Investigating the business cycle properties of tourist flows to Barbados

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Investigating the Business Cycle Properties of Tourist Flows to Barbados

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Abstract
This paper evaluates whether the tourism cycles of Barbados can be regarded as a direct consequence of business cycles of the UK, UK, Canada and Barbados. The cyclical components of the series are extracted using the structural time series framework by Harvey, 1989, and the interrelations between the variables are evaluated using innovation accounting. The variance decompositions suggests that shocks to the source country business cycle series can explain up to 25 percent of the future variation of the Barbadian tourism cycle. Shocks to the Barbadian business cycle only seem to significantly affect the Canadian tourist cycle. Finally, Granger-causality tests indicate that past values of the source country business cycles can help better predict present values tourist arrivals to Barbados, while past values of the Barbadian cycle only Granger-cause the Canadian tourist cycle. An interesting observation is that there appears to be some delay in the reaction of the tourism cycle to the business cycles. Thus, policy makers should take advantage of the delay between the two cycles, and adopt some form of countercyclical policy to soften the impact of negative income shocks in the UK, US or Canada on the Barbadian economy.

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1. Introduction

During the last few decades, Barbados has witnessed unprecedented growth in its service industry, with its more traditional sectors (agriculture and manufacturing) being subject to decline or stagnation. Estimates from the World Bank's World Development Indicators database suggest that Barbados' services sector rose from 59 percent of GDP in 1960 to about 79 percent of GDP in 2009. Tourism is the country's largest service-based industry and as such, has been largely responsible for the service sector's growth.

Since the 1980s, tourism has been the main thrust of the Government's developmental strategy. As noted by Lorde et al (2011), the main policy tools by successive Governments to develop the various tourism sectors have been favorable incentives and policies geared towards promoting their competitiveness and sustainability. These incentives usually take the form of tax concessions for a period of time and include the construction of hotels and duty free imports of some supplies and materials. The Government has also invested directly into the tourism industry through marketing, investment in tourism infrastructure and policy initiatives which have allowed investors to reduce the costs of inputs into the industry.

But, like most macroeconomic variables, tourist arrivals sometimes deviate significantly from their long-term trend. These deviations are known in the literature as the cycle of the series. Figure 1 plots arrivals from Barbados' main tourist markets – UK, US and Canada – as well as their long-term trend. It is clear from the plots that each series display several deviations from its growth path. This raises the question, what are the driving forces behind the cyclical behavior of tourist arrivals?

In this paper, the author seeks to determine the extent to which tourism cycles – particularly, the cycles of arrivals from the UK, US and Canada – can be regarded as a direct consequence of business cycles in the source country and the domestic country's output. The cyclical relationship between tourism and the income of the source country have been implicitly accounted for in tourism demand models for Barbados. Although these papers provide valuable information about tourism, they shed little light on the industry's cyclical characteristics. This largely stems from the fact that the estimated coefficients from these series may be confounded by structural shifts in the economy, or general trends in the series. Hence, in order to evaluate cyclical properties of tourist arrivals to Barbados, all series used in this paper has been de-trended, so that the underlying signal (i.e. cyclical properties) can be evaluated. More than this, the study also investigates the relationship between the Barbadian business cycle and the tourist cycle. While it is generally recognized that tourism is the main impetus for growth in Barbados (see Jackman, 2011), very few studies have investigated the growth-led tourism hypothesis – i.e. the possibility that economic activity in Barbados is capable of stimulating tourism activity.

A recent strand of the literature suggests that higher growth in the destination might also be the cause of higher levels of tourism (Eugenio-Martin et al, 2008). For instance, for the case of Korea, Oh (2005) find evidence of a causal relationship from economic growth to tourism i.e. the existence of the "supply-side" or "economic-growth driven tourism" hypothesis. Similar results were also attained Narayan (2004) for Fiji; Dritsakis (2004) for Greece; Durbarry (2004) for Mauritus; Kim et al. (2006) – Taiwan; and, Louca (2006) – Cyprus.

