mathbf{PME_t}]$;

X_{13t} $\mathbf{X_{13t}}$ - Tourist function rate at time *t* $[TFT_t]$ $[\mathbf{TFT_t}]$;

μ_t $\boldsymbol{\mu_t}$ - Term of the error at time *t* $[\mu_t]$ $[\boldsymbol{\mu_t}]$.

After the construction of the database was applied method of Ordinary Least Squares (OLS) to estimate the Multiple Linear Regression Model for Tourism Revenue. It was used the Gretl[15] econometric program.

Analysing the data in Table 2, it is possible to conclude that the model has high explanatory power in relation to Total Tourism Revenue because the Adjusted R-squared was 0,92. This means that the explanatory variables of the model explain 92% of variations occurred in the variable total tourism revenue.

Table 2: Performance Measures Multiple Linear Regression Model

	Coefficient	*Error Standard*	*ratio-t*	*p-value*	
Constant	2,47368e+07	3,63955e+07	0,6797	0,49942	
DP	212,698	303,957	0,6998	0,48687	
DE	107,916	401,776	0,2686	0,78919	
PIBPT	28539	8724,5	3,2711	0,00181	***
PIBSP	5940,04	5797,33	1,0246	0,30980	
PIBFR	-31861	8399	-3,7934	0,00036	***
PIBUK	2377,49	2549,62	0,9325	0,35495	
TON	-1,46776e+08	3,43823e+08	-0,4269	0,67104	
TOE	-1,0009e+08	4,55751e+08	-0,2196	0,82694	
NE	170318	78877,7	2,1593	0,03498	**
NER	84062,1	47246,1	1,7792	0,08044	*
PMN	-8,49098e+06	4,66201e+06	-1,8213	0,07372	*
PME	-2,6433e+06	2,96182e+06	-0,8925	0,37584	
TFT	-3,37509e+09	4,58343e+09	-0,7364	0,46448	

Average var. dependent	17476806	S.D. var. dependent	4582188
Sum squared residuals	9,94e+13	E.P. regression	1308843
R-squared	0,933350	Adjusted R-squared	0,918411
F(11, 59)	62,47844	P value (F)	3,68e-29
Log of likelihood	-1108,475	Akaike criterion	2244,949
Schwarz criterion	2276,823	Hannan-Quinn criterion	2257,638
Rho	-0,028448	Durbin-Watson	1,984545

Note: *p<0,10; **p<0,05; ***p<0,01.

After estimated the Multiple Linear Regression Model it was necessary to test whether or not the violation of model assumptions and according with the results it was possible conclude that:

- it appears that there is violation of the assumption of multicollinearity, since the Variance Inflation Factors (VIF) values are above 10 values for almost all the explanatory variables, except

[15] Open-source statistical package.

PIBSP, PMN and PME. Concluded that there are explanatory variables that are correlated with each other;

- testing normality of the error term by the test statistic χ^2 χ^2=0,394, it may conclude that this model follows a normal distribution with a significance level of 1% (p-value = 0,8210), then it can be concluded that the assumption of zero vector is not violated;
- The White test was used to test the homoscedasticity of error term. As the test statistic obtained was TR^2 TR^2 =37,243196 was higher than the p-value = 0,071065 and it can be concluded that there is no violation of the homoscedasticity assumption. The characteristics of the estimators OLS remain Best Linear Unbiased Estimators (BLUE);
- It was obtained the following Statistic of Durbin-Watson = 1,984545 which were calculated for thirteen independent variables, so it's possible say this model doesn't have autocorrelation of error terms.

Once that the model registered the presence of multicollinearity among explanatory variables, required estimating a new model that would guarantee the assumptions through the OLS method, which is guaranteeing estimators BLUE.

Therefore, it was chosen to estimate a new model using the First Differences Model (FDM) to surpass the problem. After having tested the assumptions of the OLS estimator, it is concluded that the model of the First Differences cannot be used because there is violation of the assumption of multicollinearity of the explanatory variables and violation of the independence of errors. The VIF values for multicollinearity indicate that the correlated variables of the model are correlated with variables TON (Domestic occupancy rate-bed places) and TOE (Foreigner occupancy rate-bed places).

Once again detected the violation of the assumption of multicollinearity of the explanatory variables and violation of the independence of errors, it was necessary to make a new transformation applying the Logarithm to the original model and after that the First Differences to the Logarithm model. It was also necessary to exclude the TON and TOE variables. So, the final model chosen does not include the variables TON and TOE and called First Differences Logarithm Model, which is nothing more than a lag of one period in logarithmic variables.

