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SPECIALIZATION, DIVERSIFICATION AND SEGMENTATION OF BRITISH AND GERMAN TOURISTS TO THE BALEARIC ISLANDS

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ABSTRACT

International tourism is an important source of service exports to Spain and its regions, particularly the Balearic Islands. Tourism is the major industry in the Balearic Islands, accounting for about 85% of GDP. This paper examines the time series properties of international tourism demand to the Balearic Islands. The data set comprises monthly figures from 2 leading tourist source countries, namely UK and Germany for the period January 1987 to October 2003. Tourist arrivals and the associated volatility (or uncertainty) of monthly tourist arrivals are estimated for the 2 data series. The univariate models estimates suggest that conditional volatility models provide an accurate measure of uncertainty in monthly tourist arrivals from the UK and Germany. The estimated conditional correlations indicate whether there is specialization, diversification or independence in the British and German tourism demand shocks to the Balearic Islands.

1. INTRODUCTION

The region of the Balearic Islands is a leading tourist destination in Spain, and also one of the most important tourist destinations in the Mediterranean Sea. Located in the Mediterranean, off the north-east coast of mainland Spain, the region comprises three main islands, namely Ibiza, Mallorca and Menorca, and two tiny and unspoilt islands, namely Formentera (south of Ibiza) and Cabrera (off the southern coast of Mallorca). The Balearic Islands are also close to Barcelona and Valencia.

In the last 25 years, the Balearic Islands have changed from a quiet and rural area into one of Spain's richest regions, with GDP per capita on a par with the EU average, and well above the Spanish average. Such a transformation has been due to the boom in tourism, which now contributes around 85% of regional GDP. The Balearic Islands have one of the highest tourist rates per capita in the world, with an average of 10 million tourists a year for a population of less than 1 million (for further details, see P.M. Communications (2004)).

The traditional tourism source market for the Balearic Islands has been Northern Europe, in particular, the UK and Germany. More than 95% of the international tourists to the Balearic Islands arrive by plane. The main characteristics of tourism to these Islands have been discussed in Capó et al. (2003).

1.1 Predominance of "sun and sand" mass tourism

Tourists usually visit Mallorca on a package tour, which includes transport, accommodation and some board, and remain in the island about 10.5 days. However, the yearly tourist expenditure survey (see Aguiló et al. for different years) reflects a downward trend of length of stay length.

1.2 High repeat rate

Only 25% of tourists who visit Mallorca are doing so for the first time (see the annual tourist expenditure survey; Aguiló et al. for different years).

1.3 High degree of seasonality

Tourists visit Mallorca mainly for its beaches and pleasant climate. The vast majority of tourists visit during the spring and autumn months, and especially during the summer months. The months from May to September attract about 80% of the total number of tourist arrivals.

1.4 Predominance of international tourists

Domestic tourism from Spain represents less than 15% of the total tourist arrivals. Within international tourism, British and German tourists jointly represent more than 80% of total tourist arrivals.

However, the overwhelming dependence on tourism represents a great challenge for the Balearic Islands. Tourism revenues are seasonal, create uneven demands on infrastructure, cause concerns about environmental issues, and fluctuate according to global trends (for further details, see P.M. Communications (2004)). As such, tourism shocks do not have the same variability over time. Uncertainty may be due to various unexpected factors, such as changes in disposable income and wealth, advertising campaigns, random events, and social factors.

The purpose of this paper is to examine the time series properties of international tourism demand to the Balearic Islands. The plan of the paper is as follows. Section 2 describes the data sources for the empirical analysis, and discusses the salient features of the monthly British and German tourist arrivals data for the Balearic Islands. Seasonality in the tourist arrivals data from the two leading country sources is discussed. Univariate and multivariate models of conditional volatility for monthly tourist arrivals are presented in Section 3. The empirical results for the models are presented and discussed in Section 4. Some concluding comments are given in Section 5.

2. DATA SOURCE AND DESCRIPTION

Monthly tourist arrivals data show the predominance of "sun and sand" tourism in the passenger data for total international tourist arrivals, as well as tourist arrivals from the UK and Germany (see Figures 1-3).

It is clear that, during July and August, the relative importance of tourist arrivals is about 14%, but during December or January the importance virtually disappears, and is less than 3%.

The data set comprises monthly figures from 2 leading tourist source countries, namely UK and Germany for the period January 1987 to October 2003.

