CARIBBEAN CENTRE FOR MONETARY STUDIES

PRESENTATIONS

XXXV ANNUAL CONFERENCE OF MONETARY STUDIES

TOURISM LIFE CYCLE AND REGIME SWITCHING

By

Peter Whitehall and Winston Moore

24-28 November 2003

Sir Cecil Jacobs Auditorium
Eastern Caribbean Central Bank
Basseterre
St Kitts

THEME:
Economic Reform:
Towards A Programme For The Resuscitation of Economic Growth And Development In The Caribbean

TOURISM LIFE CYCLE & REGIME SWITCHING

Peter Whitehall and Winston Moore
Research Department, Central Bank of Barbados,
PO Box 1016, Bridgetown, Barbados

19 November 2003

ABSTRACT

The tourist area life cycle concept postulates that a destination should enjoy varying levels of popularity over time, and as a result, the growth in tourist arrivals should follow an s-shaped growth path. This study uses Markov-switching models, and quarterly data on stay-over visitor arrivals for Barbados over the period 1957 to 2002, to test the tourism area life cycle concept. Markovian models allow the stochastic process of the growth in tourist arrivals to switch between the regimes outlined in the life cycle concept. The key finding of the paper is that the life cycle framework does adequately represent the growth in arrivals from individual tourist markets. However, there does not exist a common life cycle relationship, which is applicable to all tourism source markets, and by extension, to total tourist arrivals.

JEL Classification: L80; E32; C32.

Keywords: Life cycle model; Tourism; Markov Switching Models.

I. INTRODUCTION

There are a number of theories to explain the growth cycle that tourism destinations go through over time. One of the earliest of these was put forward by Cohen (1972), and attempts to categorise tourists into four character types: drifter, explorer, individual mass tourist, and organised mass tourist. The drifters and explorers are constantly searching for new destinations, and are not really interested in ancillary services, such as comfortable accommodation. On the other hand, the last two character types like to stay in an environmental bubble, and place a high premium on comfortable and relatively inexpensive accommodation. Cohen's model, therefore, implies that as a destination attracts differing types of tourist, its growth process is likely to change.

Building on these character types, Butler (1980) outlined what has become know as the tourism life cycle concept. In this framework, a destination goes through six key phases: exploration, involvement, development, consolidation, stagnation and, decline and/or rejuvenation. During the exploration stage, attractions catered specifically to tourist do not exist, and most visitors are of the drifter and explorer type. In the following phase, involvement, more locals become drawn into the provision of tourism related services. In these first two stages of growth, visitor arrivals are likely to be positive, but slow at best.

In the next regime, development, tourism officials and businesspersons invest heavily in advertisement and the development of tourist attractions catered specifically to the individual and mass-market traveller types. As a result, the destination benefits from increasing rates of arrivals growth. During the consolidation stage the rate of expansion in visitor numbers slow, and the destination is characterised by an aging infrastructure. In the stagnation phase, the peak arrivals numbers are reached. However, the destination is now seen as unfashionable, and therefore finds it difficult to maintain arrivals from its key source markets. After the stagnation regime, the destination enters the decline stage, where it either dies or rejuvenates, due to the use of man-made attractions such as casinos, and previously under-utilised natural resources.

There have been some empirical attempts to model the tourism life cycle hypothesis, however, most of these employed a perceptional or historical case study approach (see Hovinen, 1981; Oglethorpe, 1984; and Cooper, 1989). Hovinen, examined data on Lancaster County, Pennsylvania for five decades, and found that the evolution of this destination seems to support the s-shaped life cycle model. Oglethorpe reported similar conclusions for the Maltese tourist industry, while Cooper proposed that the life cycle should also depend on factors such as management decisions, and the quality of the resort.

In contrast, Haywood (1986) put forward a possible method to identify when a region or destination moves from one stage of the life cycle to the next using the percentage change in the number of visitors. The author proposed that a persistent decline in arrivals, of around one half of one standard deviation, could indicate that the destination is in the decline phase, while a persistent increase of a similar magnitude could delineate the development period. Similarly, the stagnation stage would be evidenced by a decline in arrivals of between one half of one standard deviation and zero, while the consolidation period would be demarcated by zero growth, and growth of less than one half of one standard deviation. One of the main drawbacks of Haywood's approach is that it requires data on the destination from the exploration through to the decline stage. However, not every destination is likely to have undergone all the stages, or have data for the entire life cycle.

di Benedetto and Bojanic (1993) used a step-logarithmic function to model attendance at Cypress Gardens over the period 1949 to 1984. The model allowed for an initial period of rapid growth, followed by stagnation and then decline. The authors also augmented the model with a dummy variable to capture revitalisation, the impact of new attractions, and environmental influences, such as the fuel crisis of 1974 and 1979, the Worlds Fair, EPCOT Centre and the Cuban missile crisis. di Benedetto and Bojanic reported strong evidence in support of the step-regression model. In addition, the approach also performed admirably as a forecasting tool. The authors therefore take these results as evidence in favour of the usefulness of the tourism life cycle model.

The difficulty with most of the foregoing models is that they require researchers to pre-determine the timing of the different phases of the tourism life cycle. In contrast, this study uses the Markov-switching autoregressive (MS-AR) model to describe the stochastic process of growth in tourist arrivals. The approach is an improvement over previous studies, since it allows the data to generate the regimes. In addition, a Markov-switching vector autoregressive (MS-VAR) model can be employed to identify whether arrivals from the various markets have common regime shifts in the stochastic process of visitor arrivals growth. Although the life cycle concept is primarily a descriptive device, the ability to identify where exactly on the life cycle curve is a particular source market, would be useful for forecasting and tourism planning in general. The paper is structured as follows. Section II presents the econometric approach used to test the life cycle concept. Section III analyses the statistical characteristics of arrivals from each market, while Section IV tests for a common regime. Section V concludes.

II. METHODOLOGY

A. Econometric Approach

The stochastic process of the growth in tourist arrivals is modelled using the following autoregressive specification of order four:

$$\Delta_4 y_t = v(s_t) + \sum_{i=1}^{4} \phi \Delta_4 y_{t-i} + \varepsilon_t \tag{1}$$

where v is the regime-dependent intercept, s_t is the regime index, ϕ are the coefficients on the autoregressive terms, and ε_t is a sequence of *i.i.d* $N(0,1)$ random variables. By allowing the intercept to depend on the regime, the model implicitly assumes a smooth transition from one state to the next. This approach was chosen since it most closely reflects the life cycle concept and was found to be the superior, based on specification testing.

