Modelling International Tourism Demand and Volatility in Small Island Tourism Economies

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Abstract

Small Island Tourism Economies (SITEs) vary in their size, land area, location, narrow resource bases, economic development, an overwhelming reliance on tourism, and a consistent inflow of foreign direct investment for economic growth. SITEs differ in their ethnic diversity, political systems, economic and environmental vulnerability, ecological fragility, and the risks facing investors. Owing to natural disasters, ethnic conflicts, crime, and the threat of global terrorism, there have been dramatic changes in the arrivals of international tourists to SITEs. These variations in international tourism demand to SITEs, particularly the conditional variance (or volatility) in international tourist arrivals, have not previously been analysed in the tourism research literature. An examination of the conditional volatility of international tourist arrivals is essential for policy analysis and marketing purposes. This paper models the conditional mean and conditional variance of the logarithm of monthly international tourist arrivals and the growth rate (or log-difference) in the monthly international tourist arrivals for six SITEs, namely Barbados, Cyprus, Dominica, Fiji, Maldives, and Seychelles. Diagnostic checks of the regularity conditions of the logarithm of monthly international tourist arrivals and their growth rates suggest that the estimated univariate models of trends and volatility are statistically adequate. Therefore, the estimated models are appropriate for purposes of public and private sector management of tourism.

Keywords: Island economies; small size; vulnerability; international tourism demand; arrival rate; trends; volatility; time-varying conditional variance; GARCH; GJR; asymmetry; shocks; regularity conditions

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1. Introduction

Among academics and multilateral organisations, the interest in research surrounding all aspects of the world's small island economies has been growing rapidly. Islands with small populations are also very small territorially, and these two aspects of their smallness tend to be connected. These countries differ in the extent to which they are home to different ethnic minorities, political cultures, historical experiences and vulnerability to external interventions and natural disasters, ecological fragility, and perceptions of insularity and their underlying consequences. They share common characteristics such as relatively small populations, low productive capacity, ecological surroundings, and pleasant climates, all of which foster tourism.

Decolonisation led to political expectations by the world's smallest islands, which achieved independence and consolidated their positions in the United Nations. The increasing importance and particular problems of small islands have been captured in the British Commonwealth's research publications and development projects. These developments have produced a variety of island-related research programmes at multilateral agencies and academic institutions, which have addressed the special problems and opportunities associated with these small island economies in a period of globalisation.

Regarding the economies analysed in this paper, the most frequently examined aspect has been their delicate ecosystems to global warming and rises in sea levels. These countries have voiced their concerns about global warming and rises in sea levels in various international fora, and are signatories to international environmental agreements pertaining to the reduction of greenhouse gases, most recently the Kyoto Protocol.

There is only a scant literature on the significance of tourism in Small Island Tourism Economies (SITEs) and their economic implications. Although international tourism is presently the fastest growing and most important tradeable sector in the world economy, this important sector has often been neglected and the extant literature is limited. Consequently, little is known about the relationship between tourism development and economic performance, particularly with respect to SITEs. The fundamental aim of this paper is to assess the fluctuations and volatility in tourist arrivals to SITEs. Since SITEs depend primarily on tourism earnings as a source of foreign exchange and employment, a careful examination of the volatility of tourist arrivals is important to formulate macroeconomic policy, as well as decision making in the public and private sectors.

Demand theory suggests that substitutability or complementarity between two products is associated with the sign of the cross-price elasticity, which should be derived from an appropriate demand models (see, for example, De Mello et al. (2002), who used an AIDS model). However, due to data constraints, especially at the monthly level, it is not possible to formulate such economic models for some of the SITEs examined in this paper.

Owing to time-varying effects such as natural disasters, ethnic conflicts, crime, and the threat of global terrorism, among others, there have been dramatic changes in the arrivals of international tourists to SITEs. Variations in international tourism demand, particularly the conditional variance (or volatility) in international tourist arrivals, have recently been investigated in the tourism research literature (see Chan et al. (2004), Chan et al. (2005), Shareef and McAleer (2005), and Hoti, León and McAleer (2005)).

The plan of the paper is as follows. Section 2 discusses the salient features of SITES and their implications for international tourism. Section 3 provides qualitative descriptions regarding the patterns of tourism in 6 SITEs. Section 4 describes the data used, namely the logarithm of international tourist arrivals and the growth rate (or log-difference) of international tourist arrivals in these 6 SITEs. Specifications of two univariate volatility models, namely the Generalised Autoregressive Conditional Heteroscedasticity (GARCH) model of Engle (1982) and Bollerslev (1986), and the asymmetric GJR model of Glosten, Jagannathan and Runkle (1992), are estimated and discussed in Section 5. This is followed by a discussion of the empirical results in Section 6. Some concluding remarks are given in Section 7.

2. Salient Features of SITEs and Their Implications for Volatility in International Tourism

The debate regarding the size of an economy in the literature has continued for a considerable period, but agreement has not yet been reached. Armstrong and Read (2002) have argued that in the existing conceptualisations of size, there is a tendency to include larger economies and to exclude smaller economies. Researchers have used commonly available macroeconomic variables, such a population, GDP and land area to determine the size of the economy. For example, Kuznets (1960) considered small economies as those with a population of less than 10 million, whereas Robinson (1960) argued that economies with a population of between 10 to 15 million were small. Furthermore, the British Commonwealth considers a small economy when the population is less than one million. Armstrong and Read (1995) applied microeconomic theory in a macroeconomic framework to address the issue of size, particularly with respect to small economies. They argued that the most appropriate methodology to determine the size of an economy would be to apply the concept of sub-optimality by incorporating production and trade. In this formulation, the minimum efficient scale (MES) is the optimal level of output that would determine the size of an economy.

In order to determine the choice of economies for an empirical analysis, an upper limit of population or GDP has not been used because economies can exceed an arbitrary limit but retain the characteristics of a small economy. There are six SITEs examined in this paper, these being the only SITEs for which monthly international tourist arrivals data are available. As given in Table 1, these SITEs are home to slightly more than two million people. All of the economies included in this paper are former British colonies, and have gained independence during the last forty years. Two of the six SITEs are in the Caribbean; one is in the Pacific Ocean, two in the Indian Ocean, and one in the Mediterranean.

Dommen (1980) argues that an island is land surrounded by water, but not all free-standing land masses are necessarily islands. However, all of the six SITEs examined in this paper are sovereign states surrounded by water. In the six SITEs, there are extensive coastal areas, including what are widely regarded as some of the world’s most popular beaches. Furthermore, they have one of the world’s most delicate ecosystems and are threatened by frequent natural disasters, which can have serious economic and social implications.

These six SITEs rely considerably on tourism, which accounts for a significant proportion of the levels of their respective GDP. In these SITEs, tourism has been encouraged to earn foreign exchange to finance development expenditures, as well as for employment. As illustrated in Figures 1a and 1b, these SITEs rely substantially on service industries[1], of which tourism accounts for the highest proportion in export earnings. In these SITEs, the economic benefits are not fully absorbed into the respective economies due to the enclave nature of the development in tourism facilities. Tourism requires careful planning in order to achieve economic benefits that will be sustainable and also minimise any environmental damage.

According to the Commonwealth Secretariat/World Bank Joint Task Force on Small States (2000), SITEs have displayed relatively profound volatility in GDP. Owing to their low relative endowments of natural resources, SITEs are more sensitive to changes in the international market conditions. Moreover, most SITEs are considered environmentally vulnerable. Armstrong and Read (1998) have stated that the most striking feature of SITEs is their narrow productive base and the small domestic market. Therefore, SITEs tend to specialise in one or two economic activities, where tourism is the main economic sector. There is very little agriculture and manufacturing in SITEs because exports from SITEs are uncompetitive and do not receive preferential treatment in international markets.

SITEs have frequently experienced natural disasters and are highly vulnerable, the most recent example being the 2004 Boxing Day Tsunami. Briguglio (1995) stated that vulnerability constitutes economic, strategic and environmental factors. In the aftermath of this disaster, the world has witnessed the scale of environmental vulnerability in the economy and social fabric of SITEs. In international financial markets, SITEs are categorised as high-risk entities because of the frequent incidence of natural disasters. Therefore, it is difficult for SITEs to raise capital for development.

The importance of tourism in SITEs can be identified by examining the policy areas where shocks to monthly international tourist arrivals can have the most profound impacts. Tourism earnings have a direct impact in the balance of payments of SITEs. A positive shock to international tourist arrivals will improve the current account balance and financial reserves. Hence, such an effect would strengthen exchange rate, would make imports cheaper, and would eventually improve the welfare of citizens. In most SITEs, several levies on tourism-related activities contribute directly to government finances. Any positive shocks will increase government revenues and provide greater financial resources for development expenditure. Tourism requires low-skilled labour. It is probably no coincidence that the economically active population in SITEs has relatively low skills. An improvement in the occupancy of tourist facilities has a positive impact on employment. Finally, tourism has extensive multiplier effects on the economy, whereby the relatively under-developed agricultural sector could be sustained through servicing the tourism industry. Similarly, the construction, transport and communications industries, and many other ancillary services to the tourism sector, are indirectly affected. For an extensive analysis of SITEs and the implications of being a SITE, see Chan et al. (2005), Hoti, McAleer and Shareef (2005), and Shareef and Hoti (2005).