But, why would economic growth in the destination country boost tourist arrivals? Eugenio-Martin et al (2008) note that there are several variables which contribute to a positive causal relationship from economic growth to tourism. In particular, these variables tend to boost arrivals, but also boost growth. These include:

- Infrastructure – many tourists expect a minimum level of infrastructure as part of their experience
- The degree of openness – as a country opens its frontiers and reaches new markets, there is an increase in business travel, which is often a particularly lucrative form of tourism.
- Political Stability – generally, tourists prefer destinations that are politically stable.

Taken together, it is possible that there is a relationship between economic growth in Barbados may influence its demand for tourism.

In this study, the authors focus on the impact of business cycles (domestic and abroad) on tourism demand in Barbados. The business cycle factor has only been implicitly accounted for in tourism demand models (see Dalrymple et al, 1997; Greenidge, 2001; Worrell et al, 2011) and unfortunately, can provide little insight on the evolution and cyclical behavior of tourism demand in Barbados. As such, the study fills this gap by explicitly modeling of the cyclical components of tourism. Figure 2 plots the tourism cycles for arrivals US, UK and Canada along with the business cycles of the respective countries and that of Barbados. The cycles are extracted using the structural time series framework by Harvey, 1989. As would be expected, there seems to be general co-movement between the tourist cycles and the business cycles in the source countries. Particularly, with the exception of Canada over the period 2005-2010, the phases of the tourist cycles seem to be characterized by developments in the source country cycles. There also appears to be strong co-movement between the Barbadian business cycle and the tourist cycles. However, this correlation may be due to tourism causing the Barbados business cycle and not the other way around. Of course, more robust tests will determine the direction of the relationship.
The rest of this paper is outlined as follows: Section 2 describes the dataset, Section 3 presents the findings and finally, Section 4 concludes.

2. Data

This study employs annual data over the 1966 to 2009 time period. Data on arrivals to Barbados from the US, UK and Canada are taken from the Barbados Statistical Service. Observations on real GDP for Barbados, US, UK and Canada are obtained from the World Bank World Development indicators and IMF's International Financial Statistics online database. Drawing on the previous literature on tourism demand, oil prices (a proxy for transportation costs) and the relative destination price[1] are employed as control variables. A-priori, both of these variables are expected to be negatively correlated with the tourism cycle.

2.1 Obtaining the Cyclical Components

While a host of methods have been proposed for de-trending macroeconomic variables, the Hodrick-Prescott (HP) filter is by far the most popular in literature. The HP filter is used to obtain a smoothed estimate of the long-term trend component of a series. Once the trend is estimated, the remaining series forms the cyclical component of the series. However, the HP approach to business cycles has been criticized by several authors. For instance, Cogley and Nasan (1995) argues that the HP filter can generate business cycle dynamics even if none are present in the original data. Furthermore, the HP filtered data can exhibit periodicity and co-movement over business cycle horizons even if none are present in the input series. In this study, these issues are avoided by adopting an alternative approach to the HP filer.

[1] The relative destination price is defined as the Barbadian consumer price index (CPI) divided by the origin country CPI and then multiplied by the exchange rate between the Barbadian and origin country currency.

To extract the cyclical components of each of series, the basic or univariate structural time series framework of Harvey (1989) is employed. Unlike classical decompositions of time series data, where the parameters of the various time series components are fixed, structural time series models allow the coefficients to change over time. A structural time series model for annual observations may be written as:

$$y = \mu_t + \psi_t + \varepsilon_t \qquad (1)$$

where μ_t is the trend, ψ_t is the cycle and ε_t is the irregular.

The trend component is specified as

$$\mu_t = \mu_{t-1} + \beta_{t-1} + \eta_t, \quad \eta_t \sim NID\left(0, \sigma_\eta^2\right) \qquad (2)$$

$$\beta_t = \beta_{t-1} + \zeta_t, \quad \zeta_t \sim NID\left(0, \sigma_\zeta^2\right) \qquad (3)$$

Here, μ_t is the level, β_t the slope, η_t and ζ_t are the level and slope disturbances respectively, and are mutually uncorrelated. η_t allows the level of the trend to shift up or down, while ζ_t allows the slope to change. Hence, setting either η_t or ζ_t to zero gives a fixed level or slope, respectively.