Following Hamilton (1989), the state variable, s_t, is represented as an unobserved discrete-time, discrete-state Markov process. The transition probability matrix is such that:

$$P_{ij} = \Pr[s_t = j \mid s_{t-1} = i] \quad with \sum_{j=0}^{N} P_{ij} = 1 \; for\ all\ i\,. \tag{2}$$

Maximum likelihood estimation of the framework given in Equation (1) is undertaken using the Expectation Maximisation algorithm discussed in Hamilton (1990). In addition, the smoothing algorithm of Kim (1994) is employed to assign probabilities to the unobserved regimes conditional on the information set.

The two-regime and three-regime versions of that given in Equation (1) are applied to quarterly arrivals data for each of Barbados' main source markets over the last five decades. A two-regime approach allows for a period of decline and growth, while the three-regime model allows for a period of decline, slow growth and rapid growth. Therefore, a three-regime framework would be more consistent with the life cycle concept, given that the development stage would be akin to the high growth regime, the stagnation phase reflected by the slow growth state, and the decline stage represented by the negative growth phase. In addition, the approach implicitly allows for rejuvenation, since arrivals can shift from the decline to any of the growth regimes.

The model given in Equation (1) can be generalised to a multi-market framework to allow for intermarket (from market *i* to market *j*) and intertemporal (lag *k*) transmission of market-specific shocks, ε_{it}, and a matrix of autoregressive coefficients $A_k = (a_{ijk})$. Given the state of arrivals, then the k-dimensional vector of arrivals from each market $\Delta_4 Y_t = (\Delta_4 y_{1t}, \ldots, \Delta_4 y_{kt})$ is generated by the following autoregression of order *p*:

$$\Delta_4 Y_t = V(s_t) + A_1 \Delta_4 Y_{t-1} + \varepsilon_t \qquad (3)$$

The idea behind this approach is to build up the life cycle path for total arrivals using the individual regimes for each market, rather than model total tourist arrivals.

It is also possible that some markets may be at different points on the life cycle. Thus, one cannot impose the number of regimes on the arrivals data without appropriate testing techniques. However, choosing the number of states in Markov switching models is usually quite computationally burdensome. Consequently, under the null hypothesis most of the common tests (likelihood ratio, Wald and Lagrange Multiplier) are not valid, as the parameters are not identified, and the scores are identically zero (see Garcia and Perron, 1996, for a further discussion). Thus, the asymptotic distribution of these tests is non-standard.

This study employs the Davies (1987) upper bound test statistic and the Akaike information criterion to choose the optimal number of regimes. Davies' test statistic calculates the upper bound for the significance level of the likelihood ratio to identify the optimal number of regimes. Let L_1 represent the log-likelihood ratio under the alternative, L_0, the log-likelihood under the null, q, the difference in the number of parameters under the alternative and the null and, M, the standard likelihood ratio test statistic, calculated as $M = 2(L_1 - L_0)$. If one assumes that the likelihood ratio has just one peak, the upper bound for the significance level of M can be derived from:

$$\Pr[\chi_q^2 > M] + 2(M/2)^{q/2}\exp(-M/2)/\Gamma(q/2) \tag{4}$$

where $\Gamma(.)$ is the gamma function. The upper bound given in Equation (3) implies that for a given lag length, testing the null of $n-1$ states against the alternative of $n(n>1)$ at the 5% level of significance has a critical value of 10.95. The maximum number of regimes considered was limited to three, since a larger number of regimes would be conceptually difficult to analyse, and the life cycle model can be adequately encompassed using just three regimes.

B. Data Description

The dependent variable employed in this study is the annual change in quarterly stay-over visitor arrivals for the period 1956:1 to 2002:4, and is obtained from various issues of the Annual Statistical Digest of the Central Bank of Barbados. The time series data on arrivals are tested for a unit root using the Augmented Dickey-Fuller test and each series is non-stationary in levels, but stationary in first differences.

There has been considerable debate regarding whether arrivals should be the appropriate unit of measurement used to identify the s-shaped life cycle curve. For example, Butler (1980) points out that differing lengths of stay could accompany the various stages in the cycle. As a result, Haywood (1986) offers profitability and visitor expenditure as alternatives. However, profitability is likely to decline as the cycle progresses, while expenditure series are difficult to obtain, since it is not tracked at an appropriate level of detail. Therefore, the authors employ the change in arrivals as the dependent variable, bearing in mind its deficiencies, but noting that over the long run expenditure is cointegrated with visitor arrivals.[1]

Table 1 presents some sample statistics for the growth in arrivals over the period 1956-2002. One of the most striking features of the data presented is that the average rate of growth in arrivals has exhibited a declining rate of expansion. Total arrivals in the early stages of the development of Barbados' tourism product usually averaged double-digit rates of expansion. However, by the 1986-1995 and 1996-2002 periods the growth in total arrivals was less than 3% per quarter.

This slowdown seems to have occurred on account of the stagnation of the USA and Canadian markets and, to a lesser extent, the decline in arrivals from Other markets during the late 1990s. The declines registered in these markets were, however, partially offset by the continued robust expansion in arrivals from the UK and CARICOM markets. As a result of this performance, arrivals from the UK now accounts for 41% of total tourist arrivals to Barbados, compared to only 8% in 1956.

III. EVIDENCE OF REGIME SWITCHING IN TOURISM MARKETS

A. Specification Tests

Table 2 presents the specification tests discussed in Section II. In the majority of cases, with only the USA being the exception, the statistics are usually in agreement. For the UK, the Davies test and the AIC criterion show that the two-regime model is superior to the single and three-regime models. In the case of the USA, Canada, CARICOM and Other source markets, the three-regime model is preferred. The result that the two-regime model is more appropriate for the UK could signify that this market is at a different point on the life cycle curve relative to the USA, Canada, CARICOM and Other. For example, a casual examination of the growth rates presented in Table 1 show that the stagnation phase for growth in arrivals from the UK has not yet been reached. In

[1] The Johansen cointegration approach finds that there exists a cointegrating relationship between tourist expenditure and arrivals over the period 1970 to 2002.

contrast, the USA, Canada, CARICOM and Other have all undergone prolonged periods of decline, suggesting that they are more mature or further along on the life cycle curve.

