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AN ECONOMETRIC MODEL OF TOURISM DEMAND IN FRANCE

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This case study gives an overview of the tourism demand in France by using an econometric model. The study covers the period between 1975 and 2003. Five developed countries have been selected, and the choice of the countries is based upon the fact that continuous data on all relevant variables are available only for those countries. The results show a positive relationship between tourist expenditures and generating country GDP, and a negative relation between tourist expenditures and relative prices.

INTRODUCTION

Many authors have written about the important role played by tourism industry in the economy in general and in development in particular. During the second half of the twentieth century, tourism has become one of the main economic activities that have recorded the most important growth. As a matter of fact, in the 30-year period since the 1950s toward the end of the 1980s, total international tourist flows have grown by a factor of six, to approximately 400 millions (Chu, 1998). Such a rapid expansion of tourism is linked to two main reasons: (i) first the increase of available income of wage earners in the majority of developed countries and the decrease of the working-time, thereby an increase of the

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spare-time. (ii) Second, the decrease of the transport charges between two destinations taking into account the considerable development of means of transport.

In 2004, France remained to be the first international destination in terms of number of arrivals. With a number of tourists reaching up to 75,1 millions, France is far ahead compared to countries such as Spain (53,6 millions), United States of America (46,1 millions), or China (41,8 millions). The account of the balance of payments shows a positive sign procuring to France 10,7 billions euros of receipts, representing therefore an increase of 7,5% compared to the year 2003. In that case, the sector of tourism constitutes a major issue for France. Forecasting tourism demand appears to be more than necessary for the well-being of the French economy.

Several techniques in forecasting tourism demand are currently available. Witt and Witt (1995) and Li, Song and Witt (2005) provide very interesting surveys in this field. Randriamboarison (2001) has recorded 163 empirical studies on tourism demand through use of quantitative approaches for the period starting from 1963 to 2003. The number of arrivals, the tourist expenditures, and the tourist receipts are utilised as dependant variables. As for explicative variables, we have the national income, the exchange rate, the total number of population, the price and one or more dummy variables showing a specific event in the hosting country. Econometric problem also causes the authors to include the trend and an others variables to the explicative variables. In most of the cases, data are annual. Lim (1997:837) point out that to circumvent the problem related to the unavailability of long time series of annual data, some studies used monthly, quarterly, cross-section, and pooled annual and cross-section data, or a combination of these.

In most of the case, the results are mostly not satisfying. Akis (1998) gave two possible explanations: the first explanation is related to the data used. Akis (1998, p.99) wrote that yearly time-series data do not cover enough years. Small sample size is one factor leading to large standard errors of the parameters estimated. The second explanation touches the issue of the choice of variables in the model. Concerning such point, Akis made the following assumption: instead of working with small, compact models, most researchers use model with many explanatory variables which generally lead to the problem of multicollinearity and thereby unsatisfactory t-tests. Furthermore, we can reveal the problem of unit root between variables. Actually, stationarity tests aiming at determining the degree of integration of the series are not used in many econometric works; therefore a false linear relation between the variables taken in the

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models is very possible. Likewise, we can talk about problem of co-integration. In order to address the problem, Smeral, Witt and Witt (1992) and Akis (1998) are using a model with two explicative variables, such as the national income and relative prices. The results are satisfying according to them.

In spite of such results, tourism industry is a field within only a few numbers of French economists are working. The aims of this study are to bring more light on the evolution of the tourism demand in France. It offers to examine the relationship between demand, national income and relative prices. The approach used by Smeral, Witt and Witt (1992) and Akis (1998) will be adopted but this time by also applying the test of stationarity in order to ensure that there is no false linear relation in the model. The five countries taken in the study are Germany, the United States of America (USA), Spain, Italy and the United Kingdom (UK). The annual data used are covering the period between 1975 and 2003.