The cyclical component of the model, ψ_t, is modeled as:

$$\begin{bmatrix}\psi_t \\ \psi_t^*\end{bmatrix} = \rho \begin{bmatrix}\cos\lambda_c & \sin\lambda_c \\ -\sin\lambda_c & -\cos\lambda_c\end{bmatrix}\begin{bmatrix}\psi_{t-1} \\ \psi_{t-1}^*\end{bmatrix} + \begin{bmatrix}\kappa_t \\ \kappa_t^*\end{bmatrix}, t = 1, \ldots\ldots, T \qquad (4)$$

Where λ_c is the frequency, in radians, in the range $0 < \lambda_c < \pi$, κ_t and κ_t^* are two mutually uncorrelated white noise disturbances with zero mean and common variances σ_κ^2, and ρ is a dampening factor. It is clear that the stochastic cycle becomes a first-order autoregressive process if λ_c is 0 or π.

In estimating the model, the variance of the cycle itself σ_ψ^2, rather than σ_κ^2, is taken to be the fixed parameter. Since $\sigma_\kappa^2 = (1 - \rho^2)\,\sigma_\psi^2$, it follows that $\sigma_\kappa^2 \to 0$ as $\rho \to 1$ and (4) above reduces to the deterministic but stationary cycle:

$$\psi_t = \psi_0 \cos\lambda_c\, t + \psi_0^* \sin\lambda_c\, t, \;\; t = 1, \ldots\ldots, T \qquad (5)$$

The forms the trend and cycle are determined by casting the model in state space form and applying a Kalman Filter (Harvey and Shepherd, 1993). The extent to which the variables change over time is determined by the parameters σ_κ^2, σ_ζ^2 and σ_η^2. The stochastic form is first specified. σ_κ^2, σ_ζ^2 or σ_η^2 taking a value of zero would indicate that the corresponding component is deterministic and the model would be rectified to suit. After the form is verified, the cyclical component of each series is extracted. Once the cyclical components have been isolated, the study proceeds to evaluate the underlying relationships between the variables.

3. Empirical Estimations and Analysis

3.1. Some Preliminary Results

As previously discussed, the cyclical components are modelled and extracted using the structural time series framework by Harvey (1989). As a starting point, the contemporaneous and asynchronous (calculated using one lead and one lag of the independent variable) cross correlation coefficients are estimated. Correlations provide a simple way of assessing the potential linkages between tourism and the business cycle. Tourism is said to be procyclical and

synchronous with real output if the contemporaneous correlation (i.e. the cross correlation at time t=0) between the two series is positive and statistically significant. Meanwhile, if the relationship between the two variables is negative and significant at time t = 0, then tourism are said to be countercyclical. The same logic follows for the asynchronous correlation coefficients, bearing in mind that asynchronous cross correlations enables one to identify the timing and direction that tourism respond to output drops. Finally, if all correlations are insignificant, then one can conclude that the relationship between the variables is acyclical. As the oil price and relative prices variables are I(1)[2], the model was run with these variables in first-differences. Estimates cross-correlation coefficients are presented in Table 1.

Panel A shows the response of the various tourist demand cycles to their respective source country business cycle. The cross correlations coefficients are all positive, but only the US and Canadian tourist cycles seem to be significantly impacted by their home country business cycle – at least by conventional levels of testing. Moreover, there is some difference in the timing of the response of tourism to fluctuations in source country income. Specifically, the Canadian tourist cycle seems to be contemporaneously related to the Canadian business cycle, implying that tourists respond to income changes in the same year. However, the US tourist cycle is asynchronously related to the US business cycle. Particularly, arrivals from the US are a reflection of fluctuations in the past and future/expected income values, which may be expected if travel to Barbados by US tourists is a budgeted/planned event. In contrast to a-prior expectations, the UK business cycle appears to have little impact on the UK arrivals cycle.