The preferred model specifications are then tested for heteroskedasticity and autocorrelation using various chi-squared test and the results also reported in Table 2. These results show that the null of homoskedasticity and no autocorrelation cannot be rejected for any of the models considered. Therefore, the chosen models seem to provide a reasonably robust representation of the growth in arrivals.

B. Regression Results

This section examines the stochastic process of the growth in tourist arrivals during the various phases along the life cycle through an examination of the estimation results for the preferred model specifications given in Table 3. With the exception of CARICOM, most markets are characterised by asymmetric cycles, where the duration of the boom is longer than that of the contraction regime. The duration of the bust varies from as low as 5.6 quarters for Canada to 19.7 quarters for the USA.

In the UK market the average rate of decline in the contraction regime is 6.7%, while the average rate of growth in the boom is 11.2%. In addition, the regime durations also show that the length of the contraction regime, approximately 6.7 quarters, is one of the smallest among the markets considered. The smoothed recession probabilities are plotted for this market in Figure 1 and the cycle dates are provided in Table 4. From Figure 1, the growth in arrivals from this market was in the boom regime for most of the first 24 years of the sample (1958-1982). However, after this period, growth slowed somewhat, and fluctuated between the boom and bust regime over the remainder of the sample period. From this analysis, it seems that the UK market can be classified as a relatively young market, since it has not achieved a sustained period of decline or stagnation. Thus, if one were to classify this market on the Butler (1980) life cycle, it would most likely be placed in the consolidation stage, since the stagnation or decline phases have not been observed as yet.

In contrast to the UK, the USA market is most accurately captured using a three-regime model. The contraction regime for this market is typically characterised by average declines of 2.4%, lasting approximately 19.7 quarters. The slow growth regime generally averages growth of 8.7%, compared to the 13.8% obtained in the high growth state. However, the slow growth phase lasts much longer, 23.8 quarters, than the high growth phase, 13.9 quarters. From the smoothed regime probabilities one would notice that the market exhibits the classic life cycle pattern, with relatively high rates of growth being registered in the early years 1958-1974, followed by a period of stagnation, 1975-1988, then a period of decline, 1989-2001, and finally a rejuvenation in 2002.

The pattern of growth in arrivals originating from Canada is also analysed using a three-state model. The decline in arrivals during regime 1 is one of the smallest, estimated at –10.4%. However, it is also the shortest contraction phase in terms of duration, lasting only 5.6 quarters or just over a year. The slow growth state, is usually characterised by growth of 2.9% in arrivals while in the high growth segment, arrivals expand by 16.5% over a period of 29.4 quarters. Similar to the USA, the smoothed recession probabilities for the Canadian market indicated that for most of the early years of the sample, this market was in the high-growth state. However, during the period 1973-1980 it entered a period of relatively slow growth, and then contraction from 1980 to 1990. However, a modest rejuvenation was recorded over 1991 to 2000 period, and the market has fluctuated between slow growth and decline since then.

The growth in arrivals from CARICOM is best modelled using a three-regime framework. The average decline for this source market in the contraction regime is estimated at –1.6%, while in the slow growth state arrivals tend to expand by 8.7%, compared to 17.5% in the high growth phase. However, the contraction phase is slightly longer in duration compared to the high growth regime. The CARICOM market also seems to be more erratic than all the other markets. However, relatively high rates of growth were recorded over the period 1958-1966. Afterwards, growth fluctuated between boom and bust for most of the 1970s, and finally underwent a sustained period of decline in the 1980s and early 1990s. However, like the USA market, this segment of travel to Barbados seems to be entering another growth phase.

The final market considered is Other, which consists mainly of European visitors, excluding the UK. It has an average contraction regime of 13%, a low growth regime of 6% and a high growth phase of 7.4%. The duration of the various phases for this market are quite lengthy. For example, the average contraction regime lasts approximately 15.6 quarters, while the high growth regime tends to lasts 49.8 quarters. One of the reasons for this is the dependence of this market on charter flights since there are few regularly schedule flights by major airlines to Barbados. Thus, the effects of losing/gaining charter flights can have long lasting effects. For most of the early period, this market experienced rapid rates of growth as predicted by the life cycle concept followed by stagnation and decline. However, somewhat of rejuvenation took place between 1985 to 1998, but since this period the market has been in the decline stage.

Total tourist arrivals are also modelled using the Markov switching framework. A three state Markov process best represents the growth in total arrivals. The average decline in the contraction regime is estimated at 6% and usually lasts 5.6 quarters. Regime 2 is usually characterised by growth of only 3.8% over 6.5 quarters. The rate of expansion in the high growth regime is almost more than double that obtained in the slow growth state and is estimated at 13.8%, over 10.7 quarters. Similar to most of the three regime models, arrivals during the early part of the sample period were in the high growth regime up until 1974. Afterwards, it has fluctuated between the decline and slow growth state. The plotted regime probabilities show the difficulty of classifying a destination on the life cycle curve using total arrivals, since differing markets are likely to be at different points on the life cycle. From Figure 6, no clear indication of where Barbados is on the life cycle curve using total tourist arrivals.

IV. IS THERE A COMMON REGIME SWITCHING PROCESS?

The concept of modelling total arrivals is complicated by the fact that differing markets may be at dissimilar points on the life cycle. Thus, a Markov switching vector autoregressive approach, given in Equation (3), which models multiple time series subject to regime shifts is employed. The results of this method are presented in Table 5 along with the fitted probability values in Figure 8. The Davies test suggests that a three-regime model seems to be more appropriate in this instance, and no evidence of heteroskedasticity is recognised in the residuals.