MODELLING TOURISM DEMAND IN FRANCE

France is seen as the leading country in the area of international tourism and this can be explained by the remarkable tourism richness of the country: its 22 tourism regions receiving in 2003, 75,1 millions arrivals, that is to say approximately 10% of world total of tourists. In 1998, during the year of the World Cup of football, 70 millions arrivals were registered. According to Peyroutet (1998), the visitors are mainly attracted first by touring the cities (31%), then the coast, the mountains and the countryside. The most commonly chosen regions are Provence-Alpes-Côte d'Azur (103,7 millions of overnight stay), Rhône-Alpes (92,1 millions of overnight stay) and Languedoc-Roussillon (76,8 millions of overnight stay). France has, presently, about 13 000 edifices classified as patrimony. All of them are considered as being the tourism offer of France. Such a patrimony consists of historic and prehistoric sites, religious edifices, castles, manors, and civil buildings.

Table 1. The 5 most visited monuments

Monuments	Visitors
Louvre	6 600 000
Tour eiffel	6 200 000
Château de Verseille	3 300 000
Arc de Triomphe	1 200 000
Mont Saint Michel	1 100 000

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Table 1 shows the most visited monuments in France. Besides, the country has 7 500 protected sites and 140 natural reserves.

Concerning the accommodation: in 2004, France offers to its tourists a range of 27 641 registered hotels from 1 to 4 luxury stars unequally allotted in its 22 regions. Furthermore, there are 8 059 registered camping areas from 1 to 4 stars; 813 registered holiday villages, 217 inns, and 41 957 rural as well as communal lodges and 22 053 guesthouses. The supply of tourist stopping points is summarized in table 2.

Table 2. Offer of tourist stopping point (in 2004)

Registered hotels	1 230 800
Classified camping	2 803 900
Holiday Villages	607 000
Inn	18 000
Lodges and guesthouses	266 000

It is rather difficult to express the number of jobs created, however official data show that the sector of tourism employ independent workers or wage earners. The totals of the assets in tourism are 975 300 on direct employment. Important numbers small family businesses also exist. In France, an increase of 13% of the number of workers in tourism between 1990 and 2004 is recorded. In terms of income, as previously mentioned, tourism has generated a total of 40,8 billions euros for the year 2004 in France. The account balance is regularly positive since 1963 (9,8 billions euro in 2004).

Model and data

In elaborating an econometric model, the choice of the function is always the first step. The general international tourism demand model typically estimated is:

$$DT_{ij} = f(Y_j, TC_{ij}, RP_{ij}, ER_{ij}, QF_i)$$

where:

DT_{ij} = demand for international travel services by origin j for destination i;

Y_j = national income of origin j;

TC_{ij} = transportation cost between destination i and origin j;

RP_{ij} = relative prices, the ratio of prices in destination i to prices in origin j;

ER_{ij} = exchange rate, measured as units of destination i's currency per unit of origin j's currency;

QF_i = qualitative factor in destination country i.

According to Lim (1997), in empirical economics, computational convenience and the ease of interpretation of parameters are typically

paramount in the determination of a specific functional form for purposes of estimation and testing. Two types of models are then used towards the determination of such specificity: the linear model and the log-linear model or double-logarithmic. Quayson and Var (1982) used the transformation of Box-Cox to compare the linear and log-linear models. They came to the conclusion that the log-linear specification is more robust. In the same way, Oum (1989, p.165) have also stated some advantages of the log-linear model: (a) the coefficients themselves are the respective elasticities of the demand; (b) the log-linear function is capable of modelling non-linear effects; (c) it resembles the demand function obtainable from a Cobb-Douglas utility (production) function; and (d) it permits the random errors in the equation to be normally distributed. As for us, we are going to adopt the log-linear model, the model that is close to the economic hypothesis on demand: derivability, convexity of preferences and desirability.

The second step of the elaboration of the model is the choice of the variables. By referring to the traditional theory, it is said that consumer's demand function is the function associated to a price-vector P and to an income R, the optimal choice of the consumer (Guerrien 1989:49). In that case, demand is linked to the price and income. In the case of international trade, the evolution of the importation demand is linked not only to income of the country transacting the importation, but also to the relative price which is the international price divided by domestic price. As far as tourism demand is concerned, such a demand depends on the income of the generating country. Demand depends as well as on the relative prices between the origin country and the destination country. After considering such theory-based and practical explanations, we can therefore draw our function on tourism demand in France as follows:

$$LogD_{ij} = \beta_1 + \beta_2 LogGDP_j + \beta_3 LogRP_{ij} + \varepsilon_i$$

where:

D_{ij} = Tourist expenditures from country j to country i;

GDP_j = Income from the origin country j;

RP_{ij} = Relative prices;

ε_i =random error term which is assumed to have traditional properties.

