Instituto de Economía
Facultad de Ciencias Económicas y de Administración
Universidad de la República - Uruguay

Visiting friends and relatives tourism: the case of Uruguay

Altmark, Silvia
Larruina, Karina
Mordecki, Gabriela

INSTITUTO DE ECONOMÍA
Serie Documentos de Trabajo

Agosto, 2018
DT 08/2018

ISSN: 1510-9305 (en papel)
ISSN: 1688-5090 (en línea)

Forma de citación sugerida para este documento: Altmark, S. Larruina, K. Mordecki, G. (2018) “Visiting friends and relatives tourism: the case of Uruguay”. Serie Documentos de Trabajo, DT 08/2018. Instituto de Economía, Facultad de Ciencias Económicas y Administración, Universidad de la República, Uruguay.

Turismo de visita de familiares y amigos: el caso de Uruguay

Altmark, Silvia[1]
Larruina, Karina[2]
Mordecki, Gabriela[3]

Resumen

En este trabajo analizamos a los uruguayos que viven en el exterior y visitan Uruguay durante sus vacaciones, lo que en la literatura se llama turismo nostálgico o turismo de familiares y amigos (VFR, por su sigla en inglés). Varios estudios señalan a Uruguay como uno de los países sudamericanos con la mayor proporción de su población viviendo en el exterior. Además, el turismo es una actividad económica muy importante en Uruguay. Los visitantes de Argentina han sido siempre la mayoría en el turismo receptivo uruguayo. Durante 2017 en Uruguay, el 68% del total de turistas fueron argentinos, el 12,5% brasileños y el 8% turistas VFR. Esta última porción estuvo cerca del 16% durante la primera década de este siglo y aún más en el siglo XX.

Analizamos y estimamos la demanda turística VFR en Uruguay y la comparamos con la demanda turística argentina, ya que la mayoría de los turistas VFR viven en Argentina (64%). Después de caracterizar a los turistas VFR, a través de la metodología Johansen construimos cuatro modelos: dos para el turismo VFR y dos para el turismo argentino, considerando datos mensuales para el número de turistas y datos trimestrales para el gasto de los turistas.

Aplicando la metodología de Johansen, encontramos al menos una ecuación de cointegración del modelo de corrección de errores (VEC) para cada modelo considerado. En los dos primeros modelos (teniendo en cuenta el número de turistas), las elasticidades (ingresos y precios) fueron menores para los turistas VFR en comparación con los argentinos, lo que significa que el número de turistas VFR reacciona menos a los cambios en los ingresos o los precios relativos que los argentinos. Pero en el caso del gasto de los turistas, el resultado fue el opuesto, ya que los turistas VFR respondieron más a los cambios en los precios o los ingresos que los argentinos. Las funciones de impulso-respuesta muestran una mayor reacción de los turistas argentinos a los cambios en los precios relativos, pero similar en el caso de un shock de ingresos. Finalmente, las proyecciones muestran un buen ajuste a los datos reales.

Palabras clave: turismo VFR, tipo de cambio real, Uruguay, cointegración.

Código JEL: Z32, C22, F41

1 Instituto de Estadística, FCEA, UdelaR, salt@iesta.edu.uy
2 Instituto de Estadística, FCEA, UdelaR, karinalarruina@gmail.com
3 Instituto de Economía, FCEA, UdelaR, gabriela@iecon.ccee.edu.uy

Visiting friends and relatives tourism: the case of Uruguay

Altmark, Silvia
Larruina, Karina
Mordecki, Gabriela

Abstract

In this paper, we analyze Uruguayans living abroad that visit Uruguay for their holidays, what in the literature is called Nostalgic tourism or Visiting friends and relatives (VFR) tourism. Several studies point Uruguay as one of the South American countries with the largest proportion of its population living abroad. In addition, tourism is a very important economic activity in Uruguay. Visitors from Argentina have been always the majority in the Uruguayan inbound tourism. During 2017 in Uruguay 68% of total tourists were Argentinians, 12,5% Brazilians, and 8% VFR tourists. This last share was near 16% during the first decade of this century and even higher in the XXth. century.

We analyze and estimate the VFR tourism demand in Uruguay, and compare it with Argentinian tourist demand, since the majority of VFR tourists live in Argentina (64%). After characterizing VFR tourists, we apply Johansen methodology and built four models: two for VFR tourism and two for Argentinian tourism, considering monthly data for the number of tourists and quarterly data for tourists' expenditure.

Applying Johansen methodology, we found at least one Vector error-correction model (VEC) equation for each model considered. In the first two models (taking into account the number of tourists), the elasticities (income and prices) were smaller for VFR tourists compared with Argentinian tourists, meaning that the number of VFR tourists react less to changes in income or relative prices than Argentinians. But in the case of tourists' expenditure, the result was the opposite, with VFR tourists responding more to changes in prices or income than Argentinians. Impulse response functions show a greater reaction of Argentinian tourists to changes in relative prices, but similar in the case of an income shock. Finally, forecasts show a good adjust of the forecast to actual data.

Keywords: VFR tourism, real exchange rate, Uruguay, cointegration

JEL Classification: Z32, C22, F41

1. Introducción

"Nostalgic tourism" is defined as the periodic return of migrants to their community of origin, to take part in family, cultural and social activities that take place during the year, particularly during festivities and important dates. Another definition, according to Backer, (2009) visits of friends and relatives (VFR) is "a way of travel that implies a visit that, for the purpose of the trip, the type of accommodation, one or both, visits friends and family".

This kind of visitors generally travels with other people and usually stays at relatives and friends' homes.

The denomination "Tourism of roots" is based on the sentimental bonds of the migrants with the places of origin, for feeding the idea of return to the native country, although it is during the vacations or in certain dates. This behavior of migrants generates greater displacement of people in national and international travel, stimulated by improvements in communications and transportation routes.

Tourism activity has acquired great importance as an engine of international development, due to its impact on the promotion of employment and the generation of foreign exchange receipts. Due to the spillovers of these activities to other sectors of the economy, tourism is qualified as a growth driver.

According to the World Tourism Organization (UNWTO, 2018) with information about the growth of tourist arrivals in 2016, while in the world the increase was 3.9% and in South America 7%, in Uruguay the increase was of 12.3%.

Tourism in Uruguay is a very important economic activity in terms of foreign exchange receipts, added value and employment. According to estimations of the Ministry of Tourism of Uruguay (2017), through the Tourism Satellite Account, since 2005 the sector's contribution to Uruguay's GDP has been between 5% and 8%, reaching 7.3% in 2016. In terms of foreign currency earnings, tourism represented 20% of total exports in 2016 (Central Bank of Uruguay, 2018). Its contribution to employment was significant, implying 6.3% of the job positions in the country, according to the Continuous Household Survey of the Statistical National Institute of Uruguay (INE, 2018).

Beyond the relevance of tourism in Uruguay, it is important to know about the migration phenomenon of the country, in order to identify the potential segment for the inbound tourism. According to the Ministry of Foreign Affairs of Uruguay, in 2016 Uruguayans living abroad were 529,620 people, 15% of the country's population, of which 40% live in Argentina, 15% in Spain, 13% in the United States and 10% in Brazil. Adding the children of migrants born abroad, total Uruguayans living abroad is estimated in about one million, approximately one third of Uruguayan population. Several studies point Uruguay as one of the South American countries with the highest proportion of the population living abroad. So, the potential market for VFR tourism in Uruguay is really important.

According to Dwyer et al. (2014), "Nostalgic tourism" is defined as the periodic return of migrants to their community of origin, to take part in family, cultural and social activities that take place during the year, particularly during festivities and important dates. This kind of visitors generally travels with other people and usually stays at relatives or friends' homes.

VFR tourism arises recently as a topic of study; UNWTO statistics started to take them into account in the late 90's, quantifying them together with travel for health reasons and religion, implying about 20% of total tourism, a figure that increases to 27% in 2014, between holidays and leisure trips (52%) and professional and business trips (14%). Despite being identified as of increasing importance, not all countries have enough statistics for VFR. In the case of Uruguay, although the data is available, as has been indicated above, there hasn't been done enough analysis on this subject, what is the main motivation of this study.

In some countries VFR tourism expenditures competes with remittances from relatives, because the month of traveling they substitute the remittance for the tourism expenditure. But in the case of Uruguay, remittances from relatives is not relevant at all.

2. Uruguayan and Argentinians in Uruguayan inbound tourism

In the last twenty years Uruguay has experienced significant changes in the number of visitors arriving to the country, with a growing trend from 1985 to 1997. Then, following the regional economic crisis, began a decrease in the number of visitors, with its lowest point in 2002. From that moment, the number of visitors' recovery began. In addition to the Argentinians, tourists from other origins also increased, reaching a total of 3.9 million visitors in 2017 (Figure 1).

From 1996 to 2017, the arrival of Uruguayan residents abroad (VFR tourists) was in average 14.5% of total visitors to Uruguay, and in 2016 about 64% were living in Argentina. This data is from the Receptive Tourism Survey of the Ministry of Tourism and was used to differentiate the groups of VFR visitors from non-Uruguayan visitors.

To identify the profile of VFR tourists compared to the rest we consider: area of residence, sex, age, educational level and occupation. In terms of visit profile, main destination in Uruguay, length of stay, type of accommodation used, reason for the trip, quarter of the year in which the visit is made, number of people of the travel group, frequency of the visit and expenditure, according to components. The tables with this characterization are in Annex 1.

During 2016 and regarding residence, tourists mainly came from Argentina (64,4%), 12% of total tourists live in Brazil, 9% were Uruguayans living abroad and the rest from other nationalities. By sex, although the proportion is similar, there are more women among VFR tourists. Considering age, the two groups analyzed show similar characteristics: most of them are between 30 and 64 years old, regardless of their nationality. The highest educational level achieved by VFR tourists is the secondary and for the rest (Argentinians and the rest of tourists) the educational level is the University (Annex 1, Table 1).

In 2016 the destination mainly visited by the VFR tourists was Montevideo, while the others (Argentinians and other tourists) mainly visited Punta del Este (Table 2, Annex 1).

As expected, 72% of Uruguayans living abroad have as main reason for their trip to visit family and friends, staying 92% in their homes. In contrast, non-Uruguayan tourists travel by leisure and holidays and stay at hotels or rented houses (Table 3, Annex 1).

In terms of the composition of the expenditure, VFR tourists spend much less on accommodation than non-Uruguayans, but more on food and shopping, compared with the rest of the tourists. Both groups have a similar expenditure in transportation, culture and tours.

3. Background and analysis framework

The economic approach of the tourist activity can already be found in 1983 in the work of Wanhill, S. (1983); more recently, Dwyer et al. (2004), Vanhove (2011), Hara (2008) can be mentioned, among others.