3. Patterns of International Tourist Arrivals in SITEs

This section examines the structure of international tourist arrivals in SITEs, which is imperative in the assessment of tourist demand. This will primarily entail establishing whether these SITEs represent features of competitive or complementary tourism markets through comparing the cross-correlation coefficients. The cross-correlations for the international tourist arrivals are calculated using the annual numbers of international tourist arrivals from the eleven principal markets to the six destination SITEs during the period 1980 to 2000.

Table 2 shows the mean percentages of the composition of the principal eleven nationalities of tourist arrivals to the six SITEs. Tourists from these eleven different markets account for a significant proportion in monthly international tourist arrivals in SITEs. These eleven markets are USA, UK, Canada, France, Germany, Italy, Japan, Switzerland, Sweden, Australia and New Zealand. These eleven tourist source countries are situation in varying distances from the six SITEs analysed in this paper. These eleven source markets have diverse social and economic cultures but they account for more than sixty per cent of the monthly international tourist arrivals in SITEs except Dominica. Dominica is host to a large proportion of US tourists. In Barbados, Cyprus and Dominica, monthly international tourist arrivals account for six of the eleven source countries. Fiji welcomed tourists from seven of the eleven, while Maldives and Seychelles received tourists from the most number of source markets.

As illustrated in Table 2, the USA, UK and German tourists dominate tourism in these SITEs. The highest mean percentages of US tourist arrivals feature significantly in Barbados and Dominica in the Caribbean and followed by Fiji. The mean percentages of tourists from UK are more evenly distributed among the six SITEs. Clearly, it is evident that British tourists are the most widely travelled among the eleven different source markets, owing to their colonial heritage attached to these SITEs. In general, European tourists feature more in island destinations relative to their US and Canadian counterparts. The visitor profiles of Canadian, Swiss, Swedish and Japanese tourists are mixed. Canadians tend to travel to the Caribbean and the Pacific, Swiss and Swedish tourists are present among all the regions except the Pacific, while Japanese tourists appear in the Indian Ocean and Pacific Ocean SITEs. Australian and New Zealand tourists travel substantially to SITEs in the Pacific region, but their arrivals are relatively small among the other SITEs.

A preliminary analysis of the cross-correlations of international tourism provides background information on policies on long-term tourism planning and marketing. In the literature on tourism demand, destinations are considered as substitutes when they are in the same geographic region or share similar characteristics. If the cross-correlation coefficients are negative, they are considered to be substitutes. Conversely, complementarity among destinations is recognised when the estimated cross-correlation coefficients are positive.

In the tourism literature, the findings on substitutability or complementarity of a destination are mixed. Anastasopoulos (1991) states that destinations which are close to each other have positive and large relative correlation coefficients. Additionally, such correlations are very low or negative among destinations which are far apart. Syriopoulos and Sinclair (1993) indicate that destinations show a wide range of substitutability and complementarity, depending on the tourist originating countries. Yannopoulos (1987) concluded that, while econometric evidence suggests a complementary relationship between two destinations, the relationship may not necessarily be symmetric. Thus, an increase in international tourist arrivals to Sri Lanka may increase international tourist arrivals to the Maldives. Nevertheless, an increase in international tourist arrivals to the Maldives may not increase international tourist arrivals to Sri Lanka, even though the duration of air travel between the two countries is one hour. White (1985) found both substitutability and complementarity among destinations for travellers originating from several different countries. Rosensweig (1988) found a degree of both competitive and complementary elasticities for tourism in the Caribbean. In a study based on limited data, Leiper (1989) determined the main destination ratios for several destinations for tourists from Japan, New Zealand and Australia.

In this paper, international tourist arrivals to six SITEs for the period 1980-2000 approximate the total demand for international tourism. In spite of the limited data availability to assess the competitive and complementary relationships of international tourism demand among SITEs, the broadest possible market structure (tourism originating countries) is considered.

The cross-correlations of international tourist arrivals are given in Tables 3a-3l, which show that the growth in international tourism arrivals grew simultaneously in all six SITEs (Table 3a). The cross-correlation coefficients for total international tourist arrivals to all six SITEs have a range of 0.75 to 0.96, and are relatively large. For total monthly international tourist arrivals to these SITEs, the estimated cross-correlation coefficients suggest that the six SITEs featured are complements. The main reason for the high estimated cross-correlation coefficients is that these six destinations (SITEs) have very similar economic, social and geophysical characteristics. These results are consistent with previous findings in the literature. The correlations were calculated such that the relationship between two series *x* and *y* are given by[2]:

$$r_{xy}(l) = \frac{c_{xy}(l)}{\sqrt{c_{xx}(0)}\sqrt{c_{yy}(0)}} \tag{1}$$

and

$$c_{xy}(l) = \begin{cases} \sum_{t=1}^{T-1}((x_t - \bar{x})(y_{t+1} - \bar{y}))/T \\ \sum_{t=1}^{T+1}((y_t - \bar{y})(x_{t-1} - \bar{x}))/T \end{cases} \tag{2}$$

where $l = 0, \pm 1, \pm 2, \ldots$ For the eleven markets, the cross-correlation coefficients of international tourist arrivals show considerable variability. Thus, tourists from some markets consider some destinations as substitutes, while tourists from other markets consider them as complements. According to the estimated cross-correlation coefficients, the British, French and Italian tourists consider all six SITEs as complements, while the other nine markets consider some as substitutes and some as complements.

The magnitudes of the cross-correlation coefficients reveal that British, French and Italian tourists judge these six SITEs with substantial variation in perceptions. From the estimated coefficients, British and French tourists judge these six destinations in a similar manner, while Italians seem to show some discretion in their judgment. The US, Canadian, German and Swedish tourists show a great deal of cautious perception about the six SITEs, with a higher degree of variability in the magnitudes of the estimated coefficients. Swiss tourists consider most of the six SITEs as complements, while revealing that there is a great deal of substitutability between Seychelles, Barbados and Dominica. Japanese tourists consider Seychelles to be substitutable with the other five SITEs.

4. Characteristics of the Data

The empirical section in this paper models the conditional volatility of the logarithm of international tourist arrivals and the growth rate of international tourist arrivals in six SITEs. It is well known that volatility is a measure of the variation in an asset price or asset return over a given period. Volatility clustering is a phenomenon in the time series of an asset price or asset return, where periods of high volatility are observed as being followed by periods of low volatility, and vice-versa For instance, stock returns prior to an earnings announcement are frequently observed to have higher variance than those observed during the weeks after the release date. For these SITEs, the frequency of the data observations is monthly, and the sample periods are as follows: Barbados, January 1973 to December 2002 (Barbados Tourism Authority); Cyprus, January 1976 to December 2002 (Cyprus Tourism Organization and Statistics Service of Cyprus); Dominica, January 1990 to December 2001 (Central Statistical Office); Fiji, January 1968 to December 2002 (Fiji Islands Bureau of Statistics); Maldives, January 1986 to June 2003 (Ministry of Tourism); and Seychelles, January 1971 to May 2003 (Ministry of Information Technology and Communication). In the case of Cyprus, monthly tourist arrivals data were not available for 1995, so the mean monthly tourist arrivals for 1993, 1994, 1996 and 1997 were used in calculating the trends and volatilities.

As given in Figure 2, the logarithm of international tourist arrivals to each of these SITEs displays different distinct seasonal patterns and increasing trends. Tourist arrivals in Barbados exhibit cyclical movements which maps with the business cycles in the US economy. These business cycles are clear manifestations of the boom period in the latter half of the 1970s, the recession resulting from the second oil price shock of 1979, and the recession in the early 1990s. In Cyprus, the 1991 Gulf War creates a visible change in monthly international tourist arrivals. There are distinct changes in monthly international tourist arrivals in the respective sample periods of Dominica and the Maldives. However, in Fiji, the coups d’état of 1987 and 2000 are quite noticeable. In Seychelles, tourism was rapidly rising until the second oil shock of 1979 and there after the growth rate of international tourist arrivals has stabilised.