The contemporaneous correlation matrix for the estimated model is provided below:

$$\begin{bmatrix} UK & -0.056 & 0.308 & -0.239 & 0.027 \\ -0.149 & USA & 0.090 & 0.281 & -0.091 \\ -0.206 & 0.370 & Canada & -0.070 & 0.173 \\ 0.335 & 0.207 & 0.069 & CARICOM & 0.055 \\ -0.070 & -0.014 & -0.122 & -0.423 & Other \end{bmatrix}$$

The lower triangular matrix gives the contemporaneous correlations in regime 1 and the upper triangular matrix gives those in regime 2, while the correlations for regime 3 are:

$$\begin{bmatrix} UK & & & & \\ -0.019 & USA & & & \\ 0.091 & 0.409 & Canada & & \\ -0.152 & -0.004 & -0.248 & CARICOM & \\ -0.016 & 0.464 & -0.094 & 0.416 & Other \end{bmatrix}$$

From these two matrices presented above, there does not seem to be any strong contemporaneous correlation between the markets in any of the regimes considered. This supports the conclusion derived earlier that the concept of a tourism life cycle seems only relevant for particular markets, and not total arrivals. Most of the phases for the various markets are characterised by negative correlations, with the only exceptions being the USA and Canada, which seem to have similar expansion and contraction states.

The results of this section show that the concept of a common life cycle, for stay-over visitor arrivals from Barbados main source markets, does not exist. This finding has implications for forecasting and tourism policy. For forecasting, it suggests that attempts to predict total tourist arrivals should be done for each market rather than for aggregate arrivals. For tourism policy, it indicates that targeting greater effort into obtaining greater numbers from the alternative source markets could counterbalance a short fall in one market. This would smooth the stochastic process of overall growth in arrivals, and therefore reduce large swings in overall economic activity.

V. CONCLUSIONS

This study uses Markov-switching models, and quarterly on visitor arrivals for Barbados over the period 1957 to 2002, to test the tourism area life cycle concept. The life cycle concept proposes that a destination goes through six key stages: exploration, involvement, development, consolidation, stagnation and, decline and/or rejuvenation. Thus, a destination should enjoy varying levels of popularity over time, and as a result the growth in tourist arrivals should follow an s-shaped growth path. The paper estimates a Markov-switching autoregressive model for stay-over visitor arrivals, in which the intercept is allowed to vary given the regime or state. This framework allows a smooth transition from one regime to the next, as postulated by the life cycle concept. Using the Davies (1987) upper bound statistic, a two-regime model was found to best represent the arrivals from the UK, while a three-regime model was favoured for arrivals from the USA, Canada, CARICOM, and Other markets. From an analysis of the smoothed plotted regime probabilities, the life cycle concept provided an adequate explanation of the phases of growth for each market. However, a common life cycle relationship for total stay-over visitor arrivals could not be identified. This finding seems to have occurred since differing markets seem to be at dissimilar points on the life cycle curve.

One of the key policy implications of the paper is that the UK market still has significant future growth potential, since the stagnation phase has not yet been reached. However, obtaining arrivals from US, Canada, CARICOM and Other may require a greater effort in terms of investment and advertising. However, the negative contemporaneous correlations between arrivals from the various markets could be exploited to smooth the level of change in overall arrivals from year to year, by switching effort from one market to the next.

REFERENCES

Butler, R.W. (1980). The Concept of a Tourism Area Cycle of Evolution: Implications for Management Resources. *The Canadian Geographer* 24 (1): 5-16.

Caporale, G.M. (1997). Common Features and Output Fluctuations in the United Kingdom. *Economic Modelling* 14 (1): 1-9.

Cohen, E. (1972). Toward a Sociology of International Tourism. *Social Research* 39 164-82.

Cooper, C.P. (1989). Tourist Product Life Cycle. IN *Tourism and Marketing Management Handbook*, Editors Witt, S.F. and L. Moutinho. Perentice Hall.

Davies, R.B. (1987). Hypothesis Testing When a Nuisance Parameter is Present Only Under the Alternative. *Biometrika* 74 (1): 33-43.

Di benetto, C.A. and D.C. Bojanic (1993). Tourism Area Life Cycle Extensions. *Annals of Tourism Research* 20 (3), 557-570.

Engle, R.F. and S. Kozicki (1993). Testing for Common Features. *Journal of Business and Economic Statistics* 11 (4): 151-174.

Garcia, R. and R. Perron (1996). An Analysis of the Real Interest Rate Under Regime Shifts. *Review of Economics and Statistics* 78 (1): 111-125.

Hamilton, J.D. (1989). A New Approach to the Economic Analysis of Non-stationary Time Series and the Business Cycle. *Econometrica* 57 (2): 357-384.

Hamilton, J.D. (1990). Analysis of Time Series Subject to Changes in Regime. *Journal of Econometrics* 45 (1): 39-70.

Haywood, K.M. (1986). Can the Tourist-Area Life Cycle be Made Operational? *Tourism Management* 7 (3): 154-167.

Hovinen, G.V. (1981). A Tourism Cycle in Lancaster County, Pennsylvania. *The Canadian Geographer* 25 (3): 283-286.

Kim, C.-J. (1994). Dynamic Linear Models with Markov-Switching. *Journal of Econometrics* 60 (1): 1-22.

Oglethorpe, M.K. (1984). Tourism in Malta: A Crisis of Dependence. *Leisure Studies* 3: 147-161.

TABLE 1
Average Quarterly Growth in Stay-Over Visitor Arrivals, 1957Q1-2002Q4

	UK	USA	Canada	CARICOM	Other	Total
Mean						
1956-1965	21.9	20.0	26.0	12.8	9.1	16.5
1966-1975	15.7	12.8	19.3	7.0	16.8	12.9
1976-1985	7.6	12.1	-0.4	8.0	3.2	5.6
1986-1995	15.8	-2.0	-0.4	-1.3	12.7	2.6
1996-2002	7.0	2.0	-0.9	7.2	-10.5	1.8
Standard Deviation						
1956-1965	11.6	16.9	13.2	11.6	10.6	8.4
1966-1975	17.7	20.7	23.2	13.0	17.1	11.5
1976-1985	25.7	20.3	16.1	18.5	22.2	12.3
1986-1995	30.1	11.6	14.3	10.2	16.9	9.0
1996-2002	13.1	10.6	11.4	14.0	18.2	7.8
Minimum						
1956-1965	8.1	5.2	9.3	-4.5	-16.9	0.1
1966-1975	-35.8	-30.4	-15.8	-14.1	-18.3	-10.7
1976-1985	-40.2	-19.5	-31.7	-18.6	-31.1	-17.9
1986-1995	-30.0	-25.1	-22.8	-23.7	-16.3	-14.3
1996-2002	-21.0	-18.5	-29.4	-13.3	-60.3	-13.1
Maximum						
1956-1965	41.7	62.6	46.3	28.2	23.2	36.0
1966-1975	59.1	59.0	92.1	43.6	55.4	44.2
1976-1985	67.5	72.5	32.0	62.1	49.8	33.8
1986-1995	134.0	21.9	40.1	26.6	63.8	28.2
1996-2002	40.4	29.2	17.6	43.8	19.2	16.9