Turning to the cross correlations between the tourist cycle and the Barbados business cycle (Panel B), the correlation estimates suggest that arrivals from the US and UK are unaffected by the Barbados business cycle. In contrast, the Canadian tourist cycles appear to lag fluctuations in the Barbadian real GDP. Taken at face value, this would suggest that the growth-led tourism hypotheses may have some credence for arrivals from Canada.

The last two panels present the correlations between the tourism cycle, relative prices (Panel C) and oil prices (Panel D). For the case of arrivals to the UK, oil prices have a contemporaneous and negative impact – thus suggesting that tourists from the UK respond almost instantaneously to changes in oil prices. In contrast, the US tourist cycle appears to lag oil prices. Thus, previous fluctuations in oil prices seem to be negatively correlated with US tourism demand for Barbados – which, like correlations estimated for the case of US business cycle – would be expected if travel to Barbados by US tourists is a planned event. Finally, only the UK market appears to be significantly affected by higher relative prices in Barbados.

3.2. Innovation Accounting

The correlations presented above only provide a cursory analysis of the cyclical relationship between the variables under study and unfortunately, cannot make a strong statement about the co-movements between tourism and output. In order to make more robust inferences about the underlying relationship among the variables, the study relies on a vector autoregressive (VAR) model. For instance, in Barbados, tourism leads growth, but is also possible that output may also have a significant impact on tourist arrivals. The use of the VAR addresses issues such as endogeneity by treating all the variables in the system as endogenous. The Akaike Criteria (AIC) is used to determine the optimal lag specification[3].

[2] The KPSS, ADF and PP all suggest that the relative prices and oil price variables are I(1).
[3] Q-statistics indicated the absence of serial correlation in each equation of the VAR

In order to identify the structural components of the VAR, the recursive Cholesky orthogonalization is employed, which requires the variables to be ordered in terms of exogenity. In this paper, the variables are listed as "oil prices", "tourist source country business cycle" "relative prices", "tourism cycle" and "Barbados business cycle.

Innovation accounting is used to determine the dynamic responses of the variables over a five-year horizon. The variance decomposition provides information about the percentage of the forecast error in tourism cycles that is explained by an innovation or shock to the endogenous variables. The study also investigates the causal relationship between the tourism cycles and business cycles using Granger-causality tests (see Granger, 1969). Basically, this test seeks to ascertain whether or not the inclusion of past values of a variable *x* do or do not help in the prediction of present values of another variable *y*. If variable *y* is better predicted by including past values of *x* than by not including them, then, *x* is said to Granger-cause *y*. A test of joint significance of the lagged values of *x* constitutes the Granger-causality test.

Table 2 presents the variance decomposition of the cyclical behavior of tourism demand for Barbados. Initially, the tourist cycles are all largely explained by their own variation. In the first year, the tourist cycle of the UK market accounts for about 93 percent of its own fluctuations, the US-tourist cycle accounts for about 83 percent of its own variation, while the Canadian tourist cycle accounts of about 90 percent of its variability. But as time progresses, the ability of tourism to explain itself decreases, as a result of the increasing explanatory power of the other variables.

An interesting observation is that in each specification, a shock to Barbadian economy initially accounts for 0 percent of the variation of tourist arrivals. But, as time goes on, the percentage of the forecast error variance increases - though the increase is much more dramatic for arrivals from Canada. For instance, a shock to Barbados business cycle only accounts for a maximum of about 2 percent of the variation in the UK tourist cycle and about 6 percent of the US tourist cycle. For the Canadian tourist market, the variation explained by fluctuations in Barbados output increases steadily to nearly 15 percent by the tenth year. These findings are very much in line with those reported in Table 1, which suggested that arrivals from Canada are the most influenced by the Barbadian business cycle.

The estimated decompositions suggest that shocks to the source country business cycle are much more important. But, like the case of the Barbadian business cycle, cyclical movements in tourism demand seem to have a delayed response to shocks to the source country income cycle. Specifically, a shock to the source country business cycle initially accounts for a small portion of the cyclical behavior of tourist arrivals to Barbados – 6 percent for the UK and US and about 2 percent for Canada. However, as the forecast horizon widens, the explanatory power of the source country business cycle increases, reaching 18 to 25 percent by year 10. This implies that the variability in tourism demand caused by fluctuations in the source country income is large and persistent, highlighting the considerable degree of uncertainty that policymakers in Barbados will face in planning for the long term. Given Barbados' dependence on tourism, this result also underscores the impact that business cycles aboard may have on the economic well-being of the island in both the short and long runs.