The volatilities of the logarithm of the deseasonalised and detrended monthly tourist arrivals are illustrated in Figure 3. These volatilities were calculated from the square of the estimated residuals ε_t^2 from the following regression using non-linear least squares:

$$\log TA_t = ARMA(1,1) + \sum_{i=1}^{12} \phi_i D_{it} + \theta_1 t + \theta_2 t^2 + \theta_3 t^* + \varepsilon_t \tag{3}$$

$$Vol(\varepsilon_t) = \varepsilon_t^2 \tag{4}$$

where TA_t is the total monthly international tourist arrivals at time *t*; D_{it} (= 1 in month *i* = 1, 2, …, 12, and = 0 elsewhere) denotes 12 seasonal dummies; $t = 1, \dots T$, where $T = 360,$ 324, 144, and 210 for Barbados, Cyprus, Dominica and Maldives, respectively; $T = 88$ and $t^* = 89, ..., 420$ for Fiji; and $T = 150$ and $t^* = 151, ..., 389$ for Seychelles. Several cases of volatility clustering are observed for Barbados, Cyprus and Seychelles. In Barbados, in the first half of the sample, monthly international tourist arrivals have been highly volatile due to the business cycle effects of the US economy. For Seychelles and Cyprus volatility clustering is around the first and second oil price shock of 1973 and 1979, respectively are quite evident. While volatility clustering for Maldives and Dominica is associated with seasonality of tourist arrivals, volatility clustering in Fiji is associated with the coups d’état of 1987 and 2002.

The log-difference of monthly international tourist arrivals is defined as the growth rate of monthly international tourist arrivals, and is illustrated in Figure 4. Except for Fiji, we observe that there are dramatic changes in the magnitudes of the growth rates of monthly international tourist arrivals. Cyprus, Maldives and Dominica show a very high degree of variation in the growth rates, in their respective samples. Barbados and Seychelles share similar growth rates, while Fiji shows the lowest variations.

The volatilities of the growth rate of deseasonalised monthly international tourist arrivals are given in Figure 5. These volatilities were calculated from the square of the estimated residuals, ν_t^2, from the following regression using non-linear least squares:

$$\Delta \log TA_t = ARMA(1,1) + \sum_{i=1}^{12} \phi_i D_{it} + \nu_t \qquad (5)$$

$$Vol(\nu_t) = \nu_t^2 . \qquad (6)$$

In equation (5), the dependent variable is the log-difference of TA_t. The volatilities among the six SITEs show slightly different patterns over the respective sample periods, with the simple correlation coefficients for the volatilities in Figures 3 and 5 being 0.86, 0.93, 0.91, 0.98, 0.92 and 0.60 for Barbados, Cyprus, Dominica, Fiji, Maldives and Seychelles, respectively. There is clear evidence of volatility clustering in the case of Barbados during the early 1970s and in the mid-1980s, after which there is little evidence of volatility clustering. Volatility clustering is visible for Cyprus in the mid-1970s. In Dominica, in late 1999 and early 2000, there is volatility clustering. The structure of volatility in Fiji bears a resemblance to that of a financial time series with less profound volatility clustering, except for outliers, which signify the coups d'état of 1987 and 2000. In Seychelles, volatility clustering is noticeable in the early 1970s, whereas in the Maldives, there are few extreme observations and little volatility clustering.

It is important to note that the volatilities of the logarithm of monthly international tourist arrivals and the growth rate of monthly international tourist arrivals to the six SITEs show somewhat similar dynamic behavioural patterns. However, there are visible differences in the magnitudes of the calculated volatilities, particularly in the cases of Barbados, Dominica, Fiji and Seychelles. This is plausible for monthly international tourist arrivals, so there would seem to be a strong case for estimating both symmetric and asymmetric ARCH-type conditional volatility models for both the logarithm of monthly international tourism arrivals and their log-differences to these six SITEs.

5. Univariate Models of Volatility in Tourism Demand

This section discusses alternative models of the volatility of the logarithm of international tourist arrivals using the Autoregressive Conditional Heteroscedasticity (ARCH) model proposed by Engle (1982), as well as subsequent developments in Bollersllev (1986), Bollerslev et al. (1992), Bollerslev et al. (1994), and Li et al. (2002), among others. The most widely used variation for symmetric shocks is the generalised ARCH (GARCH) model of

Bollerslev (1986). In the presence of asymmetric behaviour between positive and negative shocks, the GJR model of Glosten et al. (1992) is also widely used. Ling and McAleer (2002a, 2002b, 2003) have made further theoretical advances in both the univariate and multivariate frameworks. A comprehensive comparison of univariate and multivariate, conditional and stochastic, volatility models is given in McAleer (2005).

Consider the ARMA(1,1)-GARCH(1,1) model for the logarithm of monthly international tourist arrivals, $\log TA_t$ given in equation (3), where D_{it} are 12 seasonal dummies, t is a linear time trend, t^* is a linear time trend after the breakpoint, t^2 is a quadratic time trend, and the unconditional shocks are given by:

$$\varepsilon_t = \eta_t \sqrt{h_t}\,, \qquad \eta_t \sim iid\,(0,1) \tag{7}$$

$$h_t = \omega + \alpha \varepsilon_{t-1}^2 + \beta h_{t-1}$$

where $\omega > 0$, $\alpha \ge 0$ and $\beta \ge 0$ are sufficient conditions to ensure that the conditional variance $h_t > 0$. The ARCH (or α) effect captures the short-run persistence of shocks (namely, an indication of the strength of the shocks in the short run), while the GARCH (or β) effect measures the contribution of shocks to long-run persistence, $\alpha + \beta$ (namely, an indication of the strength of the shocks in the long run). In equations (3), (4), (5) and (6), the parameters are typically estimated by maximum likelihood to obtain Quasi-Maximum Likelihood Estimators (QMLE) in the absence of normality of η_t.

The conditional log-likelihood function is given as follows:

$$\sum_t \ell = -\frac{1}{2}\sum_t \left(\log h_t + \frac{\varepsilon_t^2}{h_t} \right). \tag{8}$$

It has been shown by Ling and McAleer (2003) that QMLE of GARCH (*p,q*) is consistent if the second moment is finite. The well known necessary and sufficient condition for the existence of the second moment of ε_t for GARCH(1,1) is $\alpha + \beta$ <1, which is also sufficient for consistency of the QMLE. Jeantheau (1998) showed that the weaker log-moment condition is sufficient for consistency of the QMLE for the univariate GARCH (*p,q)* model.

Hence, a sufficient condition for the QMLE of GARCH(1,1) to be consistent and asymptotically normal is given by:

$$E[\log(\alpha\eta_t^2 + \beta)] < 0\,. \tag{9}$$

McAleer et al. (2003) argue that the log-moment condition is not straightforward to check in practice as it involves the expectation of an unknown random variable and unknown parameters. Thus, the stronger second moment condition is far more straightforward to check in practice.

The effects of positive shocks on the conditional variance h_t are assumed to be the same as negative shocks in the symmetric GARCH model. Asymmetric behaviour is captured in the GJR model, for which GJR(1,1) is defined as follows:

$$h_t = \omega + (\alpha + \gamma I(\eta_{t-1}))\varepsilon_{t-1}^2 + \beta h_{t-1} \tag{10}$$

where $\omega > 0$, $\alpha + \gamma \geq 0$ and $\beta \geq 0$ are sufficient conditions for $h_t > 0$, and $I(\eta_t)$ is an indicator variable defined by:

$$I(\eta_t) = \begin{cases} 1, & \eta_t < 0 \\ 0, & \eta_t \geq 0\,. \end{cases} \tag{11}$$

The indicator variable distinguishes between positive and negative shocks such that asymmetric effects are captured by γ, with $\gamma > 0.$ In the GJR model, the asymmetric effect, γ, measures the contribution of shocks to both short run persistence, $\alpha + \frac{\gamma}{2}$, and long run persistence, $\alpha + \beta + \frac{\gamma}{2}$. The necessary and sufficient condition for the existence of the second moment of GJR(1,1) under symmetry of η_t is given in Ling and McAleer (2002b) as:

$$\alpha + \beta + \frac{1}{2}\gamma < 1. \tag{12}$$

The weaker sufficient log-moment condition for the GJR(1,1) model is given by McAleer et al. (2003) as follows:

$$E\,[(\log((\alpha+\gamma I(\eta_t))\eta_t^2+\beta)]<0\ . \quad (13)$$

McAleer et al. (2003) also demonstrate that the QMLE of the parameters are consistent and asymptotically normal if the log-normal condition is satisfied, so that the inferences drawn from the estimated parameters are valid.

6. Empirical Results

This section models the volatility of the logarithm of monthly international tourist arrivals and the growth rate of monthly international tourist arrivals using the GARCH(1,1) and GJR(1,1) models, as defined in equations (7) and (10) for different periods for six SITEs. In order to accommodate the presence of seasonal effects and various deterministic time trends, the logarithm of tourist arrivals is given by equation (3), and the conditional mean for the growth rate of monthly international tourist arrivals is given by equation (5).

Modelling the mean equation is important to estimate accurately the unconditional shocks, ε_t, from which to estimate the conditional variance, h_t. Time series data on monthly international tourist arrivals show a considerable degree of persistence. The literature on univariate time series analysis of tourism demand has shown that ARMA models fit the data reasonably well. Moreover, for the six SITEs examined, there is evidence of non-linearity in the series. In the cases of Fiji and Seychelles, there appear to be structural breaks in early 1975 and mid-1983, respectively, and in these have been accommodated in estimating the conditional means. Hence, an ARMA(p,q) specification is estimated with monthly seasonal dummies and various deterministic time trends, possibly with breakpoints. In this paper, we have examined various orders of ARMA, and ARMA (1,1) seems to be the optimal specification based on the Akaike Information Criterion and Schwarz Bayesian Information Criterion.

