Modelling International Tourist Arrivals to the Five Major Spanish Destinations

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EXTENDED ABSTRACT

International tourism is an important source of foreign income for Spain and its regions. Spain is a country that consists of 17 autonomous communities, namely Andalusia, Aragon, Asturias, Balearic Islands, Basque Country, Canary Islands, Cantabria, Castile-La Mancha, Castile-Leon, Catalonia, Ceuta and Melilla, Community of Madrid, Community of Valencia, Extremadura, Galicia, Murcia, and Navarra, with historical sites and unique cultural features that have always made the country attractive to foreign visitors (Figure 1).

According to the World Tourism Organization (WTO (2006)), Spain was the world's second most visited country in 2005, with a total of 55.6 million international tourist arrivals, exceeded only by France, with 76 million arrivals. Spain was also the world's second highest tourist earner (USD47.9 billions), after the USA, with USD81.7 billions.

Global tourism grew at a higher than expected rate in the first four months of 2007 due to several positive factors, the continuing world prosperity in particular. With increasing disposable income in both developed and developing countries and factors such as the continued development of low cost airlines making travel available for larger shares of population, international tourism is expected to remain strong.

Tourism's contribution to economic growth and job creation is increasingly drawing the attention of national governments, especially those in developing regions. Higher investment in infrastructure, marketing and promotion, development of domestic markets, liberalization of air transport, growing intra-regional cooperation, and a growing number of public-private partnerships are key to the strong growth of the global tourism industry (WTO, 2007).

This paper examines the time series properties of tourism demand to the top 5 autonomous community destinations in Spain, namely Andalusia, the Balearic Islands, the Canary Islands, Catalonia and the Community of Madrid, from January 1994 to February 2006. Of the 17 regions in Spain, the top 5 destinations represent almost 84% of the total tourist arrivals in Spain.

The log-differenced monthly tourist arrivals and their associated uncertainty are modelled and estimated for the 5 series using univariate and multivariate conditional volatility models. Univariate estimates suggest that conditional volatility models provide an accurate measure of uncertainty in monthly tourist arrivals for the 5 series. The estimated conditional correlation coefficients (CCC) indicate whether Spain should specialize or diversify its tourism promotion efforts on those autonomous communities that receive the largest numbers and growth in tourism arrivals. These estimates suggest that the monthly tourist arrivals shocks to alternative tourist communities are in general independent or weakly related, except for the pair of Andalusia and Catalonia.

Figure 1. Regional Map of Spain (Source: http://www.dgsfp.mineco.es).

1. DATA

As discussed in Alvarez et al. (2007), the World Tourism Organization (WTO) defines international tourists as individuals that travel to and stay in places outside their country for more than 24 hours for leisure, business and other purposes. The most common unit of measure used to quantify the volume of international tourism for statistical purposes is the number of international tourist arrivals (at frontiers or airports) and overnight tourists (WTO (2005)).

International tourism arrivals data to the top 5 autonomous community destinations in Spain are supplied by the Spanish National Institute of Statistics (Instituto Nacional de Estadistica (INE)) website. The top 5 destinations receive 84% of the total international tourists to Spain, with a sample size for each of the 5 destinations from January 1994 to February 2006.