As pointed by Backer and Yousuf (2015), visiting friends and relatives is an important way of tourism worldwide. But they found that academic research of this type of tourism started recently, with the first works in 1990. Analyzing the published works in tourism papers from 1990 to 2010 they found only 39, and the appearance of this subject in text books has been in recent years.

Moscardo et al. (2000) developed a typology for studying VFR tourism, and related it to commercial tourism. They try to find marketing implications of VFR tourism, as they studied their main characteristics and differences from tourism in general.

Although tourism is an important economic activity in Uruguay, there is not much research in this field. There are works such as Brida et al. (2008) Alonsopérez et al. (2010); or Altmark et al. (2013).

However, the first work on VFR tourism is more recent, (Altmark and Larruina, 2016), where they analyze similarities and differences of VFR tourists with the rest of the visitors.

VFR tourism as a segment of inbound tourism, has a potential growth in the future, so the present work tries to analyze the demand determinants of VFR tourism and compare it with tourism coming from Argentina, the main origin of inbound tourism in Uruguay.

López Gallero (2006) states that besides the affective motivation of the “emigrant-tourists”, they do not frequent hotels, but they consume other tourism services and also souvenirs.

Reyes Morales et al. (2006) studied the nostalgic tourism in Zapoteca, Mexico, regarding the direct and indirect economic impact of nostalgic tourism.

Sosa et al. (2015), studied the social impact of the VFR tourism to Cancun, analyzing from the perspective of the local population, in order to define its importance. The work indicates the lack of attention of policies to VFR tourism and the positive perception of the local population regarding the visits of their relatives and friends.

López Salinas et al. (2016) found that Mexican migrants in their regular visits to their home as nostalgic tourists in southern Mexico, create a cash injection that invigorates the economy of their communities of origin.

Argentinians are the main source of tourists visiting Uruguay, and Uruguayans living abroad (tourists visiting friends and relatives, VFR) were previously the second most numerous, although they are currently surpassed by Brazilian tourists.

VFR tourists visiting Uruguay mainly live in Argentina, so our interest in this paper is to compare their behaviour with Argentinian tourists, and analyze similarities and differences between them.

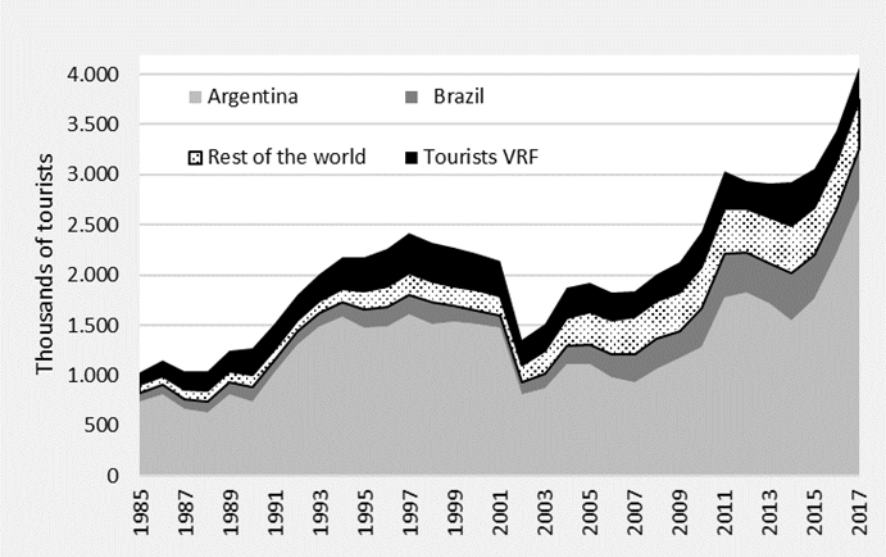
Tourism demand has been widely studied, as we can see in meta-analyses such as Crouch (1995) or more recently Peng et al. (2015), while many different variables can enter a demand function for tourism, prices and income are always important. These variables are also found in works such as Altmark et al. (2013) for Uruguay, Brida et al. (2008) for Mexico or Dritsakis (2004) for Greece.

4. Data and Methodology

4.1. Data

Argentinians are the main source of tourists visiting Uruguay, and Uruguayans living abroad (tourists visiting friends and relatives– VFR) were previously the second most numerous, although they are currently surpassed by Brazilian tourists (Figure 1).

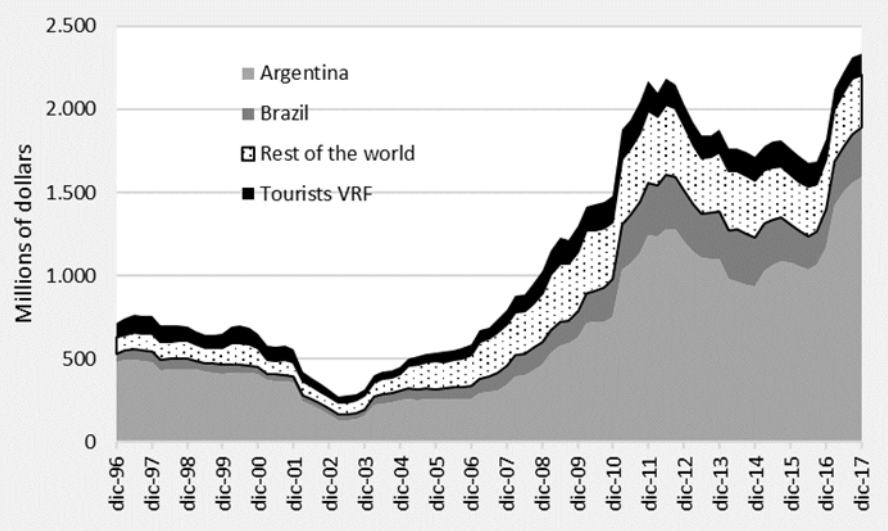
FIGURE 1 - URUGUAYAN TOURISM DEMAND BY NATIONALITY



Source: Ministry of tourism of Uruguay

It is also important to consider the revenues from tourism, where also Argentina is the most important. In this case, the expenditure of VFR tourists represents a smaller proportion of total, than when we consider number of tourists (Figure 2). In 2016 Argentinian tourists represented 64.4% and VFR represented 9.1% of total tourists. But taking into account revenues, Argentinians represented 64.3% and VFR tourists 6.9% of total tourists, also in 2016.

FIGURE 2 - URUGUAYAN TOURISM REVENUES BY NATIONALITY



Source: Ministry of tourism of Uruguay

It is important to notice that VFR tourists mainly live in Argentina (63.7% in 2016), so our interest in this paper is to compare the two types of tourist behaviour and analyze similarities and differences between them.

Following the literature, we consider two approaches to estimate tourist demand from Uruguayans living abroad. First, we considered two models, one taking into account the number of Uruguayans living abroad visiting Uruguay each month (TOUR_VRF), relative prices through the bilateral real exchange rate with Argentina (RER_ARG) as most often that is the country they live in, the monthly economic activity index of Argentina as an income proxy (Y_ARG) and as a monthly proxy of Uruguayan income the Uruguayan industrial production index (Y_URU). We also considered the global real exchange rate (RER) to include Uruguay's competitiveness with its major trading partners. The second model was built considering Argentinian tourists visiting Uruguay, where we use the number of Argentinians visiting Uruguay per month (TOUR_ARG), the bilateral RER as in the first model and the same proxy for Argentinians' income. We then compare the results of the two models. The period considered was from January 2002 to June 2017.

Secondly, we analyzed the foreign exchange revenues from tourism. As these data are only available on a quarterly basis, we tested two models, one that considers the expenditure of Uruguayans living abroad and visiting Uruguay (VFR), in addition to quarterly GDP for Uruguay (GDP_U) and Argentina (GDP_A) as well as the quarterly bilateral RER with Argentina (RER_AR). In the second model, we considered Argentinian tourists expenditure in Uruguay (SP_AR) Argentine's GDP (GDP_A) and the bilateral real exchange rate (RER_AR).

To analyze the series, we must study their stationarity through unit root tests; in this case we performed the Augmented Dickey-Fuller test (ADF). We show the results in Table 1. All the variables are considered in logarithmic form, so all the variable names are preceded by an L. In this case we considered the period from the first quarter of 1996 up to the second quarter of 2017.

TABLE 1 – UNIT ROOT TESTS

Augmented Dickey-Fuller (ADF) **H_O = there is a unit root**				
	t-statistic (series in levels)	**Reject H0 at 95% level**	**t-statistic (series in first differences)**	**Reject H0 at 95% level**
LTOUR_VRF	0.505222	No	-5.919655	Yes
(monthly data)	(no constant, 14 lags)		(no constant, 12 lags)	
LRER_ARG	-0.595350	No	-6.910374	Yes
(monthly data)	(no constant, 7 lags)		(no constant, 6 lags)	
LRER	-1.822545	No	-9.906932	Yes
(monthly data)	(no constant, 6 lags)		(no constant, 5 lags)	
LY_ARG	1.311981	No	-4.035917	Yes
(monthly data)	(no constant, 15 lags)		(no constant, 14 lags)	
LY_URU	0.689742	No	-5.019900	Yes
(monthly data)	(no constant, 12 lags)		(no constant, 11 lags)	
LTOUR_ARG	0.692576	No	-4.061406	Yes
(monthly data)	(no constant, 15 lags)		(no constant, 14 lags)	
LVRF	0.083287	No	-2.451351	Yes
(quarterly data)	(no constant, 12 lags)		(no constant, 7 lags)	
LGDP_U	1.099642	No	-2.446647	Yes
(quarterly data)	(no constant, 5 lags)		(no constant, 4 lags)	
LGDP_A	1.196657	No	-3.852482	Yes
(quarterly data)	(no constant, 5 lags)		(no constant, 4 lags)	
LRER_AR	-0.239750	No	-5.630691	Yes
(quarterly data)	(no constant, 4 lags)		(no constant, 3 lags)	
LSP_AR	0.818056	No	-2.593911	Yes
(quarterly data)	(no constant, 8 lags)		(no constant, 7 lags)	
Lags are calculated due to Akaike criteria				

Source: Author's calculations

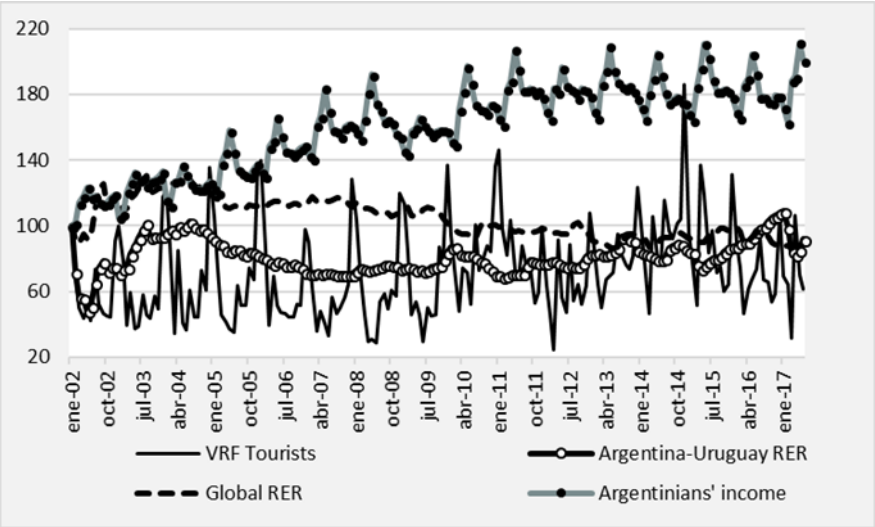
All the variables, as they have a unit root, were I(1), non-stationary, so we will apply Johansen's (1988, 1992) methodology to test for the existence of long-term equilibrium relationships between the variables by analyzing the existence of Vector Error-Correction Models (VEC). This methodology also allows us to analyze the effects of a shock through the Impulse Response Function (IRF) and to forecast the variables of interest.