Estimates of the parameters of the conditional mean and the conditional variance for the two models using the six samples are given in Tables 4 to 7. The Berndt-Hall-Hall-Hausman (Berndt et al. (1974)) algorithm incorporated in EViews 4.1 is used to obtain the estimates of the parameters. Where iterations fail to converge, the Marquandt algorithm is used. The three entries correspond to the estimate (in bold), asymptotic t-ratio and the Bollerslev-Wooldridge

(1992) robust t-ratio. A linear trend is used for Fiji before the breakpoint at April 1975, and a separate linear trend is used thereafter. Both a linear and quadratic trend are used for Seychelles before the breakpoint at June 1983, and a separate linear trend is used thereafter.

6.1 Estimates of the Logarithm of Monthly International Tourist Arrivals

The primary reason for modelling the logarithms and log-differences of monthly international tourist arrivals rather than their levels is the presence of unit roots in some of the series. The Phillips-Perron (PP) test for stationarity, with truncated lags of order 5, was conducted using the EViews 4.1 econometric software package for the six SITEs. In Table 4, the PP test results are presented for the respective sample periods for the six SITEs. For Barbados, Cyprus, Fiji and Seychelles, the critical values at 5 and 10 percent are the same, and Dominica and Maldives share the same critical values at 5 and 10 percent. Except for Maldives, the test reveals that the logarithms of monthly tourist arrivals are stationary, while the log-difference series are stationary for all six SITEs. In conducting these tests, different options of lags were used, but the results were found to be robust. The PP test is considered superior to the more widely used Augmented-Dickey Fuller (ADF) test because the ADF takes into account only serial correlation, while the PP test accommodates both serial correlation and heteroscedasticity.

Estimates of GARCH(1,1) and GJR(1,1) for the logarithm of monthly international tourist arrivals are given in Tables 5 and 6, respectively. The conditional mean estimates for GARCH(1,1) and GJR(1,1) are somewhat different in the 6 SITEs. The AR(1) estimates for GARCH(1,1) and GJR(1,1) are highly significant for all SITEs, showing a high degree of persistence of tourist visitations to these destinations. All of the estimated parameters for AR(1) in GARCH(1,1) and GJR(1,1) are very close to one. Moreover, it is important to note the negative coefficient of the AR(1) term for Dominica and Maldives in the case of GARCH(1,1) and GJR(1,1), while the MA(1) estimates are highly significant for only Barbados, Dominica, Fiji and Seychelles. The significance of the MA(1) term indicates that the unconditional shock in the previous period accounts for the determination of tourist arrivals in the current period.

The large majority of the coefficients of the 12 seasonal dummies incorporated in the conditional mean are significant, indicating that there is strong seasonality in monthly international tourist arrivals in these SITEs. Since the SITEs are located in tropical and subtropical regions, while the tourist source markets are in the temperate zones, seasonality is generally observed during the colder months of the tourist source countries, particularly November and December. This feature of seasonality can be generalised across all SITEs. For Fiji, the same principle applies, but since their main tourist sources are in the southern hemisphere, the months change to July and August, which are the coldest months of the year for Australian and New Zealand tourists. Cyprus has the longest tourist season, which is from February to August. The estimates of the seasonal dummy variables are not reported, but are available on request.

For the logarithm of monthly international tourist arrivals, the estimates of the conditional volatility using GARCH(1,1) and GJR(1,1) are highly satisfactory. The sufficient conditions $\omega > 0$, $\alpha \geq 0$, $\beta \geq 0$ ensure positivity of the conditional variance are met for all six SITEs, except for Maldives, where the ARCH effect is negative for both GARCH(1,1) and GJR(1,1). It is worth noting that the log-moment and second moment conditions are satisfied for both GARCH(1,1) and GJR(1,1) for all six SITEs, which is a strong empirical result. Therefore, the moments exist, and the QMLE of the coefficients of the conditional variance for both these models are consistent and asymptotically normal. Hence, inference on these estimates can be implemented for policy analysis and formulation.

The asymmetric effects, γ, given in Table 6 are generally satisfactory, with the exception of Dominica, where a negative coefficient is recorded. This implies that the effect of positive shocks on conditional volatility is greater than negative shocks in both the short run and long run. Thus, the results for Dominica suggest that an unexpected fall in monthly international tourist arrivals decreases the uncertainty about future monthly international tourist arrivals, which is contrary to the results for the other five SITEs. Therefore, if there is an unexpected fall in the number of monthly international tourist arrivals in all six SITEs except for Dominica, there will be greater uncertainty surrounding tourism earnings. As a result, earmarked development expenditures will have to be postponed, expectations about an exchange rate devaluation or depreciation will become greater, and tourism service providers will be considering cost-cutting measures such as redundancy packages for employees. Furthermore, upgrading of some tourist facilities and some contraction in the construction industry may occur.

6.2 Estimates of the Growth Rate of Monthly International Tourist Arrivals

The estimates for GARCH(1,1) and GJR(1,1) for the growth rate of monthly international tourist arrivals are given in Tables 7 and 8, respectively. The conditional means for both GARCH(1,1) and GJR(1,1) vary among the six destination countries, but not substantially. The AR(1) estimates for GARCH(1,1) are significant only for Barbados, Cyprus and Fiji, while the AR(1) estimates for GJR(1,1) are significant for all SITEs, but Seychelles. The MA(1) estimates for GARCH(1,1) are significant for all SITEs, but Maldives, while the MA(1) estimates of GJR(1,1) are significant for all SITEs. Virtually all of the estimates of the seasonal dummy variables in both GARCH(1,1) and GJR(1,1) are significant at the 5 percent level.

The estimates of the conditional volatility using GARCH(1,1) and GJR(1,1) for the growth rate of monthly international tourist arrivals are reasonable, except for the Maldives. The log-moment condition could not be calculated for Dominica and Maldives because of the negative estimate of the asymmetry coefficient for Dominica, and the negative estimates of both the asymmetry coefficient and the GARCH effect for Maldives, while the second moment condition is not satisfied for Maldives. However, the second moment condition is satisfied for Dominica. Thus, inference regarding the estimates may be suspect only for Maldives. For the other five SITEs, either the log-moment condition or the second moment condition, or both, is satisfied for GARCH(1,1) and GJR(1,1), so the QMLE are consistent and asymptotically normal. An interesting feature of the results in Table 8 is that the estimate of the asymmetric effect in GJR(1,1) is negative for Dominica, Maldives and Seychelles. This outcome implies that the short and long run effects of a negative shock in the growth rate of monthly international tourist arrivals will result in less uncertainty in subsequent periods for these three SITEs. However, for Barbados, Cyprus, and Fiji, if there is a negative shock to the expected growth rate of monthly international tourist arrivals, there will be greater uncertainty in subsequent periods. This is perfectly plausible, particularly as Fiji experienced military coups d’état in 1987 and 2000, which undermined the perceptions of international travellers, and as Cyprus has had a volatile political climate for an extended period, which has created greater uncertainty for tourists.

7. Conclusion

This paper examined the composition, trends and volatilities of monthly international tourist arrivals, and the growth rate of monthly tourist arrivals, for six SITEs, namely Barbados, Cyprus, Dominica, Fiji, Maldives and Seychelles. The relative cross-correlation coefficients of monthly international tourist arrivals showed that all six SITEs are complementary destinations as far as total monthly international tourist arrivals are concerned. However, when the monthly arrivals from different tourist source markets to these six economies were examined separately, some markets considered these SITEs as substitutes as well as complements.

For purposes of estimation, the conditional means of the logarithm of monthly international tourist arrivals and the growth rate of monthly international tourist arrivals were specified for each SITE as ARMA(1,1) models. In addition, 12 monthly seasonal dummy variables were included in each case, as well as a combination of linear and quadratic time trends for the monthly tourism arrivals. Two models, namely GARCH(1,1) and GJR(1,1), were used to estimate the conditional volatility of the shocks to tourism arrivals to each of these SITEs.

Estimates based on the respective sample periods for each of the SITEs for both the logarithm of monthly international tourist arrivals and the growth rate of monthly international tourist arrivals were found to be satisfactory, in general. The log-moment and second moment conditions were typically satisfied empirically, so that the moments existed and the QMLE were both consistent and asymptotically normal. This gave substantial support to the statistical adequacy of the empirical estimates of the conditional volatilities. Therefore, the estimated models are appropriate for purposes of public and private sector management of tourism.

The logarithm of monthly international tourist arrivals was stationary for all six SITEs, except for Maldives, and the growth rate of monthly international tourist arrivals was stationary for all six SITEs. Therefore, inference on the estimates was valid. The estimates of the GJR (1,1) model for the growth rate of monthly international tourist arrivals for Barbados, Cyprus and Fiji provided the most accurate information for policy formulation. If there were an unanticipated fall in monthly tourist arrivals due to unexpected shocks, such as the US business cycles for the case of Barbados, the unfavourable political developments in Cyprus and the coups d'état in Fiji, this would create greater uncertainty for monthly international tourist arrivals. In such cases, governments would have to revise their expected revenues and might have to forego certain projects. Tourist service providers would also have to adjust their operations, with a view to greater uncertainty in capacity utilisation.