Table 1 gives the descriptive statistics for monthly international tourist arrivals to the top 5 autonomous community destinations in Spain. The mean tourist arrivals vary substantially across the 5 communities, ranging from 194,156 for the Community of Madrid to 417,834 for the Balearic Islands. Of the 5 communities, the Canary Islands and the Community of Madrid have means that are less than 250,000 tourists, while Andalusia has a mean of 360,400. The means of the Balearic Islands and Catalonia monthly tourist arrivals, which are the two major tourism regions, are both well above 400,000 tourists. By comparison to the mean, the median tourist arrival measure does not vary as much across the 5 communities. Moreover, for the median case, the rank from the most to the least visited region changes. Catalonia is ranked first with 363,832 monthly international tourist arrivals, followed by Andalusia with 349,270 and the Balearic Islands with 341,968 (which are ranked first in terms of the mean). The Canary Islands and the Community of Madrid have the lowest median in the sample, receiving less than 250,000 international tourists. Monthly tourist arrival figures from the top 5 community destinations in Spain show that the Balearic Islands vary the most during the sample period, with a minimum of 33,188 and a maximum of 1,059,699 tourists. The region that presents more stability in the number of arrivals is the Community of Madrid, ranging from 89,494 to 308,144. Although the standard deviation varies substantially across the 5 communities, from 46,739 for the Community of Madrid to 326,870 for the Balearic Islands, this primarily reflects differences in mean monthly tourist arrivals. Tourist arrivals to the top 5 community destinations in Spain are all positively skewed except for the Community of Madrid, with kurtosis ranging from 1.592 for the Balearic Islands to 2.261 for the Community of Madrid.

Table 1. Descriptive statistics for monthly international tourist arrivals.

Statistics	Andalusia	Balearic Islands	Canary Islands	Catalonia	Madrid
Mean	360,400	417,834	235,377	407,922	194,156
Median	349,270	341,968	245,800	363,832	198,452
Max.	631,357	1,059,699	381,083	889,056	308,144
Min.	92,232	33,188	124,347	65,169	89,494
Std. Dev.	144,232	326,870	64,658	225,412	46,739
Skewness	0.046	0.319	0.034	0.341	-0.132
Kurtosis	1.786	1.592	1.820	1.936	2.261

International monthly tourist arrivals and the uncertainty associated with monthly tourist arrivals to the 5 most visited regions in Spain are presented in Figure 2. It clear that there are significant seasonal variations in the monthly international tourist arrivals to the communities. However, the seasonal patters are different across the 5 communities. The Balearic Islands and Catalonia receive most tourists during the European summer, between July and August, while the Canary Islands receive them in the European winter, between November and March. On the other hand, Andalusia and Madrid, receive most international tourists in two different periods of the year.

May is the month when most tourists visit Andalusia, followed by July. For Madrid, July and May are the months when most of the tourists visit the community**.** The Canary Islands is the region where monthly tourist arrivals vary the most over the sample period. For instance, the monthly mean international tourist arrival was 173,209 in 1998 and 300,176 in 1999. Overall, there is an increasing trend in the international tourist arrivals to the 5 communities over the time sample. A noticeable structural change is observed for the tourist arrivals to the Canary Islands in early 1999, which corresponds with INE's update of national tourism statistics. However, a slight increase in the number of tourist arrivals is also observed for the other top 4 community destinations after January 1999, as INE included data on one-star and similar category hotels, in addition to two-, three-, silver- and gold-star hotels. Moreover, after the 11 September 2001 terrorist attacks, the number of tourist arrivals to Community of Madrid, Andalusia, as well as the other communities decreased substantially. However, by the end of

2002, tourist arrival numbers to all communities returned to their pre-September 11 levels.

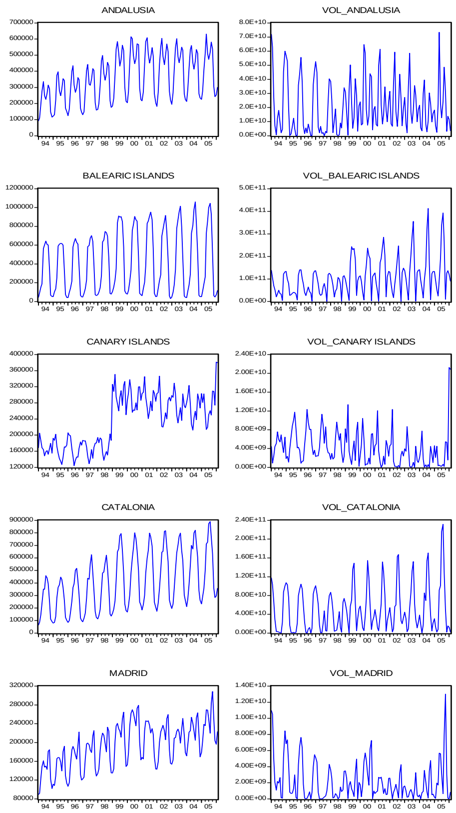

Figure 2. Monthly tourist arrivals (left) and uncertainties (rights) to the top five communities.