TABLE 2
Test Results

	UK	USA	Canada	CARICOM	Other	Total	Critical Values
One versus two regimes							
Davies	18.232	13.656	19.864	10.200	43.892	25.206	10.950
AIC Criterion (AIC_1-AIC_0)	0.013	-0.002	0.033	0.012	0.166	0.062	-
Two versus three regimes							
Davies	7.952	11.478	21.566	18.179	30.344	11.832	10.950
AIC Criterion (AIC_1-AIC_0)	-0.067	-0.037	0.020	0.034	0.069	-0.062	-
Residual tests							
Autocorrelation	0.712	0.356	0.018	0.534	0.570	1.413	3.84
Heteroskedasticity	5.240	8.645	8.654	8.012	7.983	9.137	15.51

TABLE 3
Estimation Results from Autoregressive Markov Switching Models

	UK	USA	Canada	CARICOM	Other	Total
Regime-Dependent Intercepts						
ν_1	-0.067	-0.024	-0.104	-0.015	-0.130	-0.060
	(0.030)	(0.012)	(0.029)	(0.013)	(0.038)	(0.014)
ν_2	0.112	0.087	0.029	0.087	0.060	0.038
	(0.023)	(0.012)	(0.014)	(0.009)	(0.010)	(0.009)
ν_3	-	0.138	0.165	0.175	0.074	0.138
		(0.026)	(0.025)	(0.026)	(0.018)	(0.015)
ϕ_1	0.512	0.437	0.391	0.135	0.334	0.217
	(0.083)	(0.070)	(0.082)	(0.078)	(0.082)	(0.079)
ϕ_2	-0.042	0.031	0.099	0.200	0.080	0.011
	(0.083)	(0.062)	(0.092)	(0.060)	(0.071)	(0.072)
ϕ_3	0.009	-0.011	0.093	0.126	0.073	0.051
	(0.082)	(0.060)	(0.077)	(0.064)	(0.069)	(0.073)
ϕ_4	-0.084	-0.137	-0.316	-0.424	-0.114	-0.119
	(0.073)	(0.050)	(0.080)	(0.058)	(0.057)	(0.067)
Duration						
Regime 1	6.73	19.72	5.59	13.45	15.64	5.63
Regime 2	18.78	23.79	15.02	6.91	14.80	6.51
Regime 3	-	13.92	29.37	6.31	49.78	10.71
Ergodic Probability						
Regime 1	0.852	0.949	0.821	0.926	0.936	0.822
Regime 2	0.947	0.958	0.933	0.855	0.932	0.846
Regime 3	-	0.928	0.966	0.842	0.980	0.907
Observations	180	180	180	180	180	180

Note: Standard errors are shown in parentheses.

TABLE 4
Cycle Dating

	Regime 1	Regime 2
Single Equation Models		
UK	1969:2-1969:4; 1976:3-1977:2; 1981:4-1985:3; 1989:4-1992:2; 2001:1-2002:4;	-
USA	1958:1-19581; 1973:1-1976:4; 1979:3-1982:3; 1985:2-1985:3; 1986:2-2002:2	1958:2-1964:4
Canada	1980:3-1983:1; 1985:3-1987:1; 1987:4-1988:1; 1989:4-1991:3; 2001:1-2002:2	1973:2-1980:2; 1983:2-1985:2; 1988:2-1989:3; 1991:4-2000:4; 2002:3-2002:4
CARICOM	1958:1-1958:2; 1961:2-1661:3; 1967:2-1969:1; 1971:2-1976:1; 1981:2-1995:1; 1996:1-1996:4; 2000:1-2002:2	1958:3-1958:4; 1961:4-1966:4; 1976:2-1977:1; 1995:2-1995:3; 1997:1-1998:4
Other	1961:1-1962:1; 1980:2-1983:4; 1998:4-2002:4	1958:1-1960:4; 1962:2-1966:4
Total	1974:4-1975:3; 1980:3-1982:4; 1985:2-1985:3; 1989:4-1992:2; 2001:1-2002:2	1958:1-1958:4; 1961:1-1961:4; 1972:1-1972:2; 1973:1-1974:3; 1974:4-1976:4; 1980:1-1980:2; 1983:1-1985:1; 1985:4-1987:1; 1988:1-1989:3; 1992:3-2000:4; 2002:3-2002:4
Vector Autoregression Model	1980:2-1982:4; 1985:1-1987:1; 1989:4-1992:2; 2000:4-2002:4	1958:1-1958:3; 1969:2-1969:4; 1972:1-1976:4; 1983:1-1984:4; 1987:4-1989:3; 1992:3-2000:3

TABLE 5
Estimation Results from Vector Autoregressive Markov Switching Model

	UK	USA	Canada	CARICOM	Other
Regime-Dependent Intercepts					
ν_1	-0.059	-0.036	-0.083	-0.040	-0.079
	(0.026)	(0.016)	(0.019)	(0.019)	(0.031)
ν_2	0.049	0.026	0.026	0.033	0.045
	(0.019)	(0.016)	(0.0141)	(0.013)	(0.021)
ν_3	0.161	0.126	0.128	0.106	0.160
	(0.029)	(0.019)	(0.023)	(0.021)	(0.024)
ϕ_{USA}	-0.123	0.689	0.083	-0.091	-0.141
	(0.076)	(0.058)	(0.059)	(0.055)	(0.082)
ϕ_{Canada}	-0.143	-0.157	0.423	-0.027	-0.135
	(0.077)	(0.049)	(0.063)	(0.056)	(0.072)
$\phi_{CARICOM}$	-0.191	-0.181	-0.137	0.334	-0.283
	(0.094)	(0.059)	(0.077)	(0.068)	(0.091)
ϕ_{Other}	0.048	-0.088	0.043	-0.053	0.592
	(0.058)	(0.042)	(0.048)	(0.043)	(0.062)
ϕ_{UK}	0.604	-0.048	-0.015	0.007	-0.099
	(0.063)	(0.039)	(0.049)	(0.046)	(0.055)
Duration					
Regime 1			10.77		
Regime 2			10.24		
Regime 3			14.12		
Ergodic Probability					
Regime 1			0.907		
Regime 2			0.902		
Regime 3			0.929		
Observations	180	180	180	180	180
Davies (One versus two regimes)			99.398		
Davies (Two versus three regimes)			47.458		
Heteroskedasticity (χ^2_{150})			178.014		

Note: Standard errors are shown in parentheses.