3. CONDITIONAL VOLATILITY MODELS FOR TOURIST ARRIVALS

The purpose of this section is to model the level and conditional volatility (or uncertainty) in monthly international tourist arrivals from the 2 leading source countries, namely UK and Germany, to the Balearic Islands. The specification and properties of the Constant Conditional Correlation (CCC) GARCH model of Bollerslev (1990), which will be used to estimate the correlations between the tourist arrivals shocks, will be discussed briefly.

Consider the following specification:

$$\begin{aligned} y_t &= E\left(y_t \mid F_{t-1}\right) + \varepsilon_t \\ \varepsilon_t &= D_t \eta_t , \end{aligned} \qquad (1)$$

where $y_t = \left(y_{1t},...,y_{mt}\right)'$ measures the tourist arrivals from the 2 leading source countries, $\eta_t = \left(\eta_{1t},...,\eta_{mt}\right)'$ is a sequence of independently and identically distributed (*iid*) random vectors that is obtained from standardizing the tourist arrivals shocks, ε_t, using the standardization $D_t = diag\left(h_{1t}^{1/2},...,h_{mt}^{1/2}\right)$, F_t is the past information available to time *t*, m (=2) is the number of tourism source countries, and $t = 1,...,202$ monthly observations for the period January 1987 to October 2003.

The CCC model assumes the uncertainty in tourist arrivals shocks from source *i*, h_{it}, *i* = 1,…,*m*, follows a univariate GARCH process, that is,

$$h_{it} = \omega_i + \sum_{j=1}^{r} \alpha_{ij} \varepsilon_{i,t-j}^2 + \sum_{j=1}^{s} \beta_{ij} h_{i,t-j} \qquad (2)$$

where α_{ij} represents the ARCH effects, or the short-run persistence of shocks to tourist source *i*, and β_{ij} represents the GARCH effects, or the contribution of shocks to tourist source *i* to long-run persistence. Although the CCC specification in (2) has a computational advantage over other multivariate GARCH models with constant conditional correlations, such as the Vector Autoregressive Moving Average GARCH (VARMA-GARCH) model of Ling and McAleer (2003) and VARMA Asymmetric GARCH (VARMA-AGARCH) model of Hoti, Chan and McAleer (2002), it assumes independence of uncertainty across tourism sources, and hence no spillovers in uncertainty across different tourism sources, and does not accommodate the asymmetric effects on uncertainty of positive and negative shocks.

It is important to note that the conditional correlation matrix for the CCC model, Γ, is assumed to be constant, with the typical element of Γ being given by $\rho_{ij} = \rho_{ji}$ for *i*, *j* = 1,…,*m*. When the correlation coefficient of tourism arrivals shocks, ρ_{ij}, is close to +1, the Balearic Islands should specialize on tourist sources that provide the largest numbers and growth in tourist arrivals. However, when the correlation coefficient of tourism arrivals shocks, ρ_{ij}, is close to -1, the Balearic Islands should concentrate on diversifying the tourism base rather than concentrating on sources with the largest numbers and growth in tourist arrivals. Independent tourism sources are those pairs of countries with a correlation coefficient, ρ_{ij}, close to zero, in which case neither specialization nor diversification in tourism source markets would be required for optimal management of tourism arrivals.

When the number of tourism source countries is set to m = 1, such that a univariate model is specified rather than a multivariate model, equations (1)-(2) become:

$$\varepsilon_t = \eta_t \sqrt{h_t}$$
$$h_t = \omega + \sum_{j=1}^{r} \alpha_j \varepsilon_{t-j}^2 + \sum_{j=1}^{s} \beta_j h_{t-j}, \tag{3}$$

and $\omega > 0$, $\alpha_j \geq 0$ for j = 1,…,r and $\beta_j \geq 0$ for j = 1,…,s are sufficient regularity conditions to ensure that uncertainty is defined sensibly, namely $h_t > 0$. The decomposition in (3) permits the uncertainty in the tourist arrivals shocks, ε_t, to be modelled by h_t, on the basis of historical data. Using results from Nelson (1990), Ling and Li (1997) and Ling and McAleer (2002a, 2002b), the necessary and sufficient regularity condition for the existence of the second moment of tourist arrivals shocks, ε_t, for the case $r = s = 1$ is given by $\alpha_1 + \beta_1 < 1$. This result ensures that the estimates are statistically adequate, so that a sensible empirical analysis can be conducted.