In Figure 2, the monthly tourist arrival uncertainties for the top 5 community destinations show different patterns. This is due to the fact that the 5 communities attract different types of tourists. Andalusia shows two large variations through the year and they are very extreme. There is a similar increasing trend in the tourist arrival uncertainty associated with the Balearic Islands and Catalonia. The uncertainty in Andalusia is persistent all over the sample period, with noticeable extreme observations and/or outliers. For the Canary Islands, there is a noticeable tourism uncertainty throughout the sample period, with the uncertainty decreasing towards the end of the sample. However, the associated uncertainty for Madrid is tri-modal and was increasing by the end of the sample period.

Figure 2 also suggests that monthly international tourist arrivals appear to be non-stationary. Hence, the possibility of spurious regressions with time series data necessitates tests for the presence of unit roots in the individual series. The ADF results showed the existence of unit roots in the 5 monthly tourist arrivals series. This implies that the series need to be transformed to stationary processes to enable valid empirical estimates and inferences. One way to model seasonal data and non-stationary variables is to take the first difference of the annual difference of the logarithms of monthly international tourist arrivals y_t, namely $\Delta\Delta_{12} \ln y_t$ (see Hoti, McAleer and Sanso (2005)). Taking the first difference of the annual difference renders each of the 5 series stationary, with the sample size being February 1995 to February 2006 (rather than January 1994 to February 2006). Hence, the conditional mean model of the monthly international tourist arrivals for each of 5 leading source countries is as follows:

$$\Delta\Delta_{12} \ln y_t = \theta_0 + \theta_1 y_{t-1} + (1-\theta_2 L)(1-\theta_3 L^{12})\varepsilon_t, \quad t = 1,...,146 \tag{1}$$

where y_{t-1} is the lagged dependent variable, and $L\varepsilon_t$ and $L^{12}\varepsilon_t$ are the moving average terms at lags 1 and 12 of the error term.

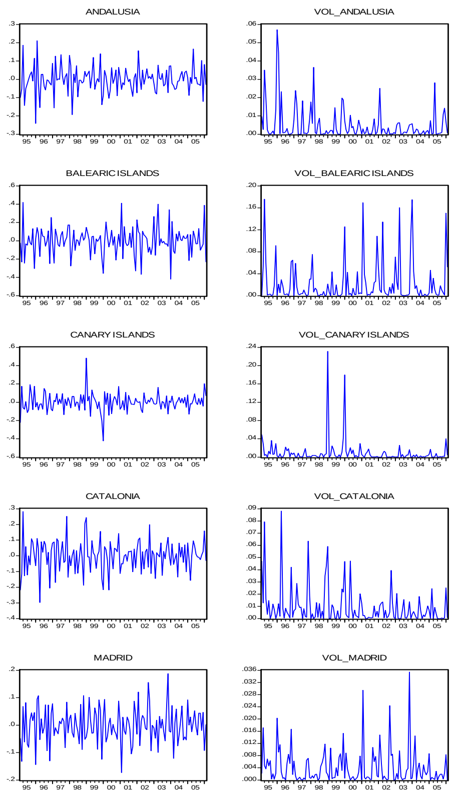

Figure 3. Log-differenced monthly tourist arrivals (left) and uncertainty (right) to the top five communities.

Figure 3 presents the log-differenced monthly tourist arrivals and the associated uncertainty to the top 5 destinations in Spain. After adjusting for the presence of seasonality and unit roots, the 5 series do not present trends and they all vary around zero, like typical financial return series. Overall, the monthly tourist arrival series to the 5 communities vary substantially, with noticeable peaks over the sample period. In particular, two peaks in 1999-2000 dominate the variations in the tourist arrivals to the Canary Islands, reflecting the new types of tourism statistics considered by the INE. Like for financial series, the positive shock was followed by a negative shock to adjust for the change in the tourism series.