FIGURE 1
Regime Probabilities for UK Tourist Arrivals

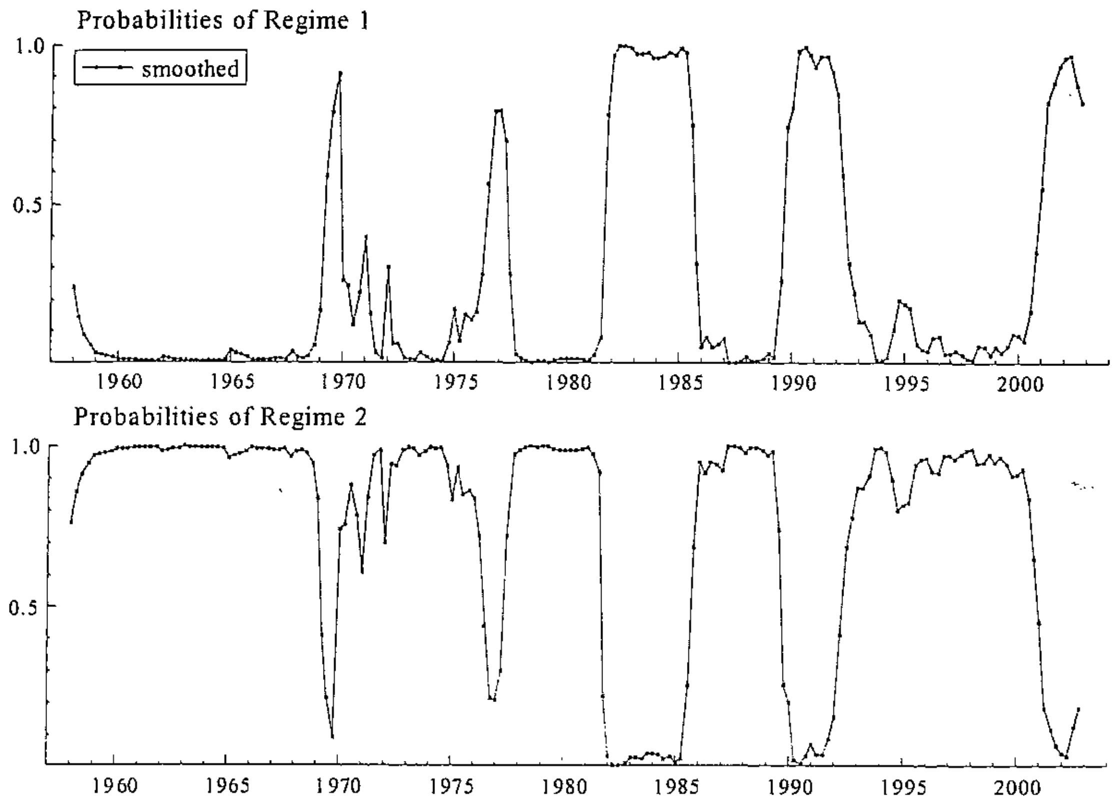

FIGURE 2
Regime Probabilities for USA Tourist Arrivals

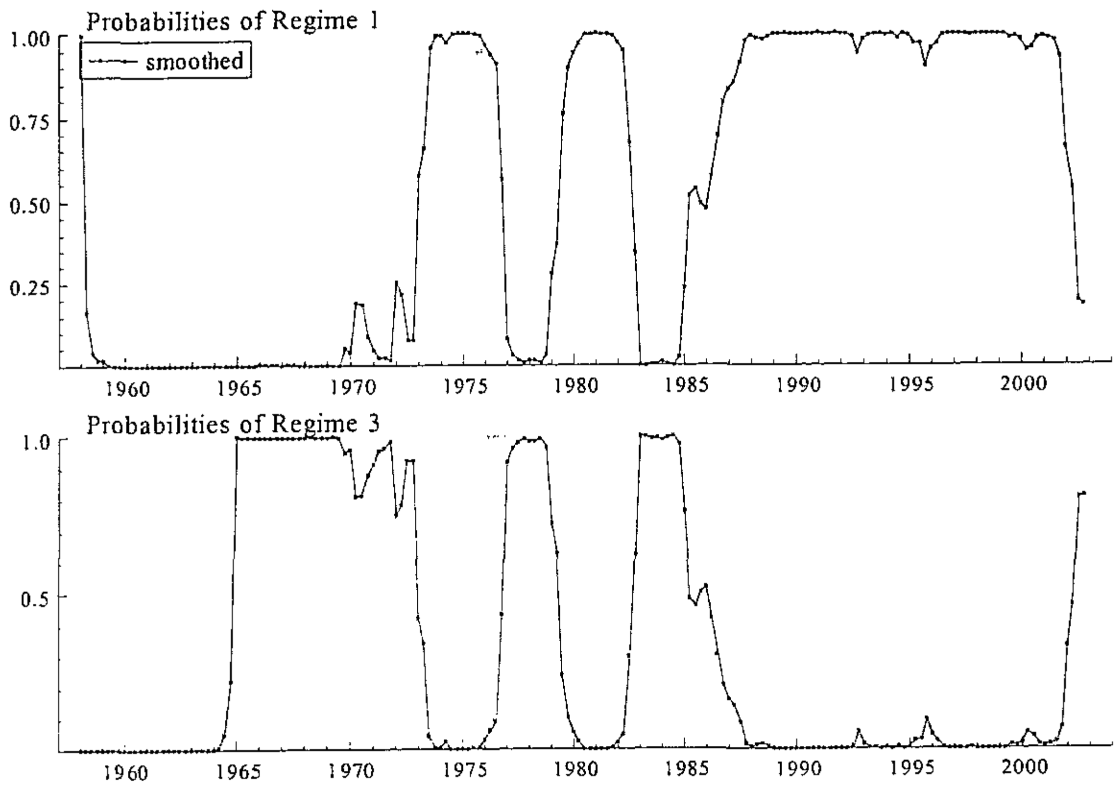

FIGURE 3