Turning now to the control variables, the forecast decompositions suggest that shocks to oil and relative prices initially explain relatively little of the future variation in tourism demand for Barbados. But, as time passes, the behavior of the tourist arrivals can be characteristised by the endogenous responses to oil prices and relative prices. The only outlier is the response of US arrivals to innovations to relative prices. Particularly, the fraction of US tourist arrivals

determined by changes in relative prices decreases slightly over time (from approximately 10 percent to 7 percent). The low and declining and declining contribution of relative price shocks in combination with the insignificance of cross correlations presented in Table 1, suggest that the price-level in the destination country may be an insignificant factor for arrivals from Canada.

As a final step to the empirical analysis, this study conducts Granger-causality tests – within the context of the VAR – to analyse the causal relations among the variables. These are presented in Table 3. The test lends support for the hypothesis that fluctuations in source country income are a key determinant of arrivals from all countries under consideration. Taken together with the results of Tables 2, it can be concluded that the tourism cycles of Barbados' main tourist market can be regarded as a direct consequence of business cycles of the UK, US, and Canada. This lends support to the notion that tourism is a key channel through which contractions in the UK, US and Canadian economies can be transmitted to Barbados. Meanwhile the Barbados business cycle only Granger-causes Canadian arrivals, which supports the results presented in Table 1 and 2. Thus, the level of economic activity of Barbados does not appear to be very important for arrivals from the US or UK markets. It could be that tourists from these countries may be less interested in the economic characteristics of the country, and more so in the 3S– sun, sea and sand. Of course, more detailed research – i.e. at the micro-level – would be needed to fully justify this statement Finally, oil prices only seem to Granger-cause arrivals from the US and UK, while relative prices is only significant for the Canadian market.

4. Concluding Remarks

This paper explicitly focuses on the dynamic specification and understanding of the cyclical component of tourist arrivals to Barbados. The main objective of the study is to determine the extent to which tourism cycles can be regarded as consequences of business cycles in the source country and business cycles in Barbados. To meet this objective, the cyclical components of the variables are extracted using the structural time series framework by Harvey (1989). Then, a VAR is estimated and variance decompositions and Granger-causality tests are conducted. The empirical results confirm that the cyclical behaviour of arrivals from the UK, US and Canada respond to the business cycles in their respective countries. As most tourists originate from the United Kingdom (UK), United States (US) and Canada, arrivals from these markets are an important factor in the economic relationship between Barbados and these countries. With respect to the relation between business cycles in Barbados, only arrivals from Canada appear to be affected by this variable.

An interesting observation is that there appears to be some delay in the reaction of the tourism cycle to the business cycles. This has importance policy implications. Specifically, policy makers can take advantage of the delay between the two cycles, and adopt some form of countercyclical policy to soften the impact of negative income shocks in the UK, US or Canada on the Barbadian economy.