To visually analyze the trajectory of the series under study we show the graphs for each group of series considered in the four models.

In Figure 3 we can see the evolution of the series for the model of the monthly evolution of VFR tourists. There we can see the high seasonality of VFR tourists, as they mainly visit Uruguay during the summer, January being the principal month of entry. In the model, we used seasonal

dummies to solve this problem. In 2002, Argentina and Uruguay experienced a deep crisis, first in Argentina with a generalized bankruptcy with a balance of payment crisis and the external debt default that was followed by a similar crisis in Uruguay some months later. It caused an 11% decrease of Argentina's GDP and an 8% reduction in Uruguayan GDP in that year. Tourism declined abruptly during that year and both countries experienced sharp devaluations of their currencies, although Uruguay's RER rose in relative terms. Thereafter, the economic situation improved in both countries, and the bilateral RER remained fairly stable, after a slight fall, throughout the period.

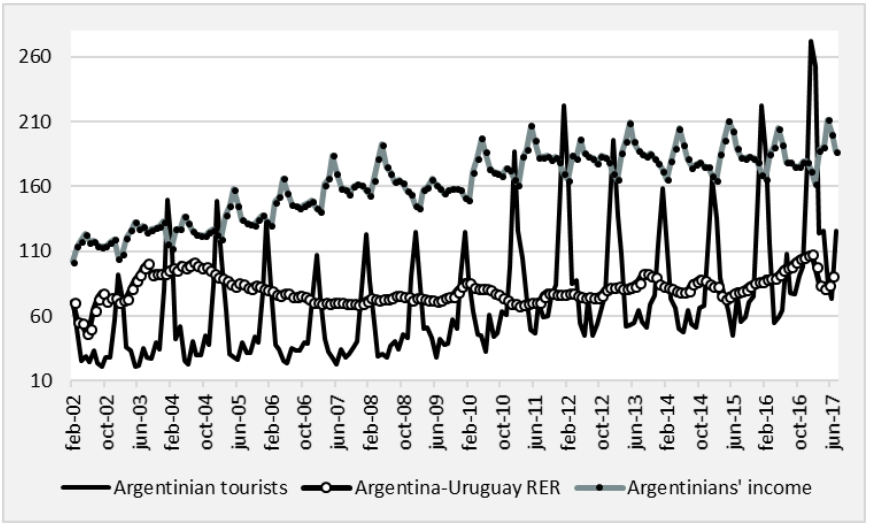
FIGURE 3 –TOURISTS VFR MODEL SERIES (Index Jan-2002=100)



Source: Uruguay Ministry of Tourism, Argentine Ministry of Economics, authors' RER calculations using Statistical Offices' data.

As VFR tourists (Uruguayans living abroad) visiting Uruguay mainly live in Argentina, we compare their behaviour with Argentinian tourists also visiting Uruguay. So, in Figure 4 we show (highly seasonal) monthly Argentinian tourists visiting Uruguay, which can be solved as in the other model with seasonal dummies. In the same figure we have Argentina's monthly economic activity indicator as a proxy of Argentina's income, and for relative prices, as in the case of the first model, we consider the bilateral RER between Uruguay and Argentina. In the first model, we tried Argentina's monthly economic activity indicator, but it was not significant, however, the Uruguayan industrial production indicator was significant in the model. This result must imply that the economic situation of the host country, of their friends and family, is the main driver of VFR tourists, and not their own economic situation in the country where they live, in this case, Argentina.

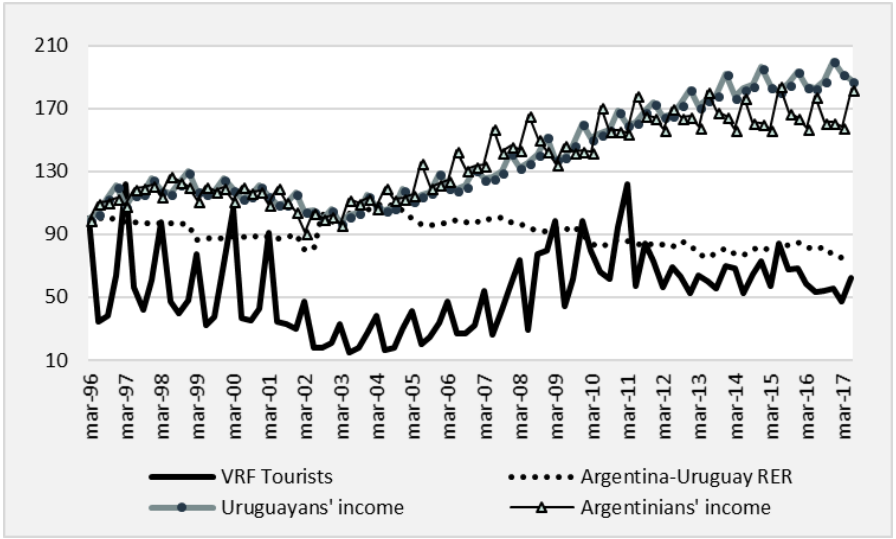
FIGURE 4 – ARGENTINIAN MODEL SERIES (Index Jan-2002=100)



Source: Uruguay Ministry of Tourism, Argentina Ministry of Economics, authors' RER calculations using Statistical Offices' data.

In Figure 5 we show the series of the third model, that considers the expenditure of tourists visiting friends and relatives on a quarterly basis. We also included bilateral RER with Argentina, Uruguayan GDP and Argentinian GDP.

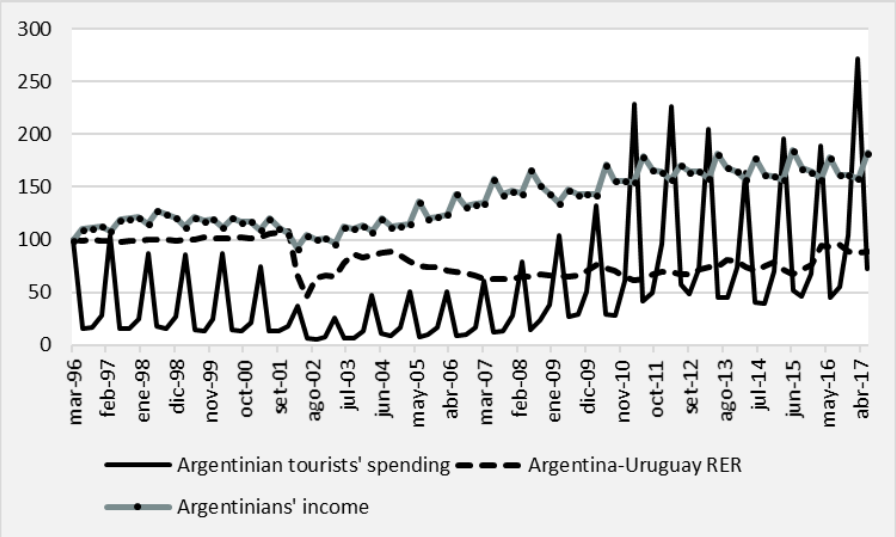
FIGURE 5 - VFR TOURISTS EXPENDITURE MODEL SERIES (Index Jan-2002=100)



Source: Uruguay Ministry of Tourism, Argentina Ministry of Economics, authors' RER calculations using Statistical Offices' data.

Finally, in Figure 6 we have the series used to estimate a model of Argentinian tourists' expenditure, and we also accounted for the bilateral RER between Uruguay and Argentina, and Argentina's GDP. In the models with quarterly data all the series were considered in logarithmic form. The period considered in this case rungs from 1996.Q1 to 2017.Q2 (the last one available when we started this study). The series seasonality was treated using seasonal dummies, as in the other case.

FIGURE 6 – ARGENTINIAN TOURISTS' EXPENDITURE MODEL SERIES (Index Jan-2002=100)



Source: Uruguay Ministry of Tourism, Argentina Ministry of Economics, authors' RER calculations using Statistical Offices' data

4.2. Methodology and Model

As explained earlier, in this study we use Johansen's (1988, 1992) methodology. This model allows us to simultaneously capture the short-run dynamic properties as well as the long-run equilibrium behavior of many non-stationary time series. We tried to find a long-run relationship representing the tourism demand of two kinds of tourists coming from Argentina: tourists VFR and Argentinian tourists, considering both the monthly number of tourists and the revenues generated from these two kinds of tourists visiting Uruguay. First, we estimated a model considering the number of tourists on a monthly basis from January 2002 to June 2017. Then, we considered the tourists expenditure with quarterly data (the only data available) from 1996 up to June 2017.

Following the literature, we define the tourism demand equation as:

$$X_i = \alpha_i RER_i + \beta_i Y_i + \varepsilon_i$$

where:

X is the tourism demand, for visitors i = Argentinian tourists and VFR tourists.

RER is the Uruguay's bilateral real exchange rate with Argentina

Y is the proxy used for income. The monthly data used is the industrial production index to estimate Uruguayan income and the monthly economic activity index for Argentinian income. For the quarterly data model, Y represents Argentina's or Uruguay's GDP.

ε_i is the error term

Johansen Cointegration Methodology

Following Enders (1995), cointegration analysis is based on an autoregressive vector with a vector equilibrium correction model (VCEqM) specification for an endogenous variable vector.

$$\Delta X\_it=A\_1\,\Delta X\_(it-1)+\ldots+A\_k\,\Delta X\_(it-k+1)+\prod X\_(it-k)+\mu+\Gamma D\_t+\xi\_(t) \qquad t=1,\ldots,T$$

where $\xi\_(t)\sim N(0,\sigma^2)$

μ is a vector of constants and Dt contains a set of dummies (seasonal and interventions).