Plots of the uncertainty associated with the 5 log-differenced tourist arrivals series to the top community destination are given in Figure 3. Overall, there are noticeable clusterings of volatility across the 5 series, with outliers and/or extreme observations over the sample period. The Balearic Islands and the Community of Madrid have similar patterns of volatility, especially from 2000-2004. For Andalusia and Catalonia, the uncertainty decreased over the sample period, while the Canary Islands show mild uncertainty and two outliers in 1999 and 2000

2. METHODS

Consider the specification of the multivariate CCC model of Bollerslev (1990):

$$y_t = E(y_t \mid I_{t-1}) + \varepsilon_t, \qquad t = 1,...,n$$
$$\varepsilon_t = D_t \eta_t, \qquad \eta_t \sim iid(0,1) \tag{2}$$

where $y_t = (y_{1t}, y_{2t}, ... y_{mt})'$ measures tourist arrivals to the top 5 tourist destinations, the univariate conditional mean, $E(y_t | I_{t-1})$, is the expected value of y_t given the past information available to time *t*, $\eta_t = (\eta_{1t}, \eta_{2t} ... \eta_{mt})'$ is a sequence of independently and identically distributed (*iid*) random vectors with mean zero and variance one obtained from standardizing the tourist arrivals shocks, ε_t, using the standardization $D_t = diag(h_{1t}^{1/2}, h_{2t}^{1/2}, ..., h_{mt}^{1/2})$, where h_{it} is the conditional variance, *m* (=5) is the number community destinations, and *t* = 1,…,146 monthly observations for the period January 1994 to February 2006.

The CCC model assumes the conditional variance or uncertainty of tourist arrivals from a source country, h_{it}, for $i = 1,...,m$ follows a univariate GARCH(1,1) process, that is,

$$h_{it} = \omega_i + \alpha \varepsilon_{i,t-1}^2 + \beta_i h_{i,t-1} \tag{3}$$

where α_i represents the ARCH effects, or the short-run persistence of shocks, and β_i represents the GARCH effects, or the contribution of shocks to long-run persistence, that is, $\alpha_i + \beta_i$. Although the CCC specification in (3) has a computational advantage over other multivariate models, such as the VARMA-GARCH model of Ling and McAleer (2003) and VARMA-AGARCH model of McAleer et al. (2007), it assumes independence of uncertainty, across different destinations, and does not accommodate the asymmetric effects on uncertainty of positive and negative tourism shocks. The CCC model is used to estimate the correlation coefficients of the monthly tourist arrival shocks between all pairs of community destinations analysed in this paper.

When the correlation coefficient of tourism arrivals shocks, ρ_{ij}, is close to +1, Spain should specialize on those community destinations that receive the largest numbers and growth in tourist arrivals. However, when the correlation coefficient of tourist arrival shocks, ρ_{ij}, is close to -1, Spain should concentrate on diversifying the community base. Independent tourism communities are those pairs of communities with a correlation coefficient, ρ_{ij}, close to zero, in which case neither specialization nor diversification in communities would be required for optimal management of tourism arrivals.

When the number of tourism destination is set to *m* = 1, such that a univariate model is specified, ω >0, $\alpha \geq 0$ and $\beta \geq 0$ are sufficient (but not necessary) regularity conditions to ensure that h_t > 0. The parameters in Equations (1)-(3) are typically obtained by the Likelihood Estimation (MLE) method using a joint normal density for the standardized tourist arrivals shocks, η_t, after the uncertainty has been modelled. The parameters are estimated by Quasi-MLE (QMLE) when η_t does not follow a joint multivariate normal distribution.

Ling and McAleer (2003) proved that the QMLE for GARCH(*r*,*s*) is consistent if the second moment regularity condition is finite. A weaker moment is the log-moment regularity condition, given by $E[\ln(\alpha_j \eta_t^2 + \beta_j)] < 0$, which is sufficient for the QMLE to be consistent and asymptotically normal.