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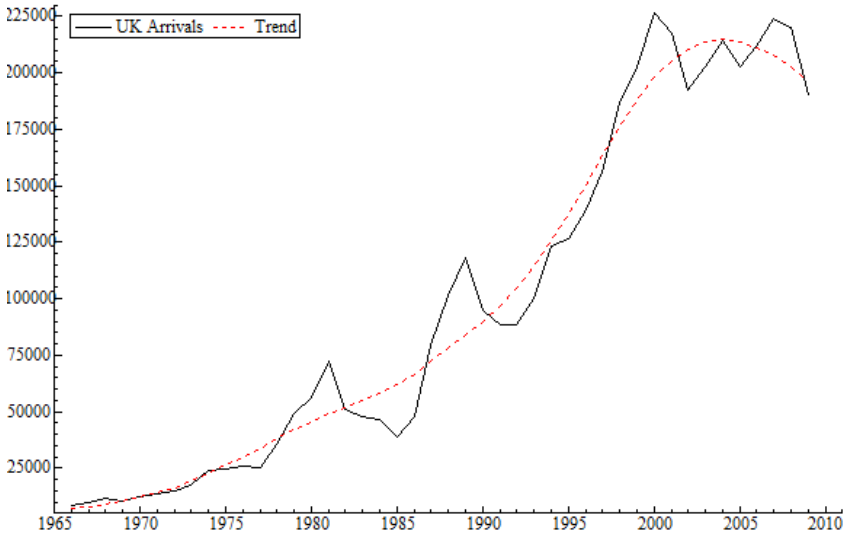
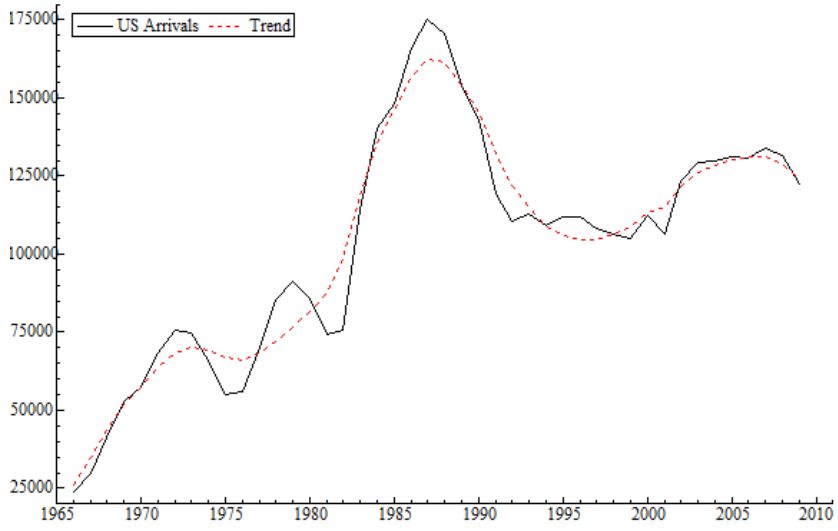
Figure 1: Tourist Arrivals to Barbados and their Long term Trend