Information about long-term relationships is included in the $\prod = \alpha\beta'$ matrix, where β is the vector of coefficients for the existing equilibrium relationships, and α is the vector of short-term adjustment mechanism coefficients. The identification of the range of the matrix $\prod$ determines all of the cointegration relationships existing among the variables.

Having examined the long-term relationship, we proceed to the short-term analysis, which shows different adjustment mechanisms of the variables to the long-run equilibrium.

Summary of estimated models:

	Name	Variables	Frequency
Model 1	Uruguayan VFR tourists	TOUR_VRF, Y_URU, RER_ARG	Monthly
Model 2	Argentinians tourists	TOUR_ARG, Y_ARG, RER_ARG	Monthly
Model 3	VFR tourists' expenditure	VRF, GDP_A, GDP_U, RER	Quarterly
Model 4	Argentinian tourists' expenditure	SP_ARG, GDP_A, RER_A	Quarterly

5. Main Results[4]

5.1. Cointegration

To verify the existence of cointegration between the variables, we applied the Johansen test, analyzing the results of the Trace and the Eigenvalue of the matrix Π (Tables 2 to 5). The existence of a co-integration vector was not rejected, and the signs of the coefficients were as expected. Furthermore, we performed the exclusion tests for β coefficients and the weak exogeneity test for α coefficients. Some of the variables were not significant, so they were excluded from the model (see Annex 2). In addition, the test on residuals (in Annex 2) found them to be well behaved. In all the models we added some dummy variables to correct for seasonality, outliers and special events in the different series.

[4] The econometric estimations were made using E-views 9. The details of the econometric estimations are available from the authors upon request.

TABLE 2 - COINTEGRATION TEST FOR MODEL 1

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized no. of CE(s)	Eigenvalue	Trace statistic	0.05 critical value	Prob.**
None *	0.190961	74.41436	47.85613	0.0000
At most 1*	0.162965	35.42337	29.79707	0.0101
At most 2	0.012724	2.691780	15.49471	0.9791
At most 3	0.001822	0.335493	3.841466	0.5624
Trace test indicates 1 cointegrating eqn(s) at the 0.05 level * indicates rejection of the hypothesis at the 0.05 level - **MacKinnon-Haug-Michelis (1999) p-values				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized no. of CE(s)	Eigenvalue	Max-Eigen statistic	0.05 critical value	Prob.**
None *	0.190961	38.99099	27.58434	0.0011
At most 1*	0.162965	32.73159	21.13162	0.0008
At most 2	0.012724	2.356287	14.26460	0.9801
At most 3	0.001822	0.335493	3.841466	0.5624
Max-eigenvalue test specifies 1 cointegrating eqn(s) at the 0.05 level * indicates rejection of the hypothesis at the 0.05 level -**MacKinnon-Haug-Michelis (1999) p-values				

Source: Authors' calculations

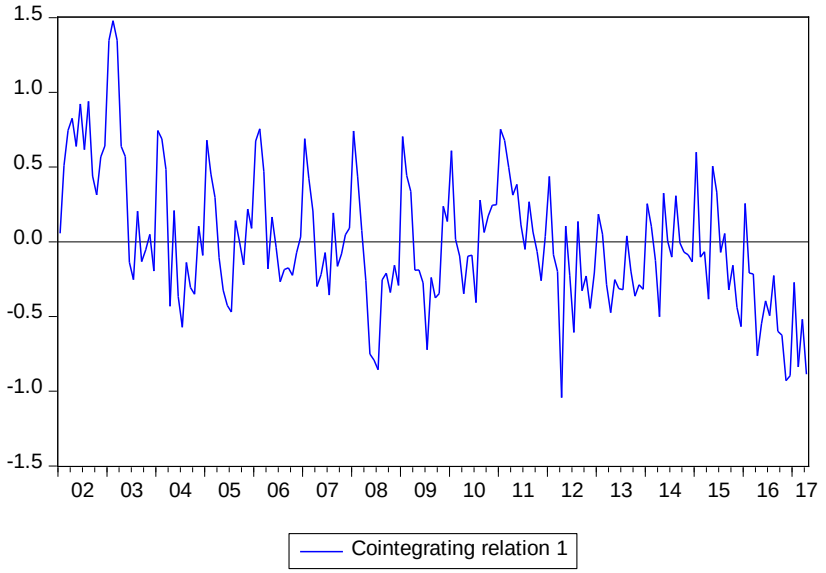
The test shows that there are at most 2 long-run vectors between the variables, but we are interested in the first one, so the long-run cointegration vector estimated for Model 1 is:

$$\underset{}{\text{LTOUR}_{\text{VRF}}} = \underset{(6.229)}{1.442\ \text{LY\_URU}_t} + \underset{(2.955)}{1.340\text{LRER}_{\text{ARG}_t}} + 2.391 \qquad (1)$$

As the variables are in log form for the estimation, the coefficients represent the elasticities. Below each coefficient we have the t value.

For Model 1 we obtained a long-run vector where the number of VFR tourists visiting Uruguay, Uruguay's income proxy and the bilateral RER between Uruguay and Argentina were all significant. The elasticities of both variables were significantly greater than 1. It is important to pint out that Argentina's GDP was not significant in the model, even though the VFR tourists live mainly in Argentina. The significant variable was Uruguayan GDP, so they decide visiting Uruguay or not, taking into account their friends and relatives economic situation, not their own.

FIGURE 7 – COINTEGRATION GRAPH OF MODEL 1



Source: Authors' calculations

The cointegration equation of Model 1 (Figure 7) shows that since 2015 VFR tourists have been below equilibrium, so an increase in the number of this category of tourists is expected in the future, as the relationship returns to equilibrium.

TABLE 3 - COINTEGRATION TEST FOR MODEL 2

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized no. of CE(s)	Eigenvalue	Trace statistic	0.05 critical value	Prob.**
None *	0.340037	86.36232	29.79707	0.0000
At most 1	0.040292	9.066084	15.49471	0.3593
At most 2	0.007587	1.416635	3.841466	0.2340
Trace test indicates 1 cointegrating eqn(s) at the 0.05 level * indicates rejection of the hypothesis at the 0.05 level - **MacKinnon-Haug-Michelis (1999) p-values				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized no. of CE(s)	Eigenvalue	Max-Eigen statistic	0.05 critical value	Prob.**
None *	0.340037	77.29623	21.13162	0.0000
At most 1	0.040292	7.649449	14.26460	0.4155
At most 2	0.007587	1.416635	3.841466	0.2340
Max-eigenvalue test specifies 1 cointegrating eqn(s) at the 0.05 level *indicates rejection of the hypothesis at the 0.05 level - **MacKinnon-Haug-Michelis (1999) p-values				

Source: Authors' calculations

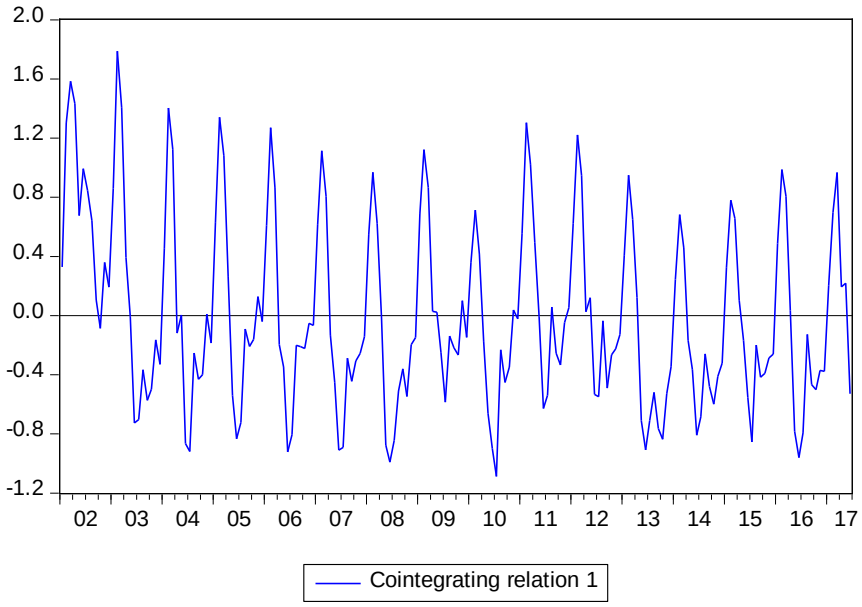
The long-run cointegration vector estimated for Model 2 is:

$$\underset{}{\text{LTOUR}_{\text{ARG}_t}} = \underset{(16.258)}{2.64\text{LY\_ARG}_t} + \underset{(8.802)}{2.039\text{LRER}_{\text{ARG}_t}} - 10.216 \qquad (2)$$

For Model 2 we found a long-run vector where the number of Argentinian tourists visiting Uruguay, Argentina's income proxy and the bilateral RER between Uruguay and Argentina are all significant. In this case, the elasticities of both variables were greater than 2.

These results show a difference between the two kinds of tourists. For tourists VFR the elasticity shows that tourism is a "normal" consumption good and depends on the income of the visiting country, not the visitors'. On the contrary, for Argentinian tourists, tourism is a luxury consumption, as it is for many tourists visiting different countries, income elasticity greater than 2.

FIGURE 8 – COINTEGRATION GRAPH OF MODEL 2



Source: Authors' calculations

In this case, for Model 2, the cointegration equation is near to the long-run equilibrium, so the future behavior of Argentinian tourists visiting Uruguay will depend on the future performance of Argentinian income and the bilateral RER.