Equation (3) assumes that the positive shocks (ε_t >0) to monthly tourist arrivals has the same impact on uncertainty, h_t, as a negative tourist arrivals shocks (ε_t <0), but this assumption is normally violated in practice. In order to accommodate the possible differential impact on uncertainty from positive and negative international tourist arrival shocks, the GJR(1,1) model is proposed for specifying h_t :

$$h_t = \omega + (\alpha + \gamma I(\eta_{t-1}))\varepsilon_{t-1}^2 + \beta h_{t-1} \quad (4)$$

where $\omega > 0$, $\alpha \geq 0$, $\alpha + \gamma \geq 0$ and $\beta \geq 0$ are sufficient (but not necessary) regularity conditions to ensure that uncertainty is positive, namely h_t >0, and $I(\eta_{t-1})$ is an indicator variable defined:

$$I(\eta_t) = \begin{cases} 1, & \varepsilon_t < 0 \\ 0, & \varepsilon_t \geq 0 \end{cases} \quad (5)$$

Under the assumption that the standardized shocks, η_t , follow a symmetric distribution, the average short-run persistence of tourist arrivals shocks is, $\alpha + \gamma / 2$, and the contribution of tourist arrivals shocks to average long-run persistence is $\alpha + \beta + \gamma / 2$. Ling and McAleer (2002) showed that the necessary and sufficient regularity condition for the second moment of GJR(*r,s*) of tourist arrivals shocks to be finite is:

$$\alpha + \beta + \gamma / 2 < 1 .$$

McAleer, Chan and Marinova (2007) established the log-moment regularity condition for the GJR(1.1) model of uncertainty, namely

$$E[\ln((\alpha + \gamma I(\eta_t))\eta_t^2 + \beta)] < 0 . \quad (6)$$

3. EMPIRICAL RESULTS

The Berndt, Hall, Hall and Hausman (BHHH) (1974) algorithm in EViews 5 is used to obtain the estimates of the parameters in this paper. Both the asymptotic and Bollerslev-Wooldridge (1992) robust t-ratios are reported to enable valid statistical inference.

In terms of the conditional mean (Tables 1 and 2), the seasonal stochastic effect is significant for all 5 international tourist arrival series, for both GARCH(1,1) and GJR(1,1). The stochastic effect of the previous month is also significant in all the regions except for the Balearic Islands, for both GARCH(1,1) and GJR(1,1).

GARCH(1,1) estimates of the conditional uncertainty of monthly international tourist arrivals to Andalusia show that the log-moment condition could not be computed and the second moment was not satisfied. However, for GJR(1,1), while the second moment is still not satisfied, the log-moment regularity condition is satisfied, ensuring that the QMLE are consistent and asymptotically normal. Indeed, there are significant asymmetric effects between positive and negative tourism shocks to Andalusia. This means that negative shocks have a greater impact on uncertainty than positive shocks of similar magnitude. Tourist arrival shocks for Andalusia have a short run persistence, that is, for about one month. However, contrary to expectations, the tourist shocks have a negative and significant contribution to the long-run persistence.

Asymmetric effects are not significant for GJR(1,1) tourist arrival estimates to the Balearic Islands. Hence, GARCH(1,1) is preferred. Regarding the regularity conditions, both the log- and second moment conditions are satisfied. Hence, QMLE are consistent and asymptotically normal and the empirical estimates are statistically adequate. These islands only have short run persistence in tourist arrivals shocks, that is, for about one month.

An interesting result is found for the Canary Islands. When using GARCH(1,1), both the log- and second moment conditions are satisfied, however, the coefficients of the GARCH(1,1) regression are not significant. This would suggest that the variance of the error term is constant. On the contrary, only the log-moment is satisfied for GJR(1,1) giving consistency and asymptotic normality to the QMLE of the ARCH effect which is significant. Overall, the variance of the error term for the Canary Islands is constant (under GARCH(1,1)), with possible short run persistence of the tourist arrival shocks (under GJR(1,1) for about a month.