The Table 3 presents the results obtained for the First Differences Logarithm Model. The Adjusted R-Squared was almost 0,79 and using the significance test for all variables F (11,59) = 24,92707 for a significance level of 1%, it's possible conclude that there is adequate statistical evidence for assert that the regressors have different values of zero and together satisfactorily explain the variations in Total Tourism Revenue in Hotels.

Table 3: Performance Measures First Differences Logarithm Model

	Coefficient	*Error Standard*	*ratio-t*	*p-value*	
Constant	0,00460865	0,018405	0,2504	0,80315	
d_l_DP	0,834053	0,153919	5,4188	<0,00001	***
d_l_DE	0,170947	0,0655265	2,6088	0,01149	**
d_l_PIBPT	1,02014	0,594118	1,7171	0,09121	*
d_l_PIBSP	-0,47949	0,72129	-0,6648	0,50879	
d_l_PIBFR	-1,74777	1,48898	-1,1738	0,24519	
d_l_PIBUK	-0,154584	0,613225	-0,2521	0,80185	
d_l_NE	1,72779	4,84461	0,3566	0,72263	
d_l_NER	2,38194	6,85866	0,3473	0,72961	
d_l_PMN	-0,693299	0,384735	-1,8020	0,07665	*
d_l_PME	-0,623187	0,265514	-2,3471	0,02230	**
d_l_TFT	-3,21334	7,44831	-0,4314	0,66774	

Average var. dependent	0,004493	S.D. var. dependent	0,181643
Sum squared residuals	0,408963	E.P. regression	0,083256
R-squared	0,822928	Adjusted R-squared	0,789915
F(11, 59)	24,92707	P value (F)	3,32e-18
Log of likelihood	82,32218	Akaike criterion	-140,6444
Schwarz criterion	-113,4922	Hannan-Quinn criterion	-129,8468
Rho	-0,389369	Durbin-Watson	2,766212

Note: *p<0,10; **p<0,05; ***p<0,01.

After checking that the regressors were statistically valid, it was necessary to test whether or not the violation assumptions in the model was presented below:

- there was no violation of the assumption of multicollinearity because all VIF were below the value 10;
- Testing normality of the residue by test statistic χ^2= 8059, it is concluded this model does not follow normal distribution at a significance level of 5% (p-value = 0,01778); The mean residue equals was approximately zero μ = -4,64222*e*-019, so concluded the assumption of zero vector is not violated;
- The White test it was used to test homoscedasticity of the error term. As the statistic test obtained $TR^2 TR^2$= 22,170227 was higher than p-value = 0,389758, it concluded there is no violation of the assumption of homoscedasticity;
- Testing the non-presence the autocorrelation of errors term, it was obtained the following statistic Durbin-Watson = 2,766212 (Table 4). In the tables Durbin-Watson statistics for 10 independent variables it was conclude that the statistic test Durbin-Watson was inconclusive for the independence errors terms. The application of the Breusch-Godfrey Test shows that

effectively occurs violation the assumption of independence errors terms, because the statistic test obtained $TR^2 TR^2$ = 35,970399 was higher than the p-value = 8,52e-005 to a level of 5% significance.

To overcome the presence of autocorrelation errors terms it was used the Cochrane-Orcutt Estimation, which is a repeatedly estimation iterative process model, using and incorporating residue after each new estimation even eliminate the autocorrelation. It concludes with the use of the test that the Adjusted R-Squared was 86,7% (see Table 4), higher than that for First Differences Model and below the Original Model. This model can surpass the multicollinearity of the explanatory variables and violation of the independence of errors.

Table 4: Performance Measures First Differences Logarithm Model, *Cochrane-Orcutt* estimation

	Coefficient	***Error Standard***	***ratio-t***	***p-value***	
Constant	0,00395635	0,00952739	0,4153	0,67948	
d_l_DP	0,905274	0,141854	6,3817	<0,00001	***
d_l_DE	0,151031	0,0572846	2,6365	0,01073	**
d_l_PIBPT	1,73471	0,5648	3,0714	0,00324	***
d_l_PIBSP	0,528653	0,57293	0,9227	0,35998	
d_l_PIBFR	-4,29439	1,19533	-3,5926	0,00068	***
d_l_PIBUK	-0,0680283	0,467448	-0,1455	0,88480	
d_l_NE	1,84758	2,55902	0,7220	0,47320	
d_l_NER	2,13007	3,56888	0,5968	0,55293	
d_l_PMN	-0,525635	0,357054	-1,4721	0,14639	
d_l_PME	-0,705504	0,213291	-3,3077	0,00162	***
d_l_TFT	-2,57176	4,08471	-0,6296	0,53143	