TABLE 4 - COINTEGRATION TEST FOR MODEL 3

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized no. of CE(s)	Eigenvalue	Trace statistic	0.05 critical value	Prob.**
None *	0.307328	61.99580	47.85613	0.0014
At most 1 *	0.236800	32.61994	29.79707	0.0230
At most 2	0.128474	11.00110	15.49471	0.2114
At most 3	3.73E-06	0.000298	3.841466	0.9883
Trace test indicates 1 cointegrating eqn(s) at the 0.05 level * indicates rejection of the hypothesis at the 0.05 level -**MacKinnon-Haug-Michelis (1999) p-values				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized no. of CE(s)	Eigenvalue	Max-Eigen statistic	0.05 critical value	Prob.**
None *	0.307328	29.37586	27.58434	0.0291
At most 1 *	0.236800	21.61883	21.13162	0.0427
At most 2	0.128474	11.00081	14.26460	0.1542
At most 3	3.73E-06	0.000298	3.841466	0.9883
Max-eigenvalue test specifies 1 cointegrating eqn(s) at the 0.05 level *indicates rejection of the hypothesis at the 0.05 level - **MacKinnon-Haug-Michelis (1999) p-values				

Source: Authors' calculations

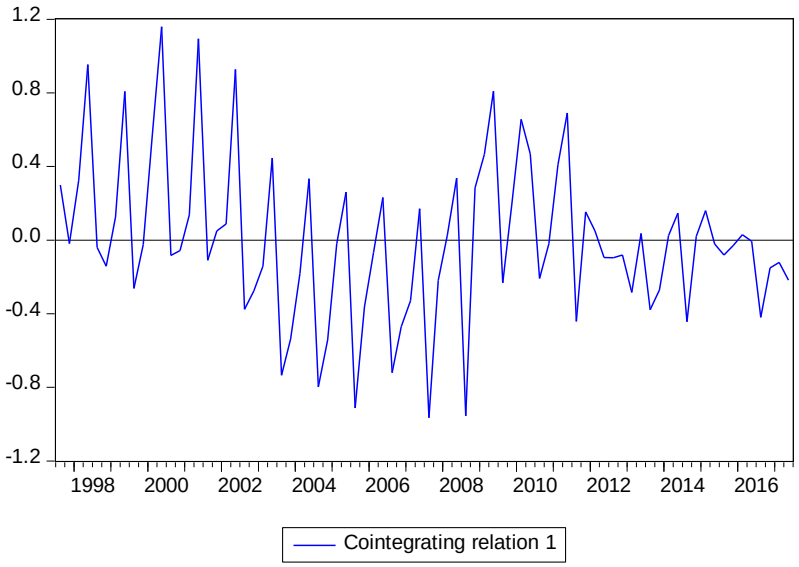
The long-run cointegration vector estimated for Model 3 is:

$$LVRF_t = 2.658 LGDP_{A_t} - 2.4758 \qquad (3)$$

(7.935)

The tourists VFR expenditure model shows different results compared with the model for the number of tourists. First, in Model 3 the relevant income is Argentinian GDP, where the tourists live and earn their living. Also, the elasticity is near 3, indicating a very different reaction of tourists in terms of their decision to travel to Uruguay or what they spend. The bilateral RER it is not relevant in this model. In this case, analyzing VFR tourists' expenditure, Uruguayan GDP does not enter the long-run model, but it enters the short-run adjustment (see Model 3 cointegration, in Annex 2).

FIGURE 9 – COINTEGRATION GRAPH OF MODEL 3



Source: Authors' calculations

The cointegration graph of Model 3 shows that the VFR tourists expenditure is under to the long-run trend, similarly to what happens to the number of VFR tourists, shown in Model 1. Therefore, the number of VFR tourists can be expected to increase, and also their expenditures. But these will depend on what happens with Uruguayan and Argentina's income with no impact of bilateral RER.

TABLE 5 - COINTEGRATION TEST FOR MODEL 4

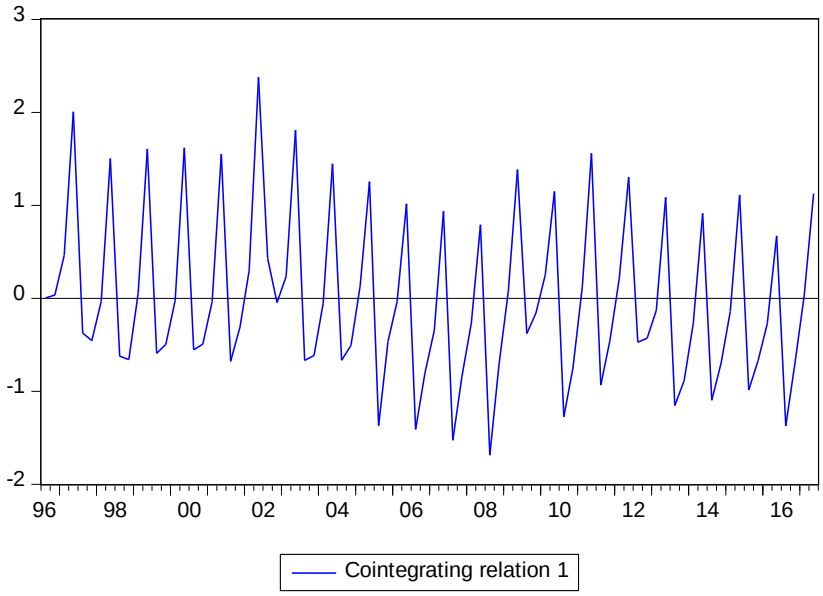
Unrestricted Cointegration Rank Test (Trace)				
Hypothesized no. of CE(s)	Eigenvalue	Trace statistic	0.05 critical value	Prob.**
None *	0.246790	31.98574	29.79707	0.0275
At most 1	0.087959	8.179243	15.49471	0.4464
At most 2	0.005287	0.445292	3.841466	0.5046
Trace test indicates 1 cointegrating eqn(s) at the 0.05 level * indicates rejection of the hypothesis at the 0.05 level - **MacKinnon-Haug-Michelis (1999) p-values				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized no. of CE(s)	Eigenvalue	Max-Eigen statistic	0.05 critical value	Prob.**
None *	0.246790	23.80649	21.13162	0.0205
At most 1	0.087959	7.733951	14.26460	0.4064
At most 2	0.005287	0.445292	3.841466	0.5046
Max-eigenvalue test specifies 1 cointegrating eqn(s) at the 0.05 level *indicates rejection of the hypothesis at the 0.05 level - **MacKinnon-Haug-Michelis (1999) p-values				

Source: Authors' calculations

The long-run cointegration vector estimated for Model 4 is:

$$\underset{t}{\mathrm{LSP}_{\mathrm{ARG}_t}} = \underset{(12.312)}{5.283\mathrm{LGDP\_A}_t} + \underset{(2.527)}{1.386\mathrm{LRER}_t} \underset{}{26.266} \qquad (4)$$

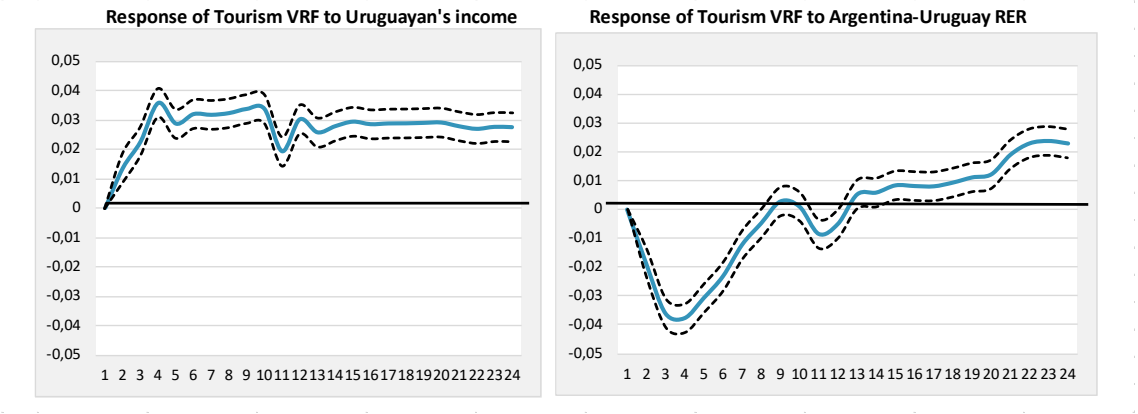
FIGURE 10 – COINTEGRATION GRAPH OF MODEL 4



Source: Authors' calculations

5.2 Impulse response functions

FIGURE 11 – TOURISM VFR IMPULSE RESPONSE FUNCTIONS IN MODEL 1

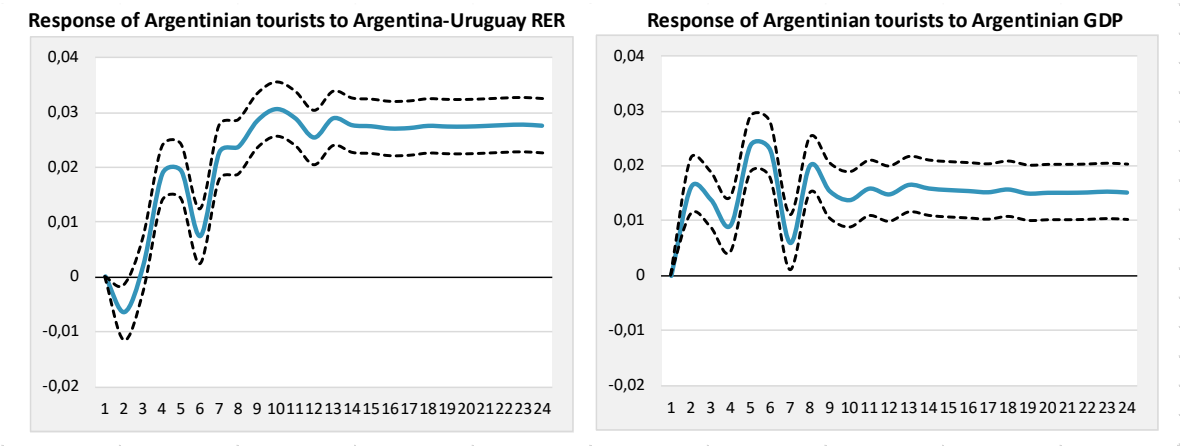


Response to Cholesky one SD innovations
Source: Authors' calculations

In Figure 11 we show impulse response functions (IRF) of Uruguayan GDP and RER on the number of VFR tourists. A positive shock of Uruguayan GDP has a positive impact on tourism VFR that stabilizes in 3%. A shock over RER between Uruguay and Argentina surprisingly shows

a negative impact on tourism VFR in the first months, but over a year it turns in a positive impact near 2%.

FIGURE 12 – ARGENTINIAN TOURISTS IMPULSE RESPONSE FUNCTIONS IN MODEL 2

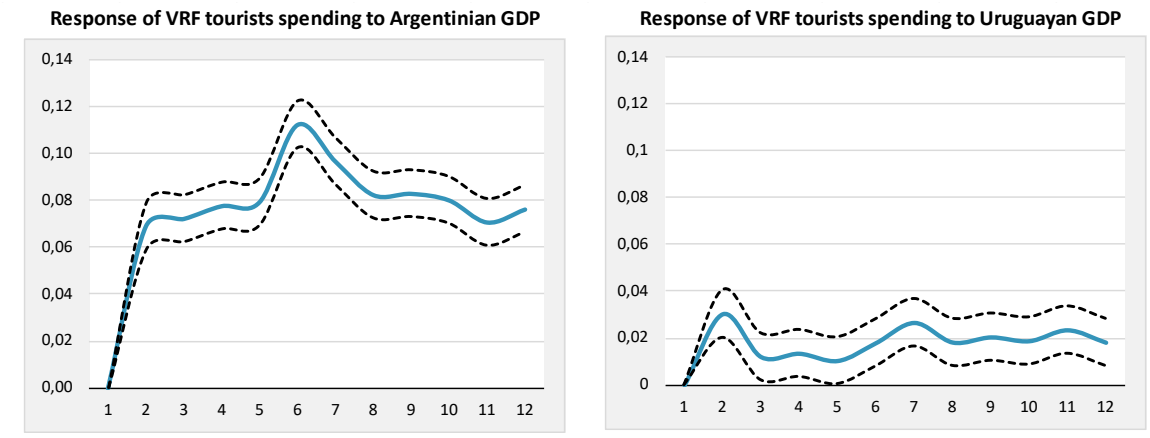


Response to Cholesky one SD innovations
Source: Authors' calculations

In Figure 12 the IRF show positive responses of Argentinian tourists to both shocks. The RER shock has an impact of near 3% and the shock on Argentinian GDP resulted 1,5%.