Equation (3) assumes that a positive shock ($\varepsilon_t > 0$) to monthly tourist arrivals has the same impact on uncertainty, h_t, as a negative tourist arrivals shock ($\varepsilon_t < 0$), but this assumption is typically violated in practice. In order to accommodate the possible differential impact on uncertainty from positive and negative tourist arrivals shocks, Glosten, Jagannathan and Runkle (1992) proposed the following specification for h_t:

$$h_t = \omega + \sum_{j=1}^{r} \left(\alpha_j + \gamma_j I\left(\varepsilon_{t-j}\right) \right) \varepsilon_{t-j}^2 + \sum_{j=1}^{s} \beta_j h_{t-j} \,. \tag{4}$$

When $r = s = 1$, $\omega > 0$, $\alpha_1 \geq 0, \alpha_1 + \gamma_1 \geq 0$ and $\beta_1 \geq 0$ are sufficient conditions to ensure that uncertainty is positive, namely $h_t > 0$. The short-run persistence of positive (negative) monthly tourist arrivals shocks is given by α_1 ($\alpha_1 + \gamma_1$). Under the assumption that the standardized shocks, η_t, follow a symmetric distribution, the average short-run persistence of tourist arrivals shocks is $\alpha_1 + \gamma_1/2$, and the contribution of tourist arrivals shocks to average long-run persistence is $\alpha_1 + \gamma_1/2 + \beta_1$. Ling and McAleer (2002a) showed that the necessary and sufficient regularity condition for the second moment of tourist arrivals shocks to be finite, and hence for sensible statistical analysis, is $\alpha_1 + \gamma_1/2 + \beta_1 < 1$.

The parameters in equations (1), (3) and (4) are typically obtained by Maximum Likelihood Estimation (MLE) using a joint normal density for the standardized tourist arrivals shocks, η_t, after uncertainty has been modelled. When η_t does not follow a joint multivariate normal distribution, the parameters are estimated by Quasi-MLE (QMLE). The conditional log-likelihood function is given as follows:

$$\sum_{t=1}^{n} l_t = -\frac{1}{2} \sum_{t=1}^{n} \left(\log h_t + \frac{\varepsilon_t^2}{h_t} \right).$$

Ling and McAleer (2003) showed that the QMLE for GARCH(r,s) is consistent if the second moment regularity condition is finite. Jeantheau (1998) showed that the log-moment regularity condition given by

$$E\left(\log\left(\alpha_1 \eta_t^2 + \beta_1\right)\right) < 0 \tag{5}$$

is sufficient for the QMLE to be consistent for the GARCH(1,1) model of uncertainty, while Boussama (2000) showed that the QMLE is asymptotically normal for GARCH(1,1) under the same condition. It is important to note that (5) is a weaker regularity condition than the second moment condition, namely $\alpha_1 + \beta_1 < 1$. However, the log-moment condition is more difficult to compute in practice as it is the expected value of a function of an unknown random variable and unknown parameters.

McAleer, Chan and Marinova (2002) established the log-moment regularity condition for the GJR(1,1) model of uncertainty, namely

$$E\left(\log\left(\left(\alpha_1 + \gamma_1 I\left(\eta_t\right)\right)\eta_t^2 + \beta_1\right)\right) < 0, \tag{6}$$

and showed that it is sufficient for the consistency and asymptotic normality of the QMLE for GJR(1,1). Moreover, the second moment regularity condition, namely $\alpha_1 + \gamma_1/2 + \beta_1 < 1$, is also sufficient for consistency and asymptotic normality of the QMLE for GJR(1,1).

In empirical examples, the parameters in the regularity conditions (5) and (6) are replaced by their respective

QMLE, the standardized residuals, η_t, are replaced by the estimated residuals from the GARCH and GJR models of uncertainty, respectively, for $t = 1,\ldots,n$, and the expected values in (5) and (6) are replaced by their respective sample means.

4. EMPIRICAL RESULTS

Using the monthly data on international tourist arrivals, univariate and multivariate uncertainty models are estimated for 2 tourism source countries for the period 1987(1)-2003(10). All the estimates in this paper are obtained using the Marquardt algorithm in the EViews 4 econometric software package. Virtually identical results were obtained by using the RATS 6 econometric software package.

The stationarity of the two processes are considered before the models of uncertainty are estimated. Table 1 shows the results of the HEGY seasonal unit root test for both time series. The HEGY test was performed by pretesting for the presence of Additive Outliers, as considered in Haldrup, Montañés and Sansó (2004).