Regime Probabilities for Canadian Tourist Arrivals

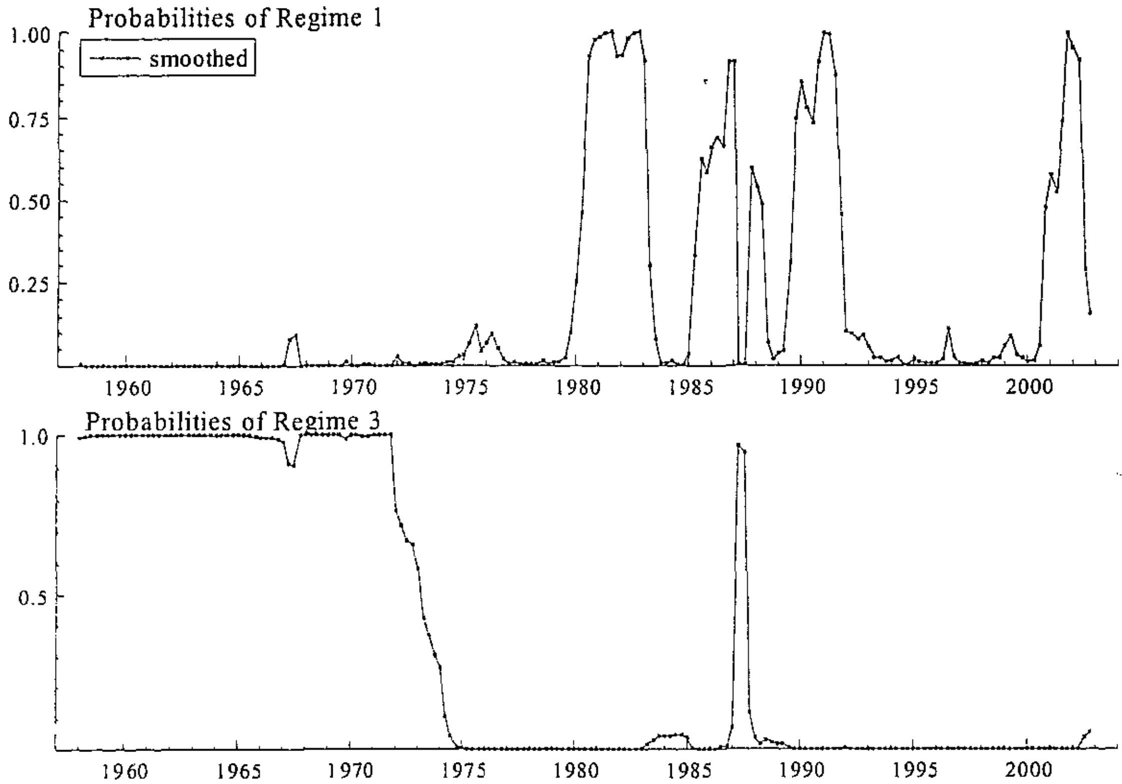

FIGURE 4
Regime Probabilities for CARICOM Tourist Arrivals

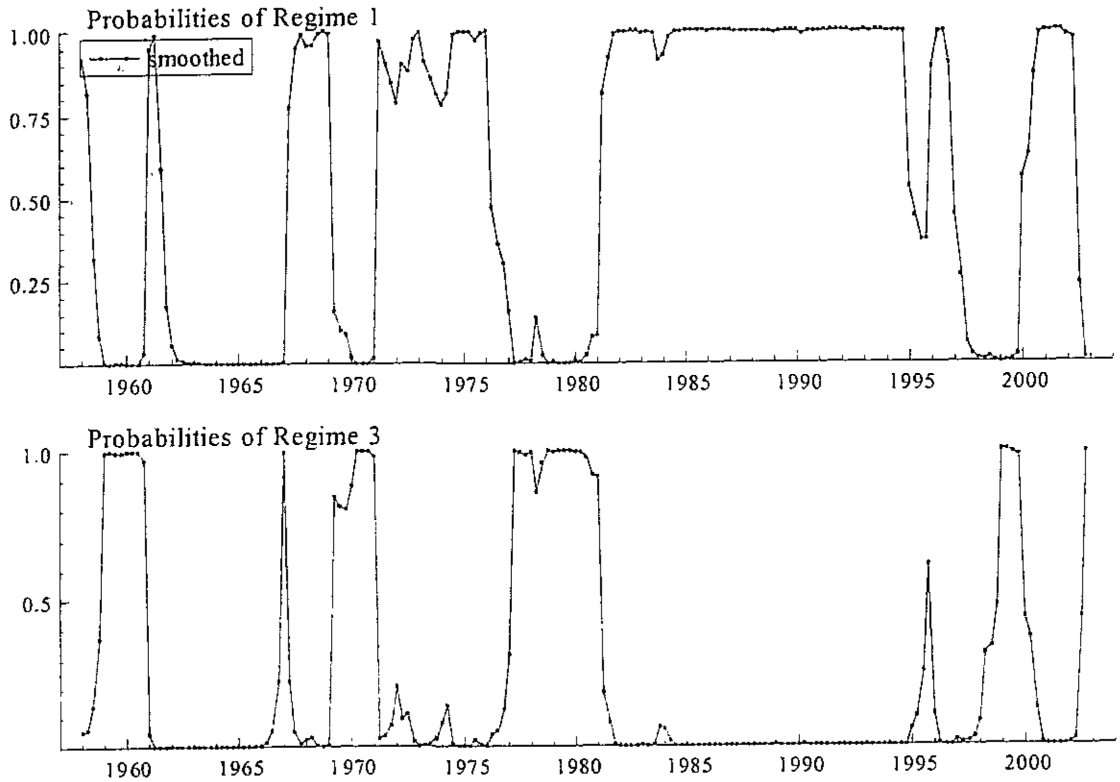

FIGURE 5
Regime Probabilities for Other Tourist Arrivals