Statistics based on the differentiated data-rho:

Average var. dependent	0,004389	S.D. var. dependent	0,182952
Sum squared residuals	0,271684	E.P. regression	0,068441
R-squared	0,887746	Adjusted R-squared	0,866457
F(11, 59)	73,31534	P value (F)	7,59e-30
Rho	-0,089347	Durbin-Watson	2,108600

Based on the results obtained in Table 4, the regressors interpretation of the First Differences Logarithms Model can be:

- If domestic and foreign overnight stays vary by 1%, in total tourism revenue increase in North Region hotels, respectively, 0,905 and 0,151 units;

- If PIBPT and PIBSP *per capita* increase by 1%, in total tourism revenue will increase by 1,73 and 0,528 units, respectively and if PIBFR and PIBUK *per capita* increase by 1%, in total tourism revenue will decrease by 4,29 and 0,068 units, respectively;
- If the number of accommodation establishments (hotels and other) increased by 1%, in total tourism revenue will increase by 1,85 and 2,13 units, respectively;
- If domestic overnight average length of stay (PMN) and foreign (PME) growth 1%, in total tourism revenue in hotels will decrease, respectively, 0,526 and 0,706 units;
- If the Tourist Function Rate increase 1%, in total tourism revenue in hotels will decrease in 2,572 units;
- Only variables overnights domestic and foreign, PMN and PIBFR were statistically significant for a significance level of 5% and the PIBPT variable for a significance level of 1%. The remaining variables have no explanatory power for a 5% of significance level;
- This last model guarantees the non-presence of multicollinearity explanatory variables because all VIF values were below 10.

Finally, through test statistic χ^2= 2578 with p-value = 0,2756 concluded there was normality of errors terms, so this model follows a normal distribution at a level of significance of 5%, then this assumption is not violated.

In conclusion, with the interpretation of the results presented above, one of the best model for estimation the Total Tourism Revenue in North Region of Portugal will be the First Differences Logarithm Model with the exclusion of variables TON and TOE and with the Cochrane-Orcutt estimation. The modeling of tourism revenue will produce macroeconomic scenarios suitable for total revenues in hotels and the desired effect of tourism development in the northern region of Portugal.

CONCLUSIONS AND FUTURE RESEARCH

The tourism sector is viewed as one of the most important engines of growth and development in the Portugal and also in the North Region of Portugal economy and as such, is a key focus in the Government's strategy.

The main purpose of this study has been to examine the importance of tourism (through revenues) as a conditioning growth factor for North Region of Portugal where tourism is a crucial sector. For that it was necessary to build a model that allows estimating the Total Tourism Revenue for the North Region of Portugal.

The estimation of First Differences Logarithms Model without variables TON and TOE allowed the elimination of multicollinearity but not a violation of the independence of errors terms. The application of the Cochrane-Orcutt helped to eliminate the autocorrelation of the error terms and obtained an Adjusted

R-Squared of 87%%, demonstrating the high quality of the fit of the model build to explain the dependent variable Total Tourism Revenue for the North Region of Portugal.

The model estimated to tourism revenue suffered some limitations throughout the study. One limitation of this study concerned with the lack of monthly data for Investment applies in the North Region during the study period. The lack of data for the Rural Tourism, not allowed the extension of this study to all accommodation establishments in the North Region of Portugal.

Looking for these limitations, it is suggested that in future research should try to surpass these limitations, taking into account the results obtained in this study. One of the suggestions to improve the Tourism Revenue Model will go through the inclusion of other variables such as Human Capital in hotels, Number of accommodation establishments with online booking, marketing investment by property or a variable dummy that measure the impact of tourism strategic plan for the region. Another line of research is the possible application of this analysis by township or tourism destination in order to verify it potential tourism capacity.

In order to fully reap the benefits that tourism sector can bring to an economy, it is necessary to put in place conditions that make the country easy to visit as well as attractive to develop, and to facilitate investment in tourism sector.

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SESSÃO 6_1

IMPACTO NO TURISMO DA REGIÃO DEMARCADA DO ALTO DOURO VINHATEIRO, APÓS A CLASSIFICAÇÃO DE PATRIMÓNIO MUNDIAL DA HUMANIDADE PELA UNESCO