As can be seen in Table 1, we cannot reject some of the seasonal and non-seasonal unit roots for the German tourist arrivals series, whereas for the British all the seasonal and non-seasonal unit roots are rejected. Hence, seasonality for the British data is stable, whereas it is not stable for the German data. This is consistent with the fact that German tourists changed their travel patterns in visiting Mallorca over the last decade. In particular, German tourists have purchased numerous second residence houses in Mallorca, and also spread their visits throughout all the months of the year.

The dependent variable is the logarithm of the level of British tourist arrivals, and the seasonally and regularly differenced logarithms of the German tourist arrivals. Given the results mentioned above, the univariate conditional mean equation for British tourism arrivals is estimated as follows:

$$
\begin{aligned}
&\ln x_t = \gamma_0 + \alpha_1 \ln x_{t-1} + \alpha_2 \ln x_{t-2} + \alpha_{12} \ln x_{t-12} \\
&+\gamma_1 t + \sum_{j=1}^{5}\left(\beta_{j,1}\cos\left(j\pi t/6\right) + \beta_{j,2}\sin\left(j\pi t/6\right)\right) \\
&+\beta_{6,1}\cos\left(\pi t/6\right) + \delta East_t + u_t
\end{aligned}
$$

where the trigonometric terms capture the deterministic seasonality, and East is a dummy variable for the Easter period.

Table 2 shows the estimated coefficients of the model given above for British tourist arrivals. Figure 4 shows the recursive OLS estimates of this model for British tourist arrivals. The British estimates show stability. This agrees with the findings regarding the seasonal unit roots, as reported in Table 1.

Given the results of Table 1 concerning German tourist arrivals data, we impose the presence of all seasonal and non-seasonal unit roots, and estimate the following model for the conditional mean:

$$
\Delta\Delta_{12} \ln x_t = \gamma + \delta East_t + \left(1-\theta_1 L\right)\left(1-\theta_{12} L^{12}\right) u_t
$$

Table 3 shows the estimates of this model, while Figure 5 shows the recursive OLS estimates for German tourist arrivals. The German estimates show a lack of stability.

The error term of the British and German tourist arrivals specifications was modelled as an asymmetric GARCH(1,1) process, and were estimated simultaneously with the conditional mean. The GARCH(1,1) estimates suggest that the conditional variance for British tourists is effectively constant (with the ARCH estimate close to 0 and the GARCH estimate close to 1), whereas there is only a one-period short run effect for German tourists. The GJR(1,1) model leads to completely different results. The GARCH effect disappears for British tourists, while the GJR (or asymmetry) effect, though significant for German tourists, is negative. This result would be regarded as being contrary to expectations.

The correlation between the squared errors is shown in Table 4. As it can be seen, the correlation is not particularly high. The Granger causality hypothesis for German tourist arrivals causing British tourist arrivals is not rejected (with a p-value of 0.373 for two lags), but it is rejected for British tourist arrivals causing German tourist arrivals (with a p-value of 0.022 for two lags).

The estimated conditional correlations indicate whether there is specialization, diversification or independence in the British and German tourism demand shocks to the Balearic Islands. As reported in Table 4, the conditional correlation coefficient between the standardized shocks to tourist arrivals from the UK and Germany is 0.14. As this is clearly very close to 0, the two markets are segmented, so that (the logarithm of) tourist arrivals from both the UK and Germany should be considered in any tourism marketing and management plans for the Balearic Islands.

5. CONCLUSION

This paper examined the time series properties of international tourism demand to the Balearic Islands. The data set comprised monthly figures from 2 leading tourist source countries, namely the UK and Germany, for the period January 1987 to October 2003. Tourist arrivals and the associated volatility (or uncertainty) of monthly tourist arrivals were estimated for the two data series. The univariate models estimates suggested that conditional volatility models provide an accurate measure of uncertainty in monthly tourist arrivals from the UK and Germany. The estimated conditional correlations indicated that the two markets were segmented, so that (the logarithm of) tourist arrivals from both the UK and Germany should be considered in any tourism marketing and management plans for the Balearic Islands.

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Table 1: Seasonal Unit Root Tests (HEGY)

Frequency	0	π/6	π/3	π/2	2π/3	5π/6	π
British Tourists	-4.5^{**}	21.0^{**}	27.7^{**}	6.45^{*}	37.4^{**}	11.8^{**}	-5.41^{**}
German Tourists	-1.75	1.79	6.49^{*}	6.77^{*}	$6.20^{\dagger}$	1.51	-5.49^{**}

Note: †, * and ** refer to 10%, 5% and 1% significance levels, respectively, using the critical values given in Franses and Hobijn (1997).