These results show that VFR tourists and Argentinian tourists have differences in their behavior, despite the fact that both groups of tourists live mainly in Argentina. VFR tourists react basically to changes in Uruguayan GDP, derived from the well-being of their family and friends in Uruguay. On the other hand, Argentinian tourists react to changes in their income and, to a lesser extent, to the relative prices represented here by the RER.

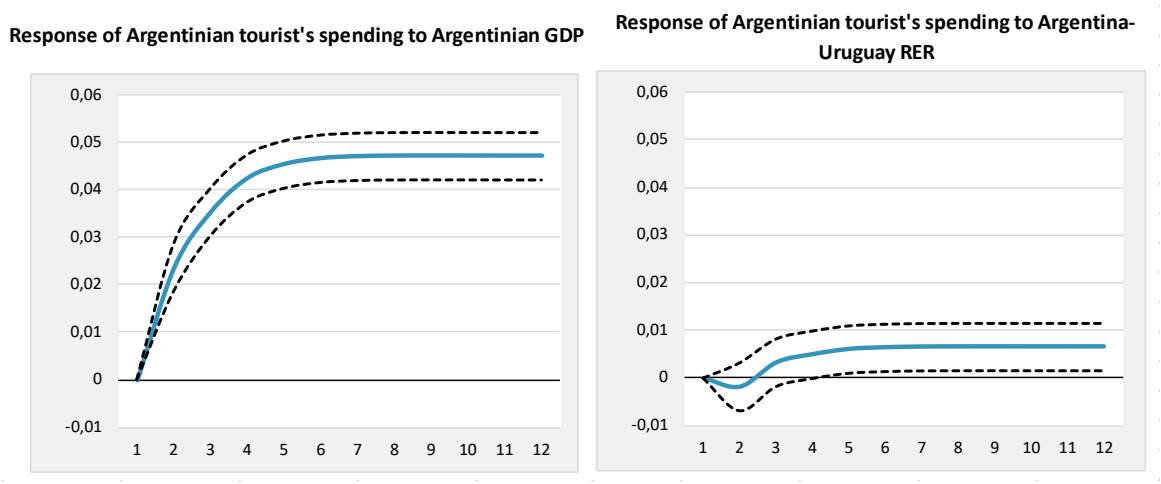
FIGURE 13 – VFR TOURISTS EXPENDITURE IMPULSE RESPONSE FUNCTIONS IN MODEL 3



Response to Cholesky one SD innovations
Source: Authors' calculations

Considering tourists expenditure, impulse response functions show that VFR tourists' expenditure reacts positively to Argentinian GDP shocks that stabilizes in around 8%. It also reacts to Uruguayan GDP after a positive shock, and the impact is less important, reaching 2%.

FIGURE 14 – ARGENTINIAN TOURISTS EXPENDITURE IMPULSE REPONSE FUNCTIONS IN MODEL 4

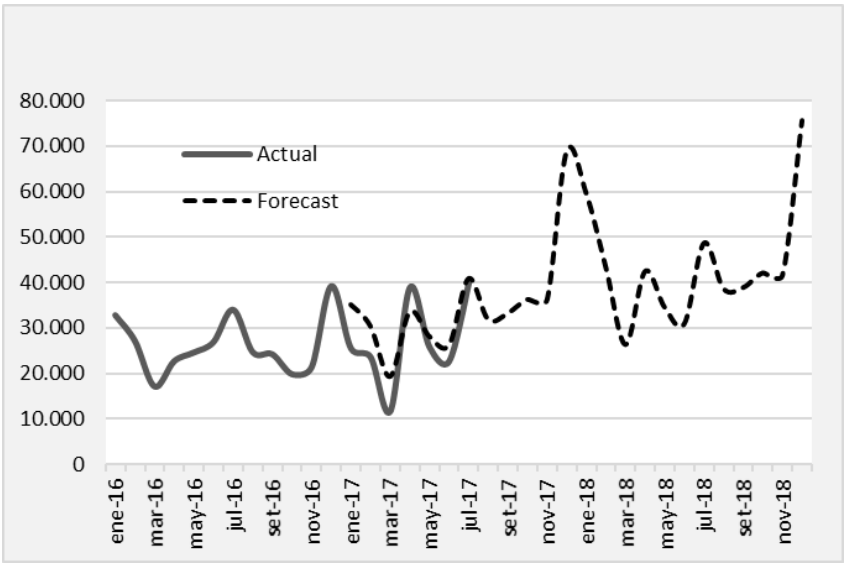


Response to Cholesky one SD innovations
Source: Authors' calculations

In the case of Argentinian tourists' expenditure, the reaction after a shock is similar but smaller than VFR tourists. Argentinians' expenditure increases 5% after a GDP shock, and VFR tourists' expenditure increases 14% after a similar shock. After a RER shock, Argentinians' expenditure increases less than 1%, and VFR tourists' expenditure about 6%.

5.3 Forecast

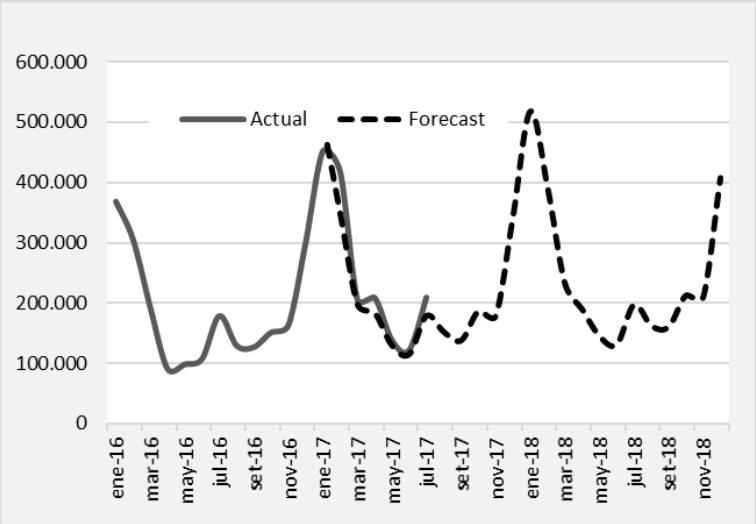
FIGURE 15 - VFR TOURISTS FORECAST



Source: Authors' calculations

Forecast for VFR tourists in 2017 (Figure 15) is very similar to actual data, and for 2018 it predicts a significant increase in these tourists (24%).

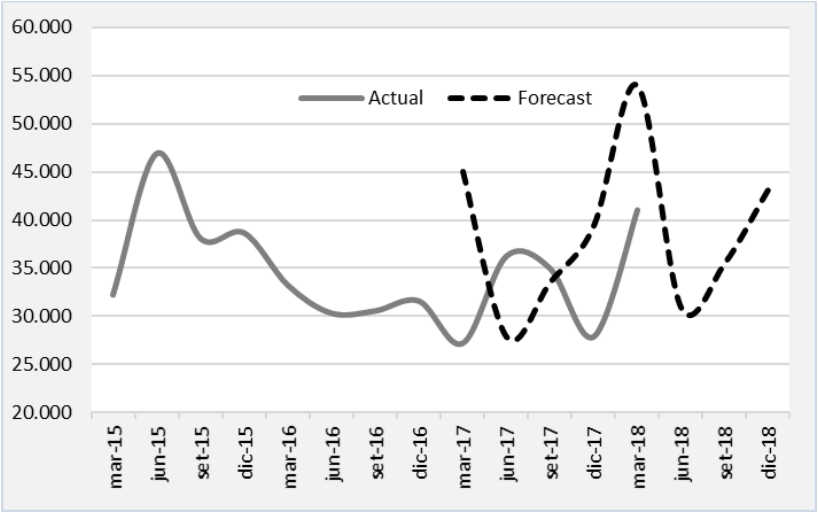
FIGURE 16 - ARGENTINIAN TOURISTS FORECAST



Source: Authors' calculations

Forecasts for Argentinian tourists (Figure 16) show an increase of 11,5% for 2018, but the future data will depend of the new circumstances of the Argentinian economy and its impact on tourism to Uruguay.

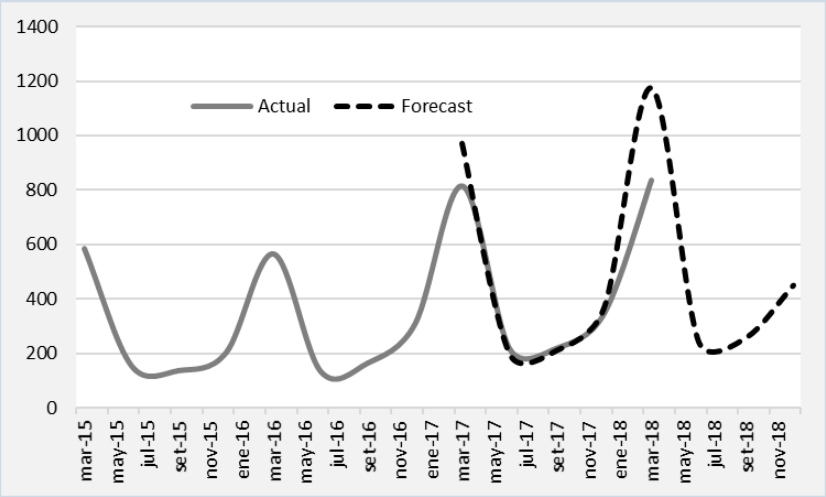
FIGURE 17 - VFR TOURISTS EXPENDITURE FORECAST



Source: Authors' calculations

In Figure 17 there is the graph of actual and forecasted VFR tourists' expenditure. There is a significant difference between actual and forecasted data for 2017, that is mainly consequence of the seasonal change of real data, showing a great increase in the second and third quarter, that the model could not predict. In 2018 the expenditure growth appears with the right seasonality, but smaller than the forecast. There must have impacted other events, not considered in the model.