Notes

1. These include value added in wholesale and retail trade (including hotels and restaurants), transport, government, financial, professional, and personal services such as education, health care and real estate services.

2. These specifications are given in EViews 4.1 Users Guide, p. 214.

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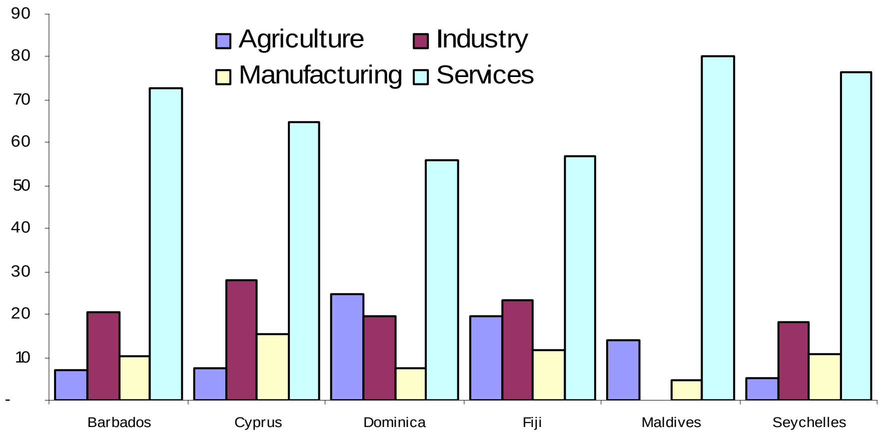