Tourist expenditures represent the dependant variable; our choice is based upon the existence of long-series on that variable and also because of the fact that expenditures minimize any problem of reliability that might affect data. Gray (1966), Artus (1972), O'Hagan and Harrison (1984) and Smeral, Witt and Witt (1992) used the same variable in their studies. Data were extracted from the "l'Annuaire Statistique de la France", 2000th edition.

Concerning the explicative variables, we have the income of tourist-generating country. In this study such a variable is represented by the GDP, in the constant price. The use of the available income appears to be more relevant but data on such a variable are not available. GDP of the EU countries were taken from the Eurostat while the ones for the USA, UK come from the "Economie Européenne". The problem is how to measure relative prices. Transforming data was an inevitable necessity in order to determine relative prices. The formula used to calculate the relative prices of all countries taken in the sample is:

$$RP_{ij} = \left(\frac{IPC_i}{IPC_j * ER_{ij}} \right)$$

where:
IPCi = consumer price index of the destination country;
IPCj = consumer price index of the tourist generating country;
ERij = exchange rate.
For example, the relative price between France and Germany is given by the consumer price index in France divided by the consumer price index in Germany, multiplied by the exchange rate between French Francs and Deutsch Mark. The series of those variables were excerpted from World Tables and the variable exchange rate of the "Economie Européenne".

As a first step, the order of integration of our series is determined through the application of some stationarity tests. Those series will be corrected by having recourse to differentiation with order of integration. The equation is estimated by ordinary least squares (OLS). That leads us in a second step to the following conclusion: the model is deemed to be satisfying if it shows the real sign of the coefficient. In our case, the sign of the coefficient borne by income should be positive. An increase of income will lead to the increase of tourist expenditures. The real sign of the coefficient borne by relative prices is negative, the demand being a decreasing function of the price. In other words, we have an elasticity price of the demand negative. There will be a decrease in expenditures following an increase of the price. Besides, the coefficients have to be significant different of zero following the value of the t-Student. The Durbin-Watson (DW) is also used in decision-making. The DW indicates the absence (or likely absence) of autocorrelation. The F statistic has to be a high value. A low value of the F statistic suggests that the equation is not, in general, significant. The coefficient R^2 should be close to 1.

Empirical results

To determine the integrating order of the variables, the Augmented Dickey-Fuller (ADF) procedure suggested by Dickey and Fuller (1981) is

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used to test our variables for a unit root in its level, and then in the first difference form. Table 3 presents testing results for tourist expenditures variable, table 4 for the GDP variable and table 5 for the relative prices.

Table 3. ADF tests on expenditures

Countries	Tourist expenditures			
	Level form		First difference form	
	With C & trend	None	With C & trend	None
Germany	-1.90	2.08	-2.05	-2.65 * *
USA	-1.82	1.22	-4.33 *	-6.65 * *
UK	-1.87	2.49	-3.89 *	-2.83 * *
Italy	-2.69	2.12	-2.72	-2.14 *
Spain	-2.63	0.85	-3.74 *	-3.81 * *

**, statistical significant at the 1 percent level

*, statistical significant at the 5 and 10 percents level

Table 4. ADF tests on GDP

Countries	GDP			
	Level form		First Difference Form	
	With C & trend	None	With C & trend	None
Germany	-2.16	-0.57	-2.92	-3.07 **
USA	-1.97	-1.71	-2.57	-2.68 **
UK	-2.09	0.29	-3.07	-3.06 **
Italy	-4.91 *	-1.58	-6.22 **	- 5.17 **
Spain	-2.45	1.76	-4.29 **	-4.49 **