GARCH(1,1) estimates of the monthly international tourist arrivals to Catalonia show that the log-moment condition could not be computed and that the second moment was not satisfied. However, both the log-moment and second moment regularity conditions are satisfied for GJR(1,1). Therefore, the QMLE are consistent and asymptotically normal. Such results suggest that the empirical estimates are statically valid for tourist arrivals to this community. There are significant asymmetric effects between positive and negative shock of similar magnitude to tourist arrivals. However, unlike the case of Andalusia, negative shocks for Catalonia have a lower impact on uncertainty than positive shocks. This is an unusual result, which highlights the differences in the properties of tourist arrival series analysed in this paper. Moreover, tourist arrival shocks to Catalonia have a significant long run effect, which accumulates over time.

Like for Andalusia and Catalonia, the log-moment condition could not be computed and second moment was not satisfied for GARCH(1,1) for the Community of Madrid. On the other hand, both the log- and second moment regularity conditions are satisfied for GJR(1,1), therefore, the QMLE are consistent and asymptotically normal. Such results suggest that the empirical estimates are statically valid. However, the short and long persistence of shocks is found to be insignificant, suggesting that the GJR(1,1) is also not appropriate for the Community of Madrid.

Overall, the univariate results suggest that the GJR(1,1) model provides an accurate measure of the uncertainty in international monthly tourist arrivals to the top 5 tourism communities, except for Catalonia for which neither GARCH(1,1) nor GJR(1,1) was appropriate.

As the estimated GJR(1,1) model was found to be preferable to its GARCH(1,1) counterpart for the monthly tourist arrivals to the 5 autonomous communities, the multivariate CCC will be discussed only for the GJR(1,1) model of uncertainty. Estimates of the CCC coefficients for monthly international tourist arrival shocks by autonomous communities are given in Table 5.3. These correlations are calculated using the GJR(1,1) standardised tourist arrivals shocks for the 5 most visited communities in Spain.

In Table 3, the CCC coefficients are not very high, ranging from -0.159 (Balearic Islands, Madrid) to 0.412 (Andalusia, Catalonia). The second highest conditional correlation is for (Andalusia, Madrid), followed by (Catalonia, Madrid) and (Canary Islands, Madrid). These results are mainly due to two factors. First, the most internationally well-known Spanish cities, in order of importance, are Barcelona (Catalonia) and Granada and Seville (Andalusia). Hence, when tourists travel to Spain, they visit more than one city in the country. Second, Spanish international and regional transport, by road and/or air, is centralised in the capital city, Madrid (Community of Madrid). For this reason, when travelling from one community to another, crossing through Madrid by road and/or air, tourists take a chance to visit the city.
However, the Balearic Islands and Canary Islands, the two island communities, do not seem to be strongly related in terms of their tourism shocks, while they both seem to be independent of the Community of Madrid in terms of tourist arrival shocks. The former occurs because the two island communities attract different types of tourists and at different times of the year. Moreover, most of the international tourists visiting these islands are Europeans and almost all of them reach the islands by air-transport. As the two island communities are directly connected to the European cities, the tourists do not need to stop by and visit Madrid on their way to the islands. Another interesting result is that the conditional correlation between shocks to the Balearic Islands and Catalonia, the two most visited communities in Spain and the closest in geographical distance is also very low. This shows that Balearic Islands and Catalonia are different markets that attract different types of international tourist. The Balearic Islands attract “sun, sand and sea” tourists that are interested in relaxing holidays, while the ones visiting Catalonia are interested in cultural holidays.