Figure 1(a): Economic Structure of the Six SITEs

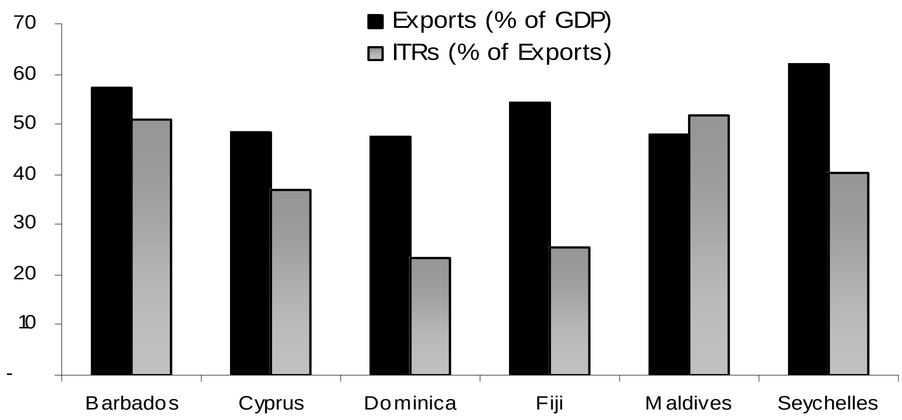

Figure 1(b). International Tourism Receipts (ITRs) and Total Exports

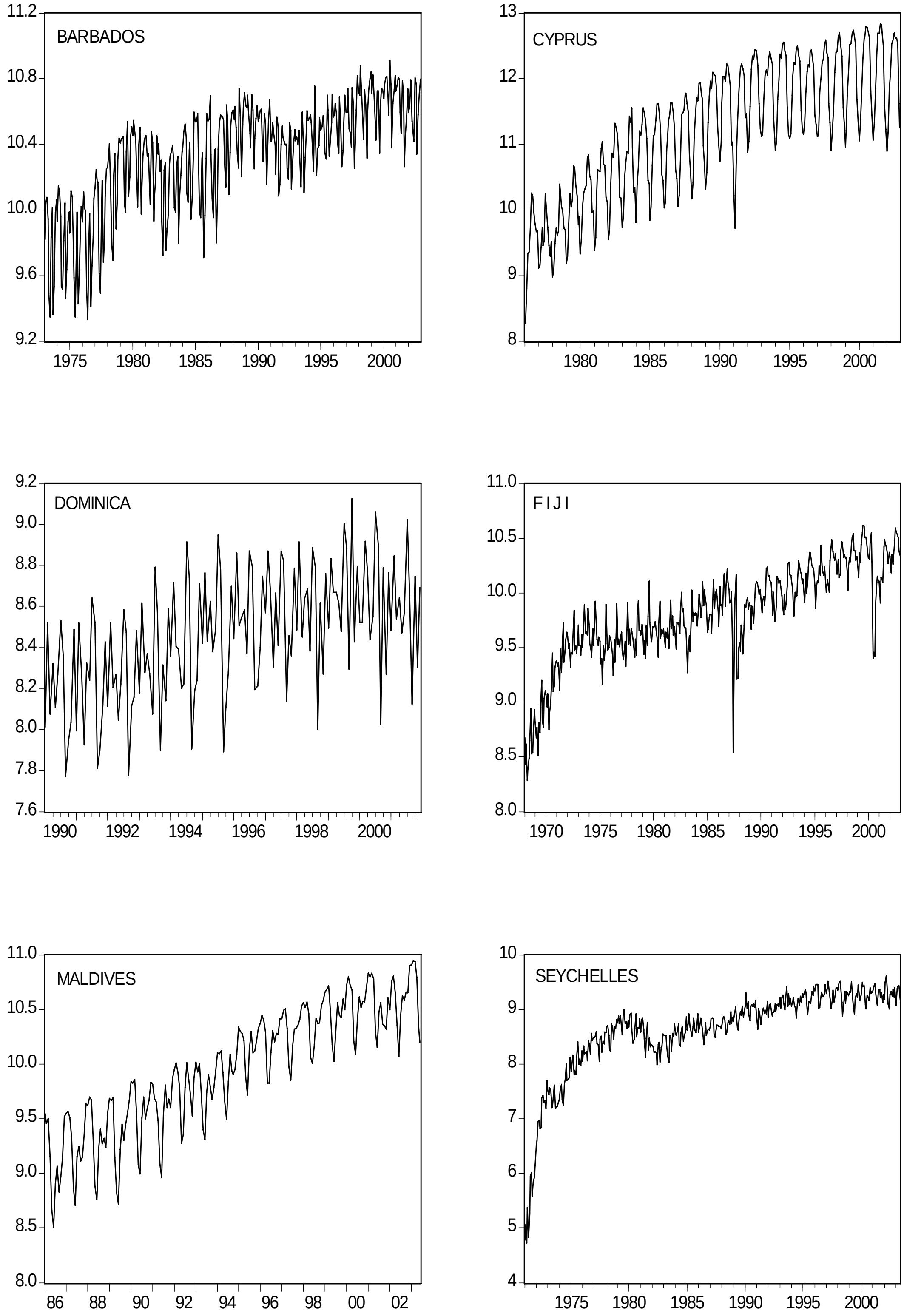

Figure 2: Logarithm of Monthly International Tourism Arrivals

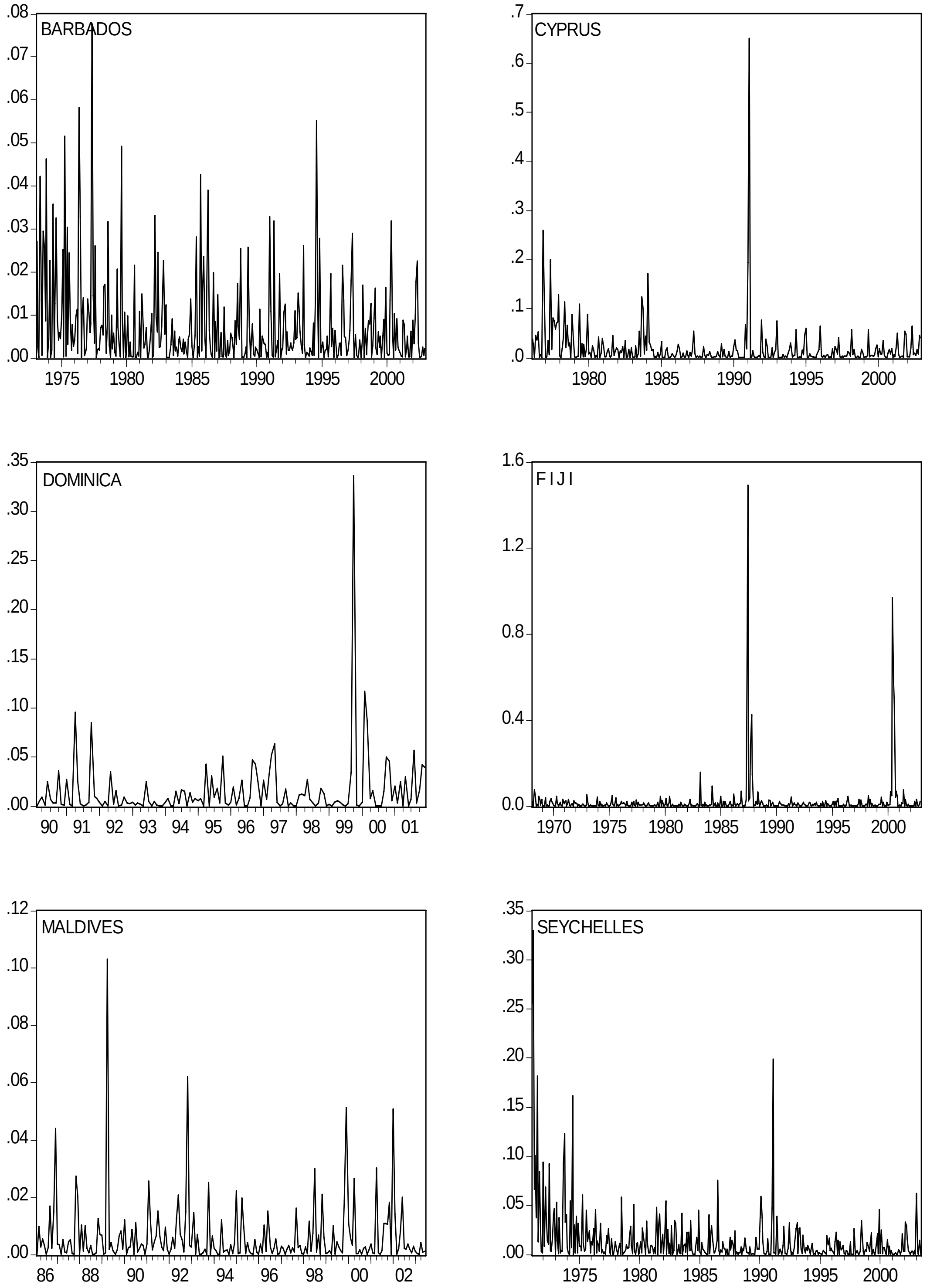

Figure 3: Volatility of the Logarithm of Monthly Deseasonalised and Detrended International Tourism Arrivals

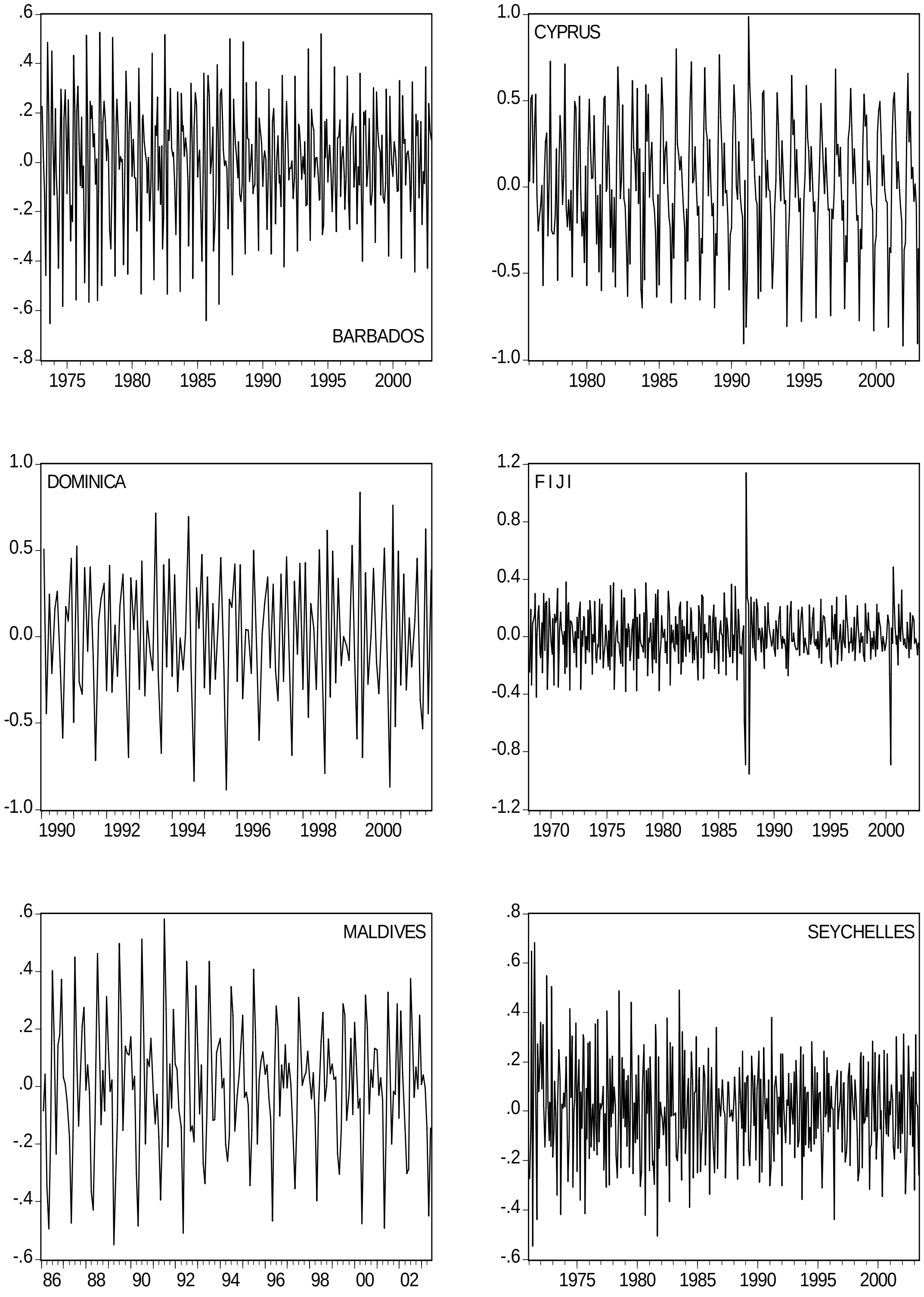

Figure 4: Growth Rate of Monthly International Tourist Arrivals

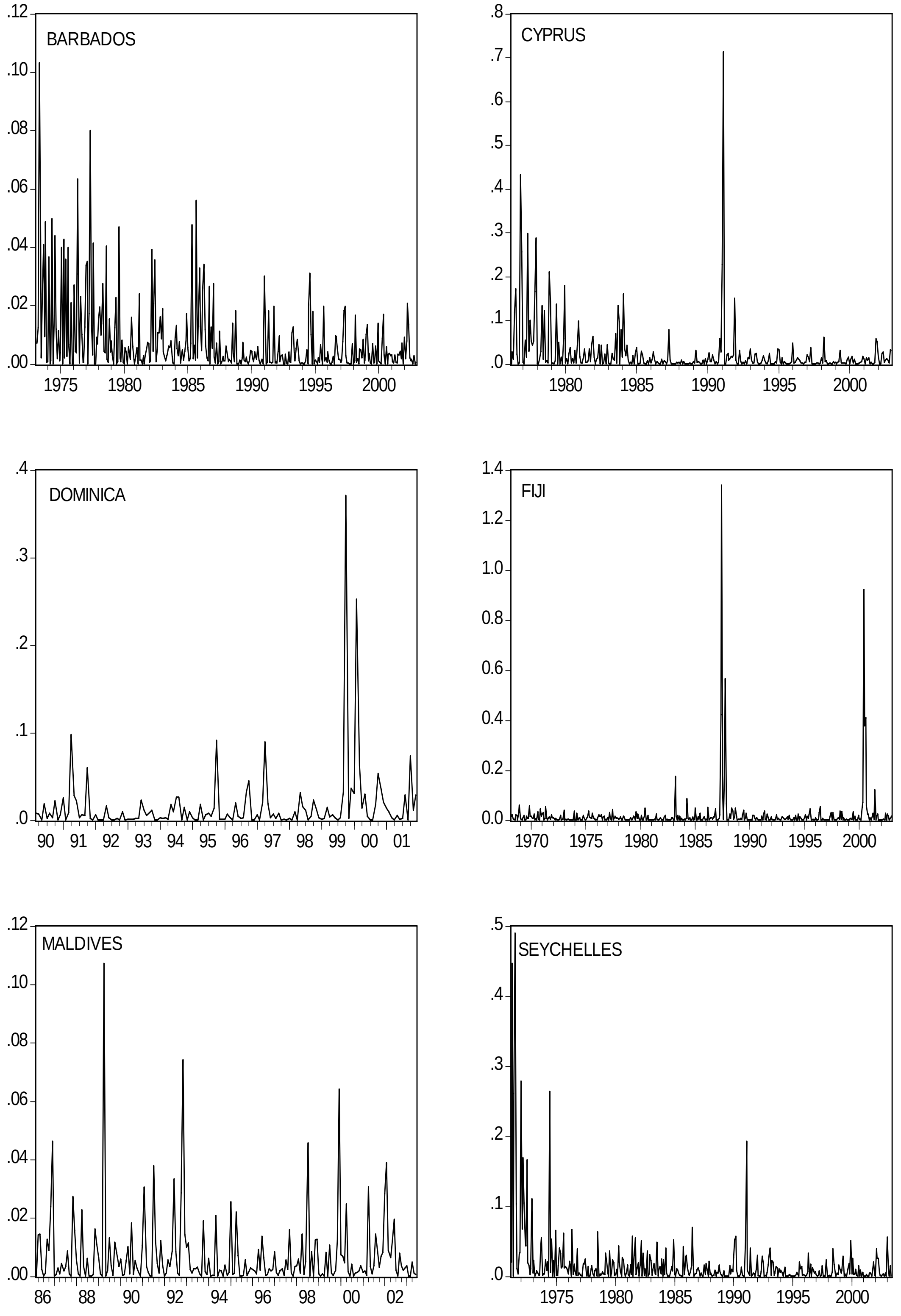

Figure 5: Volatility of the Growth Rate of Deseasonalised Monthly International Tourist Arrivals