FIGURE 18 - ARGENTINIAN TOURISTS EXPENDITURE FORECAST



Source: Authors' calculations

The forecast for Argentinians expenditure (Figure 18) was grater than real data for the first quarter of 2018, because these data showed an unexpected low increase.

6. Final Remarks

Tourism in Uruguay is a very important economic activity and Argentinians have been the main visitors in the Uruguayan inbound tourism.

Uruguay is one of the South American countries with the highest proportion of the population living abroad. Uruguayans living abroad visit Uruguay for their holidays, being the third segment in number of inbound tourists (after those coming from Argentina and Brazil), what is called Nostalgic tourism or Visiting friends and relatives and (VFR) tourism. Nostalgic or VFR tourism in Uruguay was near 16% during the first decade of this century and even higher in the XX century. In 2017 it represented 8% of total tourism, since Argentinian and Brazilian tourists had a great increase this year.

In this paper, we analyze the VFR tourism demand in Uruguay. After characterizing VFR tourists, we apply Johansen methodology and compare VFR tourism demand with Argentinian tourism demand. We built four models, two comparing the number of tourists, the other two analyzing the tourists' expenditure.

Applying Johansen methodology, we found at least one VEC equation for each model considered: two models considering the number of tourists, with monthly data (from January 2002 to June 2017), and two models taking into account tourists expenditure, with quarterly data (from January 1996 to June 2017).

In the first two models, the elasticities (income and prices) were smaller for VFR tourists compared with Argentinian tourists, implying that the number of VFR tourists react less to changes in income or relative prices than Argentinians', so their fidelity is higher than Argentinians'. But in the case of tourists' expenditure, the result was the opposite, with VFR tourists responding more to changes in prices or income than Argentinians'. Impulse response

functions show a greater reaction of Argentinian tourists to changes in relative prices, but similar impact in the case of an income shock. Finally, forecasts show a good adjust of the forecast to actual data.

It is important to point out that VFR tourists decide their visits to Uruguay taking into account Uruguayan GDP and relative prices between both countries, bilateral RER, as Argentina's GDP was not significant in the model. What was significant was Uruguayan GDP, so they decide visiting Uruguay or not, taking into account their friends and relatives economic situation, not their own.

On the other hand, their expenditure decision, depends only of Argentina's GDP, and with an elasticity greater than 2.5, so for VFR tourists, their expenditure reacts considering it a luxury expenditure (income elasticity greater than 1), as it is generally considered tourism.

Besides, Argentinian tourists decide their visiting and their expenditure taking into account their own GDP and relative prices. The income elasticity of Argentinians' expenditure indicates that tourism is a luxury expenditure for these tourists too.

Since the decision of both groups of tourists depend on different variables, public policies attending tourism demand and the decisions of private sector agents should take these results into account.

7. References

Alonsopérez, M., Altmark, S., Lara, C., Larruina, K., and Mordecki, G. (2010). Índice de Precios de Consumo Turístico y Tipo de Cambio Real Turístico para Uruguay, Argentina y Brasil. Quantum, Vol. V Nº 1, pp 66-87.

Altmark, S., Mordecki, G., Risso, W.A., Santiñaque, F. (2013). Argentinian and Brazilian Demands for Tourism in Uruguay. Tourism Analysis, Vol. 8, pp 173-182. DOI: 10.3727/108354213X13645733247738

Altmark, S. and Larruina, K. (2016). Turismo nostálgico en Uruguay. Los uruguayos que visitan su país, similitudes y diferencias con el resto de los visitantes. Serie Documentos de trabajo IESTA-UDELAR, DT 16/5.

Backer, E. (2009). The VFR Trilogy. Refereed paper in J. Carlsen, M. Hughes, K. Holmes & R. Jones (Eds). See Change: Proceedings of the CAUTHE Conference, 10-13 Feb, 2009, Fremantle, WA, Australia. CD Rom, Curtin University, WA, Australia.

Backer, E. and Yousuf, M. (2015). A content analysis of Visiting Friends and Relatives (VFR) travel research. Journal of Hospitality and Tourism Management, 25 (2015) 1-10. DOI: 10.1016/j.jhtm.2015.07.003

Brida J. G., Risso W. A., Carrera E. J. S. (2008). A Long-Run Equilibrium Demand Function: Tourism in Mexico. TOURISMOS, 3 (1): 66-82.

Crouch, G. I. (1995). A meta-analysis of tourism demand. Annals of Tourism Research, Volume 22, Issue 1. DOI: 10.1016/0160-7383(94)00054-V

Central Bank of Uruguay (BCU) (2018). Balance of Payment. http://www.bcu.gub.uy/Estadisticas-e-Indicadores/Paginas/Balanza-MBP-6.aspx

Dritsakis, N. (2004). Cointegration analysis of German and British tourism demand for Greece. Tourism Management 25, pp. 111–119. DOI:10.1016/S0261-5177(03)00061-X

Dwyer, L., Mellor, R., Livaic, Z., Chulwon, K., Edwards, D. (2004), Attributes of Destination Competitiveness: A Factor Analysis. Tourism Analysis 9(1-2):91-101. DOI10.3727/1083542041437558

Dwyer L., Seetaram N., Forsyth P., King B. (2014). Is the migration-tourism relationship only about VFR? Annals of tourism research, 2014, v. 46, p. 130-143 http://hdl.handle.net/10397/32062

Enders, W. (1995). Applied Econometric Time Series. Iowa State University, John Wiley & Sons, Inc. Editors.

Hara, T. (2008). Quantitative Tourism Industry Analysis: Introduction to Input-output, Social Accounting Matrix Modeling and Tourism Satellite Accounts, Elsevier.

Johansen, S. (1988). Statistical Analysis of Cointegration Vectors, Journal of Economic Dynamics and Control, vol. 12, pp. 231-254. DOI: 10.1016/0165-1889(88)90041-3

Johansen, S. (1992). Determination of Cointegration Rank In The Presence of A Linear Trend. Oxford Bulletin of Economics & Statistics 54(3):383-97. DOI: 10.1111/j.1468-0084.1992.tb00008.x

Statistical National Institute (INE) (2018). Continuous Household Survey. http://www.ine.gub.uy/encuesta-continua-de-hogares1

López Gallero, A. (2006). Frontiers, Migrations and Tourism, Fifth Research Seminar on Tourism of MERCOSUL and III Seminar of the National Research Associate and Graduate in Tourism-ANPTUR, Caxias do Sul.

López-Salinas, A., Reyes Morales, R., Elizabeth Buckley, R. (2016). Economic Development and Nostalgic Tourism in Southern Mexico, Hatfield Graduate Journal of Public Affairs.

Moscardo, G., Pearce, P., Morrison, D. and O'Leary J. (2000) Developing a Typology for Understanding Visiting Friends and Relatives Markets. Journal of Travel Research, vol. 38, 3: pp. 251-259. DOI: 10.1177/004728750003800307

Ministry of Tourism of Uruguay, Statistical Yearbook 2017 Tourism Satellite Account, https://www.mintur.gub.uy/index.php/component/jdownloads/send/75-anuarios/280-anuario-2017

Peng, B., Song, H., Crouch, G. and Witt, S.F. (2015). A Meta-Analysis of International Tourism Demand Elasticities. Journal of Travel Research, 2015, Vol. 54(5) 611–633. https://doi.org/10.1177/0047287514528283

Reyes Morales, R, Mata Sánchez, N., Gijón-Cruz, A., Cruz Contreras, A., López Platas,S. (2006). Impact of nostalgic tourism on the economy of a Zapoteca community of high migration, in https://kipdf.com/impacto-del-turismo-nostalgico-en-la-economia-de-una-comunidad-zapoteca-de-alta-_5aae3d341723dd4781f719c2.html

Sosa, P; Martínez C; Moncada, P; Beltrán, M; Álvarez, V (2015). Visitas de familiars y amigos en Cancún: impactos en una comunidad en contrucción, Temas pendientes y nuevas oportunidades en turismo y cooperación al desarrollo, pp 156-165. https://books.google.com.uy/books?isbn=8484244229

Vanhove, N., (2011). The Economics of Tourism Destinations. Amsterdam, London: Elsevier Butterworth-Heinemann. DOI: 10.4324/9780080477459

Wanhill, S. (1983). Measuring the Economic Impact of Tourism. The Service Industries Journal, 3(1), 9-20.

World Tourism Organization (UNWTO, 2018). Tourism Highlights. 2017 Edition. https://www.e-unwto.org/doi/pdf/10.18111/9789284419029

Annex 1

TABLE 1 - 2016 VISITORS' PROFILE (% of total)

Residence				
Country	**Uruguayans**		**Other nationality**	**Total**
Argentina	63,7%		72,7%	71,8%
Brazil	11,7%		14,5%	14,2%
Other	24,6%		12,9%	14,0%
Sex				
	Uruguayans	**Argentinians**	**Other nationality**	**Total**
Female	53,3%	50,0%	48,9%	50,0%
Male	46,7%	50,0%	51,1%	50,0%
Age				
	Uruguayans	**Argentinians**	**Other nationality**	**Total**
Under 30 years	33,1%	32,5%	27,1%	31,2%
30 - 64 years	61,5%	59,5%	66,5%	61,5%
65 years and over	5,4%	7,9%	6,4%	7,3%
Education Level				
	Uruguayans	**Argentinians**	**Other nationality**	**Total**
Primary	1,5%	0,4%	0,3%	0,5%
Secondary	64,4%	36,5%	24,6%	36,0%
University	30,6%	60,1%	72,8%	60,6%
Other	3,5%	3,0%	2,3%	2,9%

Source: Ministry of Tourism of Uruguay

TABLE 2 - 2016 VISIT CHARACTERISTICS (% of total)

Destination				
Destination Area	**Uruguayans**	**Argentinians**	**Other nationality**	**Total**
Montevideo	43,89%	21,25%	40,87%	28,54%
Punta del Este	2,30%	23,60%	20,93%	20,89%
Thermal Coast	22,30%	16,98%	7,21%	14,91%
Colonia	5,75%	7,24%	12,65%	8,52%
Others	25,76%	30,93%	18,34%	27,14%
Accommodation				
	Uruguayans	**Argentinians**	**Other nationality**	**Total**
Family Housing	92,36%	21,73%	17,00%	27,13%
Own Housing	3,71%	10,40%	2,58%	7,71%
Hotel	1,30%	34,15%	53,88%	36,25%
Others	2,63%	33,73%	26,54%	28,91%
Motivation				
	Uruguayans	**Argentinians**	**Other nationality**	**Total**
Leisure and holidays	21,63%	65,24%	73,15%	63,22%
Visits of Relatives and	71,75%	10,50%	9,51%	16,00%
Others	6,62%	24,26%	17,34%	20,78%
Travel Period				
Period	**Uruguayans**	**Argentinians**	**Other nationality**	**Total**
First Quarter	24,5%	39,3%	29,2%	35,3%
Second Quarter	23,6%	13,4%	18,1%	15,6%
Third Quarter	26,4%	19,7%	21,9%	20,9%
Fourth Quarter	25,6%	27,6%	30,8%	28,3%
Number of Visits				
Period	**Uruguayans**	**Argentinians**	**Other nationality**	**Total**
Without Data	0,3%	10,6%	6,2%	8,5%
Once	0,0%	3,4%	34,3%	11,2%
From Two to Five Times	3,8%	31,4%	31,7%	28,9%
More than Five Times	95,8%	54,5%	27,8%	51,4%
Duration of the Stay				
	Uruguayans	**Argentinians**	**Other nationality**	**Total**
Days	6,7	5,1	5,1	5,3