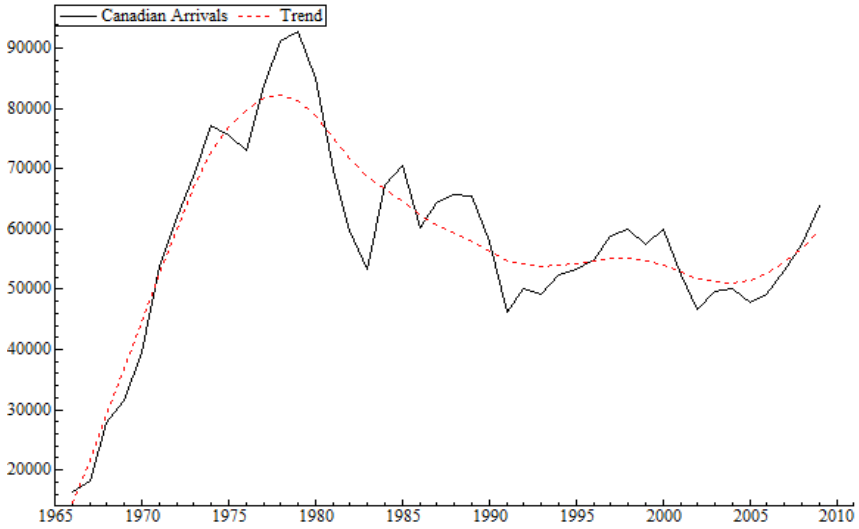


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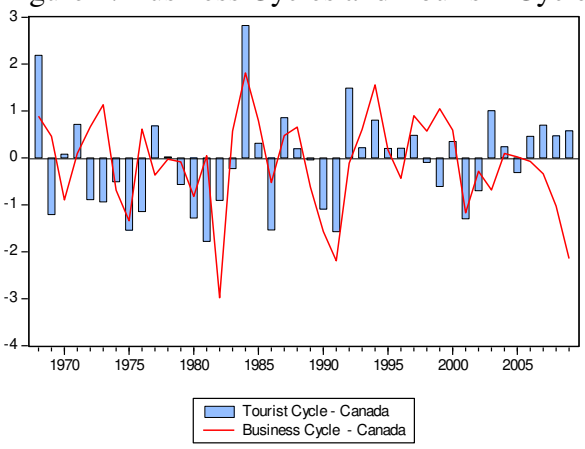
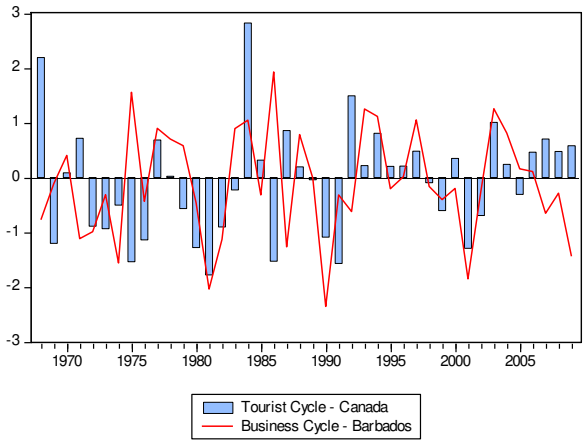
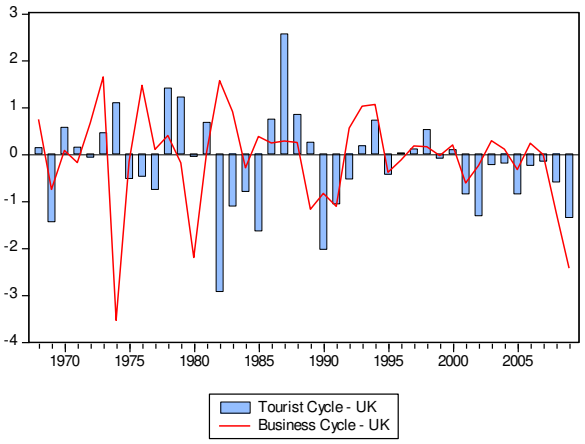
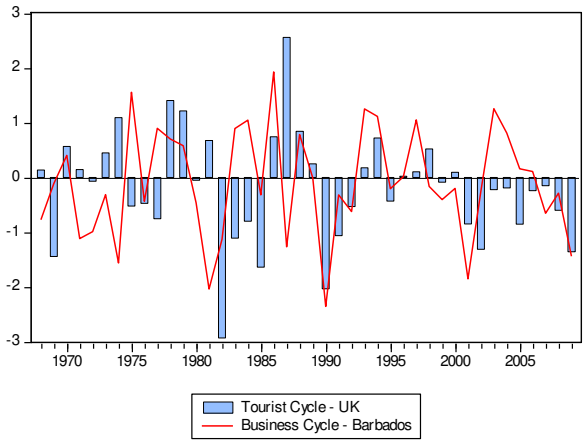
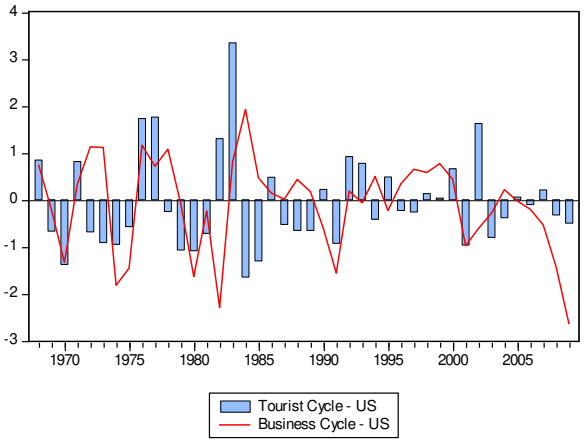
Figure 2: Business Cycles and Tourism Cycles