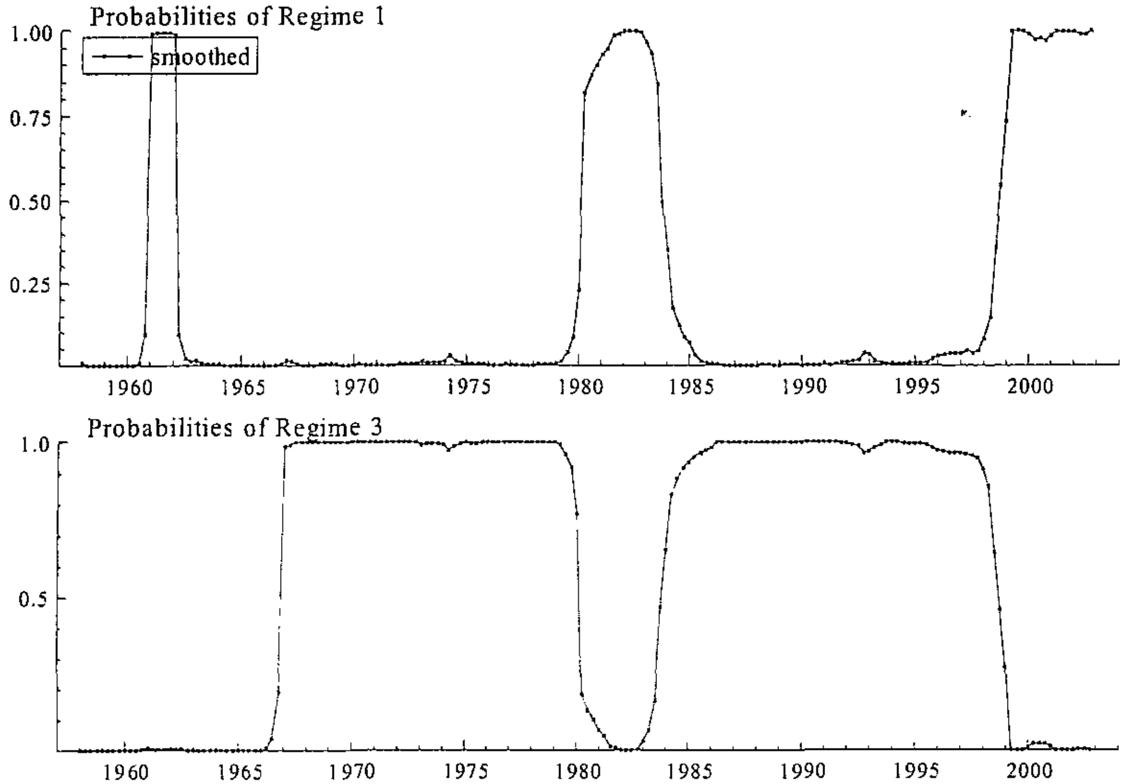

FIGURE 6
Regime Probabilities for Total Tourist Arrivals

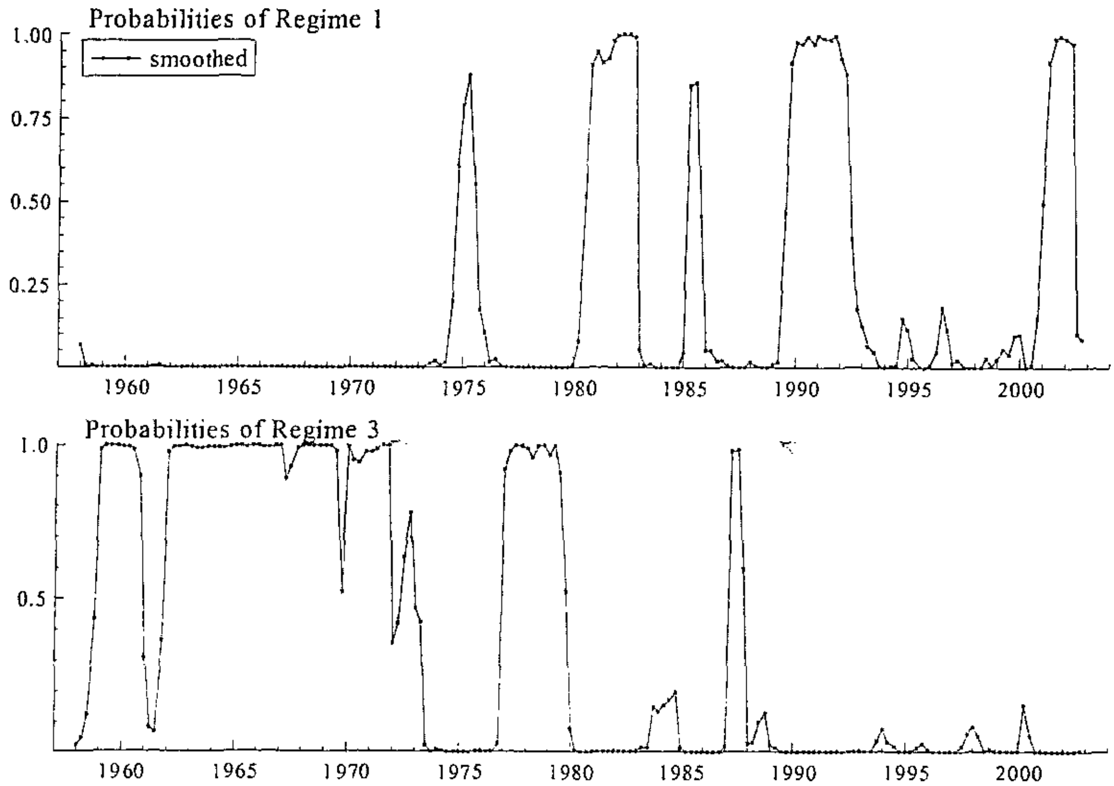

FIGURE 7

Regime Probabilities for Markov Switching Vector Autoregressive Model