Table 2: Conditional Mean Estimates

Parameters	British Tourists	Germans Tourists
γ_0	3.045 (4.87)	0.002 (1.03)
α_1	0.377 (5.44)	
α_2	0.224 (4.02)	
α_{12}	0.159 (4.14)	
γ_1	0.001 (3.68)	
δ	0.318 (4.64)	-0.036 (-2.14)
$\beta_{1,1}$	-0.572 (-1.75)	
$\beta_{2,1}$	-0.035 (-1.65)	
$\beta_{3,1}$	0.288 (11.66)	
$\beta_{4,1}$	0.012 (0.77)	
$\beta_{5,1}$	-0.140 (-7.79)	
$\beta_{6,1}$	-0.010 (-0.99)	
$\beta_{1,2}$	0.331 (5.81)	
$\beta_{2,2}$	0.136 (7.47)	
$\beta_{3,2}$	0.039 (2.02)	
$\beta_{4,2}$	-0.040 (-3.12)	
$\beta_{5,2}$	-0.231 (-11.75)	
MA(1)		-0.794 (-24.19)
MA(12)		-0.426 (-7.03)
SE	0.129	0.132
Q(12)	15.533 (0.21)	11.162 (0.35)

Notes:
(1) t-ratios are given in parentheses.
(2) SE is the standard error of the residuals.
(3) Q(12) is the Ljung-Box test for non-autocorrelation in the first twelve lags.
(4) The entries in parantheses for Q(12) are p-values.

Table 3: Conditional Volatility Models: GARCH(1,1) and GJR(1,1)

	British Tourists		German Tourists	
Parameters	GARCH(1,)	GJR(1,1)	GARCH(1,)	GJR(1,1)
ω	1.2E-04	0.005	0.012	0.008
	1.08	4.00	3.88	2.06
α	-0.020	0.331	0.343	0.179
	-0.88	1.88	2.72	10.50
γ		1.032		-0.255
		2.08		-3.90
β	0.995	0.02	-0.047	0.397
	60.63	0.31	-0.31	1.40

Note: The two entries for each parameter are their respective estimate and the asymptotic t-ratio.

Table 4: Correlations Between the Squared Errors

Lags, Leads	-3	-2	-1	0	1	2	3
Correlations	-0.0251	-0.0402	0.0987	0.1411	0.1622	0.1822	0.0129

Note: Leads (+) and lags (-) are taken with respect to British tourists.

Figure 1: Monthly International Tourist Arrivals

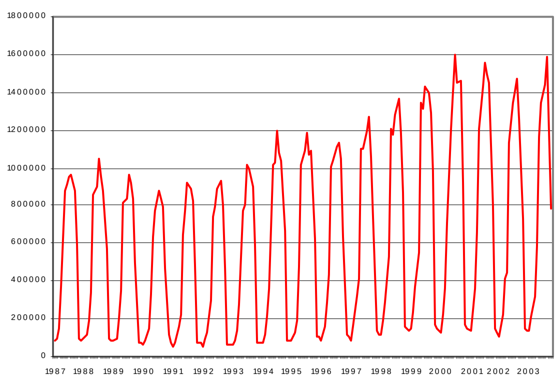

Figure 2: Monthly British Tourist Arrivals

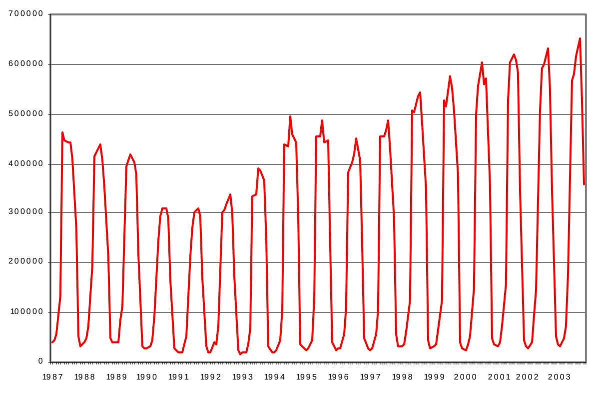

Figure 3: Monthly German Tourist Arrivals

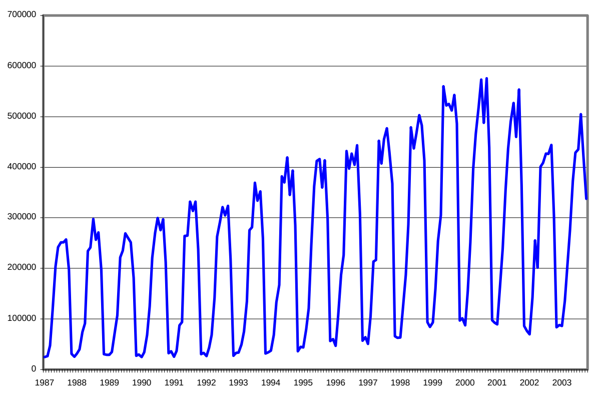

Figure 4: Recursive Coefficients Estimates (British Tourists)