**, statistical significant at the 1 percent level

*, statistical significant at the 5 and 10 percent level

Table 5. ADF tests on relative prices

Countries	Relative prices			
	Level Form		First Difference Form	
	With C & trend	None	With C & trend	None
Germany	-2.16	-0.57	-2.92	-3.07**
USA	-1.97	-1.71	-2.57	-2.68**
UK	-2.09	0.29	-3.07	-3.06**
Italy	-4.91*	-1.58	-6.22**	-5.17**
Spain	-2.45	-1.76	-4.29**	-4.49**

**, statistically significant at the 1 percent level

*, statistically significant at the 5 and 10 percent level

Based on the critical values reported by MacKinnon (1990), the results in tables 3, 4 and 5 show that the null hypothesis of a unit root for

all variables was not rejected in level. The null hypothesis of a unit root for our all variables in first difference was significantly rejected at the 1 percent level, indicating that all first differenced variables are characterized as integration 0. Mention should be made about the case of the USA, UK and Spain for which the series by the first difference is stationary with trend and constant. But by verifying the stationarity with the test by Philip-Perron presents a different result.

The results from the test lead to consider the following model:

$$\Delta LogD_{\ ij} = \beta_1 + \beta_2 \Delta LogGDP_{\ j} + \beta_3 \Delta LogRP_{\ ij} + Du_{\ i} + \varepsilon_i$$

where Δ is the operator of difference following the order of integration of the series.

The estimation of the model for France provided the following results:

Table 6. Results of the estimation

Countries	β_1	β_2	β_3	D.W	R^2	F Stat
Germany	4.025 (30.49)	0.002** (14.43)	-0.25* (-2.37)	1.56	0.96	113.025
USA	-4.53 (15.36)	1.66** (17.18)	-0.16 (1.75)	1.47	0.94	169.79
UK	-1.92 (-2.74)	1.55** (16.30)	-0.16* (-2.42)	1.45	0.95	61.86
Spain	5.34 (21.18)	0.23** (2.99)	-0.06* (-2.51)	1.22	0.66	20.69
Italy	-2.01 (-4.56)	0.51** (22.5)	-0.21** (4.56)	1.71	0.88	26.65

**, statistically significant at the 1 percent level
*, statistically significant at the 5 and 10 percent level
(.) t-Students

The results given in table show a good statistic quality. The signs of the estimated parameters in the model are in line with prior expectations and they are significant at the 10% level or better. We have a high R^2 close to the unity except for Spain for which it is 0,66. The values of D.W are deemed to be good statistic results. We can make the assumption according to which there is no positive or negative autocorrelation between the variables in the model. Therefore, the F-statistic is largely

superior to the unity. The F value shows that the model is significant at the 1 percent level.

The sign of the coefficient of the income (*1nGDPj*) is correct for all countries taken in our study considering its positive sign. Therefore elasticity of demand with respect to income are positive. An increase of 1% of the income will lead to an increase of 0,002% of the German tourist expenditure. As far as American, English, Italian and Spanish tourists, such an increase would be respectively by 1,66%, 1,55%, 0,51% and 0,23%. Moreover, we can say that goods and services in tourism to France may be considered as luxury goods for American and English tourists because the elasticity being positive and superior to 1 for these later.

The coefficients of the relative price (*1nRPij*) are as expected, significantly negative at 5% level for four countries but it is not significant for the case of USA. Elasticity of demand with respect to relative prices is evaluated at 0,25 for Germany, 0,16 for USA, 0,16 for UK, 0,06 for Spain and 0,21 for Italy. In that case an increase of 1% of price in France, *caeteris paribus*, will lead to decrease in tourist expenditures: 0,25% for German's, 0,16% for American's, 0,16% for English's, 0,06% for Spanish's and 0,21% for Italian's.
To conclude, in spite of a non-significant coefficient of the relative price for USA, we may assume that our model provides satisfying results.

CONCLUSION

This study provided an elaborated picture of an econometric model of tourism demand in France on the basis of the traditional theory on demand. The analysis is only based on the selection of important variables possibly influencing demand in the neo-classic theory. Tourism demand depends on available income and relative prices. In our model, tourist expenditures represent the dependent variable. We took the GDP and relative prices as explicative variables. Generally, we have a positive relation between tourist expenditures and GDP of the tourists' generating countries and a negative relation between expenditures and relative prices.

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