4. ACKNOWLEDGMENTS

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Table 2. GARCH(1,1) Estimates of the Conditional Mean and Uncertainty of Monthly Tourist Arrivals to the Top Five Autonomous Communities Visited in Spain

Communities	θ_0	θ_1	θ_2	θ_3	ω	α	β	Log-Moment	2^{nd} Moment
Andalusia	-3.E-04	0.118	-0.565	-0.476	0.003	0.268	-0.271	NC	-0.003
	-0.219	0.934	-3.951	-5.785	3.084	1.544	-1.065		
	-0.267	0.505	-3.727	-6.493	3.155	2.362	-1.376		
Balearic	-5.E-04	0.478	-0.862	-0.539	0.009	0.363	0.094	-1.346	0.457
Islands	0.316	3.564	-11.512	-7.951	2.211	2.260	0.334		
	0.385	3.846	-14.867	-6.991	3.014	2.233	0.502		
Canary	0.001	-0.449	0.240	-0.741	0.006	0.026	0.039	-2.896	0.065
Islands	0.395	-2.092	0.994	-8.799	0.164	0.304	0.007		
	0.529	-3.141	1.307	-10.298	1.515	0.361	0.076		
Catalonia	0.001	0.104	-0.466	-0.500	0.010	0.133	-0.683	NC	-0.550
	0.209	11.338	-31.200	-35.252	4.742	0.091	-2.530		
	0.444	0.558	-4.408	-7.509	2.485	3.248	-3.770		
Madrid	-0.001	0.427	-0.715	-0.489	0.003	0.264	-0.361	NC	-0.097
	-0.517	2.115	-4.655	-6.580	3.454	1.917	-1.551		
	-0.599	2.345	-5.384	-6.725	3.675	1.972	-1.969		

Table 3. GJR(1,1) Estimates of the Conditional Mean and Uncertainty of Monthly Tourist Arrivals to the Top Five Autonomous Communities Visited in Spain

Communities	θ_0	θ_1	θ_2	θ_3	ω	α	γ	β	Log-Moment	2^{nd} Moment
Andalusia	0.001	0.012	-0.494	-0.417	0.004	0.212	0.296	-0.382	-2.027	-0.022
	0.390	0.080	-3.085	-4.155	2.461	1.177	10.733	-1.040		
	0.512	0.067	-3.805	-6.139	4.768	2.615	1.945	-2.940		
Balearic	-3.E-04	0.496	-0.870	-0.545	0.009	0.283	0.128	0.108	-1.384	0.455
Islands	0.208	3.790	-12.181	-7.952	2.154	1.345	0.480	0.386		
	0.238	4.048	-15.498	-7.122	3.119	1.473	0.428	0.584		
Canary	-0.001	-0.371	0.255	-0.365	0.003	0.202	1.734	-0.031	-2.146	1.038
Islands	-0.123	-2.024	1.053	-4.894	4.503	1.033	2.552	-1.252		
	-0.147	-1.811	1.115	-4.911	6.283	1.999	1.527	-1.588		
Catalonia	0.002	0.326	-0.705	-0.500	0.002	-0.053	-0.112	0.850	-0.240	0.741
	1.239	3.478	-8.635	-6.412	1.720	-1.838	-1.830	7.027		
	1.221	3.076	-9.033	-7.130	3.683	-1.291	-3.859	14.612		
Madrid	-1.E-04	0.332	-0.670	-0.518	0.003	0.320	-0.200	-0.296	-1.413	-0.076
	-0.107	1.761	-4.879	-8.071	2.847	1.938	-1.126	-0.821		
	-0.109	2.254	-6.704	-6.555	3.793	1.302	-0.851	-1.722		

Note: The three entries corresponding to each parameter are their estimates, their asymptotic t-ratios, and the Bollerslev and Wooldridge (1992) robust t-ratios.

Table 4. GJR(1,1) Constant Conditional Correlations of Monthly Tourist Arrivals Shocks to the Top Five Autonomous Communities Visited in Spain

Communities	Andalusia	Balearic Islands	Canary Islands	Catalonia	Madrid
Andalusia	1.000	0.207	0.277	0.412	0.330
Balearic Islands		1.000	0.275	0.224	-0.159
Canary Islands			1.000	0.289	-0.013
Catalonia				1.000	0.290
Madrid					1.000