Table 1: Common Size Measures of SITEs

SITEs	Mean 1980-2000		2000		Surface Area (km2)
	Pop. (m)	GDP per capita (USD)	Pop. (m)	GDP per capita (USD)	
Barbados	0.26	7,100	0.27	8,300	430
Cyprus	0.69	10,000	0.76	14,100	9,240
Dominica	0.07	3,400	0.07	3,400	750
Fiji	0.73	2,300	0.81	2,400	18,270
Maldives	0.21	1,300	0.28	1,900	300
Seychelles	0.07	5,900	0.08	7,000	450
Mean	**0.34**	**5,000**	**0.38**	**6,167**	**4,907**

S*ource*: World Development Indicators (WDI) 2002, The World Bank, 2002.

Table 2: Percentage Sources of International Tourist Arrivals to SITEs

SITEs	USA	CAN	UK	GER	FRA	ITA	SWI	SWE	JAP	AUS	NZ	Total
Barbados	30	15	24	3	-	1	-	2	-	-	-	75
Cyprus	3	-	43	8	2	1	-	7	-	-	-	64
Dominica	19	4	9	2	4	-	1	-	-	-	-	39
Fiji	14	5	5	2	-	-	-	-	7	27	12	72
Maldives	1	-	8	24	6	18	8	2	8	2	-	77
Seychelles	2	-	12	10	14	11	4	-	8	-	-	61

Source: World Tourism Organisation and respective Government Statistics Offices and Bureaux. The figures in Table 2 are the mean percentage sources of international tourist arrivals in SITEs from 1980 to 2000 from USA, Canada (CAN), UK, Germany (GER), France (FRA), Italy (ITA), Switzerland (SWI), Sweden (SWE), Japan (JAP), Australia (AUS) and New Zealand (NZ). '-' means the percentages are well below 1%.

Table 3: Cross-correlations of International Tourist Arrivals for Individual Markets

(a) All Tourists

	BRB	CYP	DMA	FJI	MDV	SYC
BRB	1					
CYP	0.84	1				
DMA	0.83	0.95	1			
FJI	0.75	0.86	0.77	1		
MDV	0.87	0.94	0.96	0.78	1	
SYC	0.82	0.92	0.94	0.86	0.93	1

(b) American Tourists

	BRB	CYP	DMA	FJI	MDV	SYC
BRB	1					
CYP	0.13	1				
DMA	**-0.16**	0.34	1			
FJI	0.45	0.44	0.50	1		
MDV	**-0.19**	0.38	0.91	0.54	1	
SYC	**-0.42**	**-0.11**	0.74	0.11	0.67	1

(c) Canadian Tourists

	BRB	CYP	DMA	FJI	MDV	SYC
BRB	1					
CYP	**-0.40**	1				
DMA	**-0.35**	0.86	1			
FJI	0.34	**-0.70**	**-0.62**	1		
MDV	**-0.37**	0.97	0.88	**-0.71**	1	
SYC	0.11	0.92	0.79	**-0.72**	0.93	1

(d) British Tourists

	BRB	CYP	DMA	FJI	MDV	SYC
BRB	1					
CYP	0.85	1				
DMA	0.81	0.87	1			
FJI	0.89	0.85	0.81	1		
MDV	0.96	0.84	0.78	0.94	1	
SYC	0.53	0.64	0.82	0.51	0.46	1

(e) German Tourists

	BRB	CYP	DMA	FJI	MDV	SYC
BRB	1					
CYP	0.42	1				
DMA	**-0.06**	0.32	1			
FJI	0.30	**-0.18**	**-0.41**	1		
MDV	**-0.46**	**-0.17**	0.68	**-0.35**	1	
SYC	**-0.49**	0.75	0.79	0.63	0.73	1

(f) French Tourists

	BRB	CYP	DMA	FJI	MDV	SYC
BRB	1					
CYP	0.80	1				
DMA	0.76	0.88	1			
FJI	0.49	0.60	0.71	1		
MDV	0.71	0.71	0.76	0.63	1	
SYC	0.85	0.86	0.90	0.61	0.88	1

(g) Italian Tourists

	BRB	CYP	DMA	FJI	MDV	SYC
BRB	1					
CYP	0.76	1				
DMA	0.82	0.67	1			
FJI	0.46	0.69	0.58	1		
MDV	0.53	0.90	0.35	0.57	1	
SYC	0.55	0.73	0.31	0.37	0.78	1

(h) Swiss Tourists

	BRB	CYP	DMA	FJI	MDV	SYC
BRB	1					
CYP	0.62	1				
DMA	0.38	0.21	1			
FJI	0.38	0.78	0.08	1		
MDV	0.47	0.91	0.00	0.71	1	
SYC	**-0.22**	0.38	**-0.05**	0.47	0.46	1

(i) Swedish Tourists

	BRB	CYP	DMA	FJI	MDV	SYC
BRB	1					
CYP	0.53	1				
DMA	0.21	**-0.16**	1			
FJI	0.00	**-0.11**	0.66	1		
MDV	0.80	0.58	**-0.10**	**-0.31**	1	
SYC	0.51	0.59	0.28	0.31	0.44	1

(j) Japanese Tourists

	BRB	CYP	DMA	FJI	MDV	SYC
BRB	1					
CYP	0.30	1				
DMA	0.43	**-0.01**	1			
FJI	0.45	0.20	0.75	1		
MDV	0.63	0.70	0.59	0.70	1	
SYC	**-0.67**	**-0.30**	**-0.23**	**-0.31**	**-0.53**	1

(k) Australian Tourists

	BRB	CYP	DMA	FJI	MDV	SYC
BRB	1					
CYP	na	1				
DMA	na	na	1			
FJI	0.30	na	na	1		
MDV	0.52	na	na	0.15	1	
SYC	0.07	na	na	**-0.49**	**-0.30**	1

(l) New Zealand Tourists

	BRB	CYP	DMA	FJI	MDV	SYC
BRB	1					
CYP	na	1				
DMA	na	na	1			
FJI	0.70	na	na	1		
MDV	0.62	na	na	0.56	1	
SYC	**-0.35**	na	na	**-0.00**	**-0.49**	1

Source: World Tourism Organisation (WTO) and the respective Government Statistics Offices and Bureaux.

Table 4: Unit Root Tests for Logarithms and Log-differences of Monthly International Tourist Arrivals to SITEs

Variable	Barbados				Cyprus				Dominica			
	Obs.	Stat.	CVs		Obs.	Stat.	CVs		Obs.	Stat.	CVs	
Logarithms	359	**-6.83**	5%	10%	323	**-4.54**	5%	10%	143	**-10.35**	5%	10%
Log Difference		**-23.94**	-2.87	-2.57		**-12.03**	-2.87	-2.57		**-37.10**	-2.88	-2.58

Variable	Fiji				Maldives				Seychelles			
	Obs.	Stat.	CVs		Obs.	Stat.	CVs		Obs.	Stat.	CVs	
Logarithms	419	**-3.54**	5%	10%	209	**-2.24**	5%	10%	388	**-5.05**	5%	10%
Log Difference		**-29.18**	-2.87	-2.57		**-11.09**	-2.88	-2.57		**-29.58**	-2.87	-2.57

Table 5: GARCH(1,1) Estimates for the Logarithm of Monthly Deseasonalised and Detrended International Tourist Arrivals