Source: Ministry of Tourism of Uruguay

TABLE 3 - 2016 REVENUE (% of total)

Composition of expenditure				
Component	**Uruguayans**	**Argentinians**	**Other nationality**	**Total**
Accommodation	4,0%	31,3%	32,1%	29,7%
Food	36,4%	23,5%	23,4%	24,3%
Transportation	8,9%	7,1%	9,2%	7,8%
Cultural	8,2%	9,0%	8,1%	8,7%
Tours	0,1%	0,2%	0,3%	0,2%
Shopping	19,7%	12,4%	11,9%	12,8%
Other	22,7%	16,5%	15,0%	16,5%
Expenditure per tourists				
	Uruguayans	**Argentinians**	**Other nationality**	**Total**
USD	401	548	600	548
Expenditure per tourist and per day				
	Uruguayans	**Argentinians**	**Other nationality**	**Total**
USD	60	107	117	104

Source: Ministry of Tourism of Uruguay

Annex 2

Model 1

Cointegration model

Vector error correction estimates
Sample (adjusted): 2002M01 2017M04
Included observations: 184 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegration restrictions:
B(1,1)=1, B(1,4)=0, A(3,1)=0,
Convergence achieved after 16 iterations.
Restrictions identify all cointegrating vectors
LR test for binding restrictions (rank = 1):

Chi-square(2)	1.636564
Probability	0.441189

Cointegrating eq:	CointEq1
LTOUR_VRF(-1)	1.000000
LY_URU(-1)	-1.442518
	(0.23160)
	[-6.22860]
LRER_ARG(-1)	-1.340543
	(0.45369)
	[-2.95477]
LRER(-1)	0.000000
C	2.391141

Error correction:	D(LTOUR_VRF)	D(LY_URU)	D(LRER_ARG)	D(LRER)
CointEq1	-0.166610	0.037919	0.000000	0.018362
	(0.06063)	(0.01717)	(0.00000)	(0.00577)
	[-2.74798]	[2.20893]	[NA]	[3.18214]

Residual tests

VEC residual normality tests
Orthogonalization: Cholesky (Lutkepohl)
Null hypothesis: residuals are multivariate normal
Sample: 2002M01 2017M06
Included observations: 184

Component	Skewness	Chi-sq	df	Prob.
1	-0.120370	0.444329	1	0.5050
2	-0.000454	6.33E-06	1	0.9980
3	0.221846	1.509277	1	0.2192
4	0.009820	0.002957	1	0.9566
Joint		1.956569	4	0.7437

Component	Kurtosis	Chi-sq	df	Prob.
1	3.418659	1.343779	1	0.2464
2	3.648007	3.219333	1	0.0728

3	3.817680	5.125934	1	0.0236
4	3.436033	1.457621	1	0.2273
Joint		11.14667	4	0.0250

Component	Jarque-Bera	df	Prob.
1	1.788108	2	0.4090
2	3.219340	2	0.2000
3	6.635211	2	0.0362
4	1.460578	2	0.4818
Joint	13.10324	8	0.1083

VEC residual serial correlation LM tests
Null hypothesis: no serial correlation at lag order h
Sample: 2002M01 2017M06
Included observations: 184

Lags	LM-Stat	Prob
1	29.65765	0.0199
2	25.06164	0.0687
3	19.30514	0.2532
4	18.00799	0.3234
5	29.75507	0.0193
6	24.33443	0.0825

Probs from chi-square with 16 df.

Model 2

Cointegration model

Vector error correction estimates
Sample (adjusted): 2002M01 2017M06
Included observations: 186 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating eq:	CointEq1
LTOUR_ARG(-1)	1.000000
LRER_ARG(-1)	-2.038973
	(0.23165)
	[-8.80178]
LY_ARG(-1)	-2.640238
	(0.16240)
	[-16.2580]
C	10.21570

Error correction:	D(LTOUR_ARG)	D(LRER_ARG)	D(LY_ARG)
CointEq1	-0.196962	0.054026	0.031296
	(0.04810)	(0.00958)	(0.00644)
	[-4.09473]	[5.64061]	[4.86071]

Residual tests

VEC residual normality tests
Orthogonalization: Cholesky (Lutkepohl)
Null hypothesis: residuals are multivariate normal
Sample: 2002M01 2020M12
Included observations: 186

Component	Skewness	Chi-sq	df	Prob.
1	-0.179987	1.004259	1	0.3163
2	0.001223	4.64E-05	1	0.9946
3	0.067964	0.143190	1	0.7051
Joint		1.147496	3	0.7656

Component	Kurtosis	Chi-sq	df	Prob.
1	3.578166	2.590639	1	0.1075
2	3.621542	2.993940	1	0.0836
3	3.545467	2.305893	1	0.1289
Joint		7.890473	3	0.0483

Component	Jarque-Bera	df	Prob.
1	3.594899	2	0.1657
2	2.993987	2	0.2238
3	2.449083	2	0.2939
Joint	9.037969	6	0.1715

VEC residual serial correlation LM tests
Null hypothesis: no serial correlation at lag order h
Sample: 2002M01 2020M12
Included observations: 186

Lags	LM-Stat	Prob
1	12.75276	0.1741
2	13.29157	0.1499
3	7.097532	0.6270
4	15.99067	0.0671
5	7.676743	0.5670
6	15.28000	0.0835

Probs from chi-square with 9 df.

Model 3

Cointegration model

Vector Error Correction Estimates
Sample (adjusted): 1997Q3 2017Q2
Included observations: 80 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegration Restrictions:
B(1,1)=1, A(4,1)=0, B(1,3)=0, A(2,1)=0, B(1,4)=0
Convergence achieved after 6 iterations.
Restrictions identify all cointegrating vectors
LR test for binding restrictions (rank = 1):
Chi-square(4) 4.261093
Probability 0.371822

Cointegrating Eq:	CointEq1
LVRF1(-1)	1.000000
LGDP_A(-1)	-2.658041 (0.33498) [-7.93503]
LGDP_U(-1)	0.000000
LRER(-1)	0.000000
C	2.475835

Error Correction:	D(LVRF1)	D(LGDP_A)	D(LGDP_U)	D(LRER)
CointEq1	-0.506466 (0.11626) [-4.35649]	0.000000 (0.00000) [NA]	-0.017127 (0.00659) [-2.59863]	0.000000 (0.00000) [NA]

Residual tests

VEC Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal
Sample: 1996Q1 2020Q4
Included observations: 80

Component	Skewness	Chi-sq	df	Prob.
1	0.249754	0.831692	1	0.3618
2	-0.083883	0.093818	1	0.7594
3	-0.080450	0.086296	1	0.7689
4	-0.211710	0.597617	1	0.4395
Joint		1.609423	4	0.8071

Component	Kurtosis	Chi-sq	df	Prob.
1	2.859627	0.065682	1	0.7977
2	2.312356	1.576180	1	0.2093
3	2.466119	0.950096	1	0.3297
4	3.064596	0.013909	1	0.9061
Joint		2.605867	4	0.6258

Component	Jarque-Bera	df	Prob.
1	0.897374	2	0.6385
2	1.669998	2	0.4339
3	1.036392	2	0.5956
4	0.611526	2	0.7366
Joint	4.215290	8	0.8372

VEC Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h
Date: 05/18/18 Time: 19:06
Sample: 1996Q1 2020Q4
Included observations: 80

Lags	LM-Stat	Prob
1	18.43822	0.2989
2	16.53968	0.4160
3	21.61657	0.1560

Probs from chi-square with 16 df.

Model 4

Cointegration model

Vector error correction estimates
Date: 12/08/17 Time: 19:26
Sample (adjusted): 1996Q3 2017Q2
Included observations: 84 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegration restrictions:
B(1,1)=1, A(3,1)=0,
Convergence achieved after 5 iterations.
Restrictions identify all cointegrating vectors
LR test for binding restrictions (rank = 1):
Chi-square(1) 0.123368
Probability 0.725410

Cointegrating eq:	CointEq1

LSP_AR(-1)	1.000000		
LGDP_A(-1)	-5.282675		
	(0.42907)		
	[-12.3119]		
LRER_AR(-1)	-1.385891		
	(0.54845)		
	[-2.52690]		
C	26.26641		
Error correction:	D(LSP_AR)	D(LGDP_A)	D(LRER_AR)
CointEq1	-0.164934	0.051983	0.000000
	(0.06259)	(0.01306)	(0.00000)
	[-2.63523]	[3.98133]	[NA]

Residual tests

VEC residual normality tests
Orthogonalization: Cholesky (Lutkepohl)
Null hypothesis: residuals are multivariate normal
Date: 12/08/17 Time: 19:27
Sample: 1996Q1 2020Q4
Included observations: 84

Component	Skewness	Chi-sq	df	Prob.
1	0.148321	0.307987	1	0.5789
2	-0.018883	0.004992	1	0.9437
3	0.004522	0.000286	1	0.9865
Joint		0.313266	3	0.9575

Component	Kurtosis	Chi-sq	df	Prob.
1	2.490084	0.910049	1	0.3401
2	2.522801	0.797015	1	0.3720
3	3.351039	0.431300	1	0.5114
Joint		2.138364	3	0.5442

Component	Jarque-Bera	df	Prob.
1	1.218037	2	0.5439
2	0.802007	2	0.6696
3	0.431586	2	0.8059
Joint	2.451629	6	0.8738

VEC residual serial correlation LM tests
Null hypothesis: no serial correlation at lag order h
Date: 12/08/17 Time: 19:27
Sample: 1996Q1 2020Q4
Included observations: 84

Lags	LM-Stat	Prob
1	12.17440	0.2037
2	16.99473	0.0488

Probs from chi-square with 9 df.

INSTITUTO DE ECONOMÍA

Serie Documentos de Trabajo

Agosto, 2018
DT 08/2018

Instituto de Economía
Facultad de Ciencias Económicas y de Administración
Universidad de la República - Uruguay