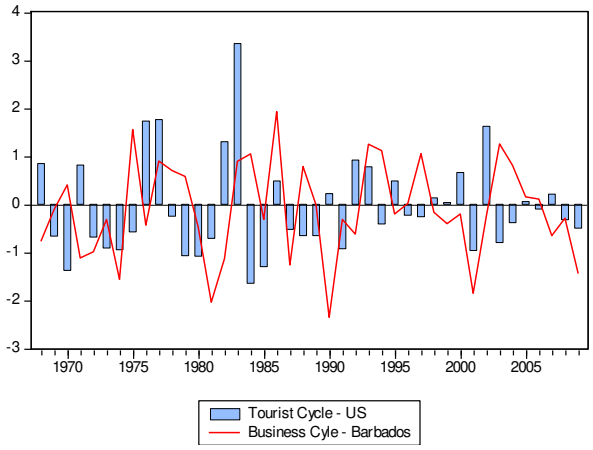


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Table 1: Cross Correlation Coefficients

	t-1	***t***	***t+1***
A. Cross Correlations with the Source Country Business Cycle			
UK Tourist Cycle	0.105 [0.111]	0.056 [0.721]	0.033 [0.843]
US Tourist Cycle	0.453 [0.009]	0.125 [0.481]	0.284 [0.096]
Canadian Tourist Cycle	0.055 [0.708]	0.356 [0.031]	0.258 [0.137]
B. Cross Correlations with the Barbados Business Cycle			
UK Tourist Cycle	0.314 [0.139]	0.169 [0.297]	0.209 [0.206]
US Tourist Cycle	0.173 [0.261]	0.026 [0.880]	0.211 [0.209]
Canadian Tourist Cycle	0.326 [0.034]	0.097 [0.551]	0.065 [0.707]
C. *Cross Correlations with Oil Prices*			
UK Tourist Cycle	-0.008 [0.988]	-0.993 [0.060]	-0.766 [0.144]
US Tourist Cycle	-1.416 [0.011]	-0.393 [0.493]	-0.177 [0.745]
Canadian Tourist Cycle	-0.690 [0.159]	-0.189 [0.709]	-0.540 [0.313]
D. Cross Correlations with Relative Prices			
UK Tourist Cycle	-4.513 [0.006]	-2.596 [0.109]	-2.588 [0.111]
US Tourist Cycle	-3.442 [0.342]	-3.329 [0.423]	-3.047 [0.486]
Canadian Tourist Cycle	-3.454 [0.143]	-2.041 [0.417]	-0.651 [0.815]

Note: p-values in squared parentheses [ ].

Table 2: Variance Decompositions

	Horizon	Tourism Cycle	Source Country Business Cycle	Barbados Business Cycle	Oil Prices	Relative Prices
A. UK Tourist Cycle						
	1	93.355	6.036	0.000	0.276	0.333
	5	47.537	18.343	1.555	9.751	22.814
	10	45.983	18.611	1.897	10.034	23.475
B. US Tourist Cycle						
	1	83.358	6.146	0.000	0.549	9.948
	5	54.062	24.147	5.596	9.026	7.168
	10	53.909	24.153	5.678	9.119	7.141
C. Canadian Tourist Cycle						
	1	89.996	2.753	0.000	0.199	7.713
	5	29.064	14.449	14.449	19.300	10.438
	10	27.429	25.331	14.171	18.031	15.039

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Table 3: Granger Causality Tests

Null Hypothesis	**χ^2 test statistic**
Source Country business cycle does not Granger-cause:	
UK Tourist Cycle	4.971 [0.083]
US Tourist Cycle	7.559 [0.006]
Canadian Tourist Cycle	6.887 [0.032]
Barbadian Business Cycle does not Granger-cause	
UK Tourist Cycle	3.522 [0.172]
US Tourist Cycle	1.258 [0.262]
Canadian Tourist Cycle	13.495 [0.001]
Oil Prices does not Granger-cause	
UK Tourist Cycle	0.227 [0.893]
US Tourist Cycle	6.725 [0.010]
Canadian Tourist Cycle	10.977 [0.004]
Relative Prices does not Granger-cause	
UK Tourist Cycle	11.077 [0.004]
US Tourist Cycle	0.922 [0.337]
Canadian Tourist Cycle	2.803 [0.246]

Note: p-values in squared parentheses [ ].