SITE	*AR (1)*	*MA(1)*	*t*	t^2	*Breakpoint t*	ω	α	β	*Log-moment*	*Second Moment*
Barbados	**0.821**	**-0.224**	**8.2E-04**	**-8.7E-07**		**6.7E-05**	**0.014**	**0.975**	**-0.010**	**0.989**
	8.557	-3.082	2.797	-1.799		0.283	0.971	26.156		
	20.388	-3.138	2.987	-1.997		0.510	1.011	37.908		
Cyprus	**0.642**	**0.021**	**8.2E-03**	**-1.E-06**		**2.5E-03**	**0.176**	**0.744**	**-0.140**	**0.920**
	6.043	0.299	17.412	-14.003		1.739	2.792	11.423		
	8.989	0.204	4.538	-4.247		1.526	1.511	5.259		
Dominica	**-0.671**	**0.772**	**6.1E-03**			**9.3E-03**	**0.281**	**0.250**	**-0.891**	**0.531**
	-8.026	9.123	9.960			2.675	3.471	1.807		
	-3.451	4.415	7.022			1.672	1.227	0.656		
Fiji [3]	**0.928**	**-0.568**	**4.5E-04**		**2.4E-04**	**6.2E-03**	**0.487**	**0.180**	**-0.845**	**0.667**
	6.367	-9.516	2.466		4.315	5.972	6.685	2.210		
	42.873	-7.930	2.269		3.122	3.498	2.203	1.499		
Maldives	**0.682**	**-0.068**	**5.5E-03**	**-4.5E-06**		**1.5E-03**	**-0.011**	**0.828**	**-0.199**	**0.817**
	6.412	-0.478	1.777	-1.182		0.246	-0.377	1.097		
	8.647	-0.600	4.822	-4.271		0.338	-0.337	1.552		
Seychelles [4]	**0.959**	**-0.578**	**4.2E-04**	**-2.3E-06**	**1.2E-04**	**4.8E-04**	**0.070**	**0.888**	**-0.046**	**0.958**
	9.217	-12.531	1.591	-1.637	2.309	1.721	2.831	22.716		
	7.795	-11.721	1.567	-1.624	1.911	1.235	1.565	13.489		

Notes: 1. The three entries correspond to the estimate (in bold), the asymptotic t-ratio and the Bollerslev-Wooldridge (1992) robust t-ratio.
2. Twelve monthly seasonal dummy variables were used in each model.
3. A linear trend is used for Fiji before the breakpoint at April 1975, and a separate linear trend thereafter.
4. Both a linear and quadratic trend are used for Seychelles before the breakpoint at June 1983, and a separate linear trend thereafter.

Table 6:. GJR(1,1) Estimates for the Logarithm of Monthly Deseasonalised International Tourist Arrivals

SITE	*AR (1)*	*MA(1)*	*t*	*t^2*	*Breakpoint t*	*ω*	*α*	*γ*	*β*	*α + γ/2*	*Log-moment*	*Second Moment*
Barbados	**0.845**	**-0.266**	**6.8E-04**	**-7.1E-07**		**3.1E-05**	**0.002**	**0.046**	**0.967**	**0.025**	**-0.007**	**0.992**
	29.785	-3.920	4.304	-2.432		1.829	0.776	4.646	128.368			
	25.053	-4.129	8.206	-25.982		0.260	0.073	1.768	39.243			
Cyprus	**0.628**	**-0.004**	**8.4E-03**	**-1.0E-05**		**2.9E-03**	**0.068**	**0.221**	**0.727**	**0.179**	**-0.168**	**0.906**
	26.880	-0.042	13.614	-10.086		3.244	2.697	2.585	10.894			
	15.269	-0.052	24.942	-112.171		2.133	1.151	1.356	6.510			
Dominica	**-0.782**	**0.824**	**6.5E-03**			**5.3E-03**	**0.383**	**-0.374**	**0.507**	**0.196**	**-0.467**	**0.702**
	-25.009	11.975	13.077			1.538	2.031	-1.160	3.620			
	-4.431	4.808	7.593			1.038	0.844	-0.840	1.205			
Fiji [3]	**0.924**	**-0.536**	**5.1E-04**		**2.6E-04**	**7.2E-03**	**0.437**	**0.187**	**0.110**	**0.530**	**-1.064**	**0.640**
	58.087	-8.487	2.525		4.284	6.399	3.946	0.999	1.366			
	39.980	-7.116	2.361		3.131	4.027	1.990	0.505	1.002			
Maldives	**0.660**	**-0.030**	**5.8E-03**	**-4.8E-06**		**1.8E-03**	**-0.092**	**0.084**	**0.783**	**-0.050**	**-0.313**	**0.733**
	10.836	-0.302	6.687	-3.851		2.425	-4.539	1.542	6.199			
	9.131	-0.296	8.202	-10.758		1.126	-2.320	1.866	3.572			
Seychelles [4]	**0.957**	**-0.568**	**3.9E-04**	**-2.1E-06**	**1.2E-04**	**8.6E-04**	**0.018**	**0.114**	**0.850**	**0.075**	**-0.084**	**0.925**
	137.969	-12.384	1.536	-1.640	2.114	2.263	0.435	2.185	17.034			
	91.030	-11.468	1.585	-1.611	2.023	1.712	0.389	1.529	11.187			

Notes: 1. The three entries correspond to the estimate (in bold), the asymptotic t-ratio and the Bollerslev-Wooldridge (1992) robust t-ratio.
2. Twelve monthly seasonal dummy variables were used in each model.
3. A linear trend is used for Fiji before the breakpoint at April 1975, and a separate linear trend thereafter.
4. Both a linear and quadratic trends are used for Seychelles before the breakpoint at June 1983, and a separate linear trend thereafter.

Table 7: GARCH(1,1) Estimates for Growth Rate of Monthly International Tourist Arrivals

SITEs	*AR(1)*	*MA(1)*	*ω*	*α*	*β*	*Log-moment*	*Second Moment*
Barbados	**0.361**	**-0.795**	**1.6E-04**	**0.062**	**0.913**	**-0.091**	**0.975**
	4.622	-17.614	1.151	1.979	20.658		
	4.578	-14.126	0.948	2.429	23.778		
Cyprus	**0.482**	**-0.840**	**0.001**	**0.209**	**0.760**	**-0.275**	**0.968**
	5.077	-14.471	2.224	4.628	15.525		
	6.155	-17.534	1.375	2.145	8.263		
Dominica	**-0.180**	**-0.814**	**0.007**	**0.677**	**0.059**	**-2.823**	**0.736**
	-1.479	-13.906	2.312	3.733	0.377		
	-1.894	-11.599	4.977	2.017	0.600		
Fiji	**0.323**	**-0.799**	**0.007**	**0.455**	**0.179**	**-1.719**	**0.634**
	4.803	-21.108	6.791	6.533	2.710		
	3.432	-18.855	3.215	2.024	1.174		
Maldives	**-0.230**	**0.029**	**0.015**	**0.094**	**-0.801**	**-0.221**	**-0.707**
	-0.538	0.063	5.603	5.452	-3.277		
	-0.748	0.092	7.730	2.913	-7.376		
Seychelles	**-0.029**	**-0.484**	**4.5E-04**	**0.074**	**0.890**	**-0.116**	**0.964**
	-0.393	-5.634	2.324	3.598	38.857		
	-0.175	-4.003	1.022	1.566	12.629		

Table 8: GJR(1,1) Estimates for Growth Rate of Monthly International Tourist Arrivals

SITEs	*AR(1)*	*MA(1)*	*ω*	*α*	*γ*	*β*	*α+γ/2*	*Log-moment*	*Second Moment*
Barbados	**0.365**	**-0.780**	**2.5E-05**	**-0.054**	**0.114**	**0.994**	**0.004**	**-0.007**	**0.997**
	5.755	-23.128	1.134	-4.376	4.323	104.063			
	4.719	-12.791	0.730	-2.851	2.759	75.077			
Cyprus	**0.460**	**-0.831**	**0.001**	**0.171**	**0.105**	**0.760**	**0.223**	**-0.066**	**0.983**
	4.838	-14.196	1.891	3.015	1.394	14.325			
	5.806	-17.185	1.419	2.082	0.629	9.948			
Dominica	**-0.201**	**-0.856**	**0.003**	**0.891**	**-0.970**	**0.565**	**0.405**	**N.C.**	**0.971**
	-2.265	-25.063	2.979	22.288	-21.342	6.310			
	-1.878	-16.849	1.943	1.988	-2.242	3.745			
Fiji	**0.322**	**-0.798**	**0.007**	**0.383**	**0.128**	**0.172**	**0.447**	**-0.900**	**0.620**
	4.667	-21.257	7.117	4.128	0.821	2.838			
	3.388	-18.168	3.290	1.615	0.374	1.107			
Maldives	**0.612**	**-0.904**	**0.012**	**0.221**	**-0.160**	**-0.848**	**0.141**	**N.C.**	**-0.707**
	7.178	-17.981	7.904	8.521	-3.938	-8.611			
	9.608	-20.967	7.544	4.194	-3.252	-13.043			
Seychelles	**-0.006**	**-0.499**	**4.9E-04**	**0.073**	**-0.031**	**0.901**	**0.057**	**-0.044**	**0.958**
	-0.072	-5.861	2.215	3.357	-0.860	44.154			
	-0.036	-4.422	0.937	1.180	-0.519	12.417			

Notes: 1. The three entries correspond to the estimate (in bold), the asymptotic t-ratio and the Bollerslev-Wooldridge (1992) robust t-ratio.
2. Twelve monthly seasonal dummy variables were used in each model.
3. N.C. denotes that the log-moment could not be calculated because $[(\alpha + \gamma I(\eta_t))\eta_t^2 + \beta)]$ in (10) was negative for one observation.