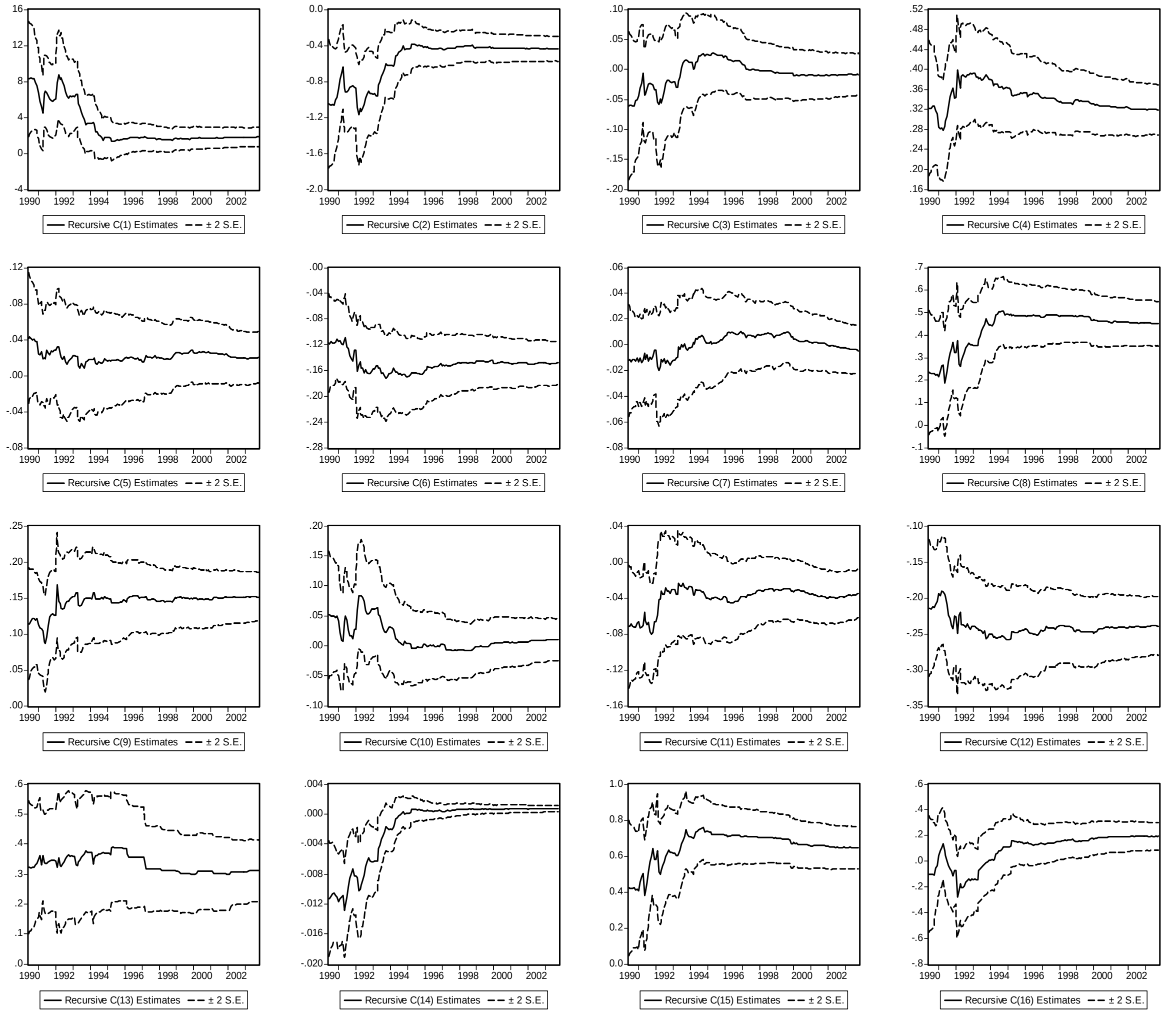

Figure 5: Recursive Coefficients Estimates (German Tourists)