Tourism, Economic Growth and Monetary Policy in Jamaica

Abstract

The study examines the causal relationships among economic growth, tourism expansion and the real exchange rates in Jamaica over the period 1963 to 2008. Both Dickey-Fuller (1979) and augmented form, and Kwiatkowski, Phillips, Schmidt and Shin (1992) tests are used to test the stationarity properties of the variables, and AIC and SBIC are used to determine the optimum lag lengths of the variables. Johansen cointegation test and the autoregressive distributed lag estimates are used to determine the long-run equilibrium relationships among the variables. In both short-term and long-run increase in tourist arrivals (or real tourist expenditures) causes expansion in economic growth. In the long-run there is bi-directional causal relationship between only tourist arrivals and the real exchange rates. Economic growth and the real exchange rates do not cause tourist arrivals (or real tourist expenditures). The Johansen tests show tourist arrivals (or real tourist expenditures), real exchange rate and economic growth to be cointegrated. Tourism-led economic growth finding in both short-term and long-run implies that extending incentives to promote the country as a tourist destination is worthwhile. However, it is important that policymakers implement policies to reduce the leakage of foreign exchange earnings in the tourism sector.

Keywords: Tourism; economic growth; real exchange rate; autoregressive distributed lagged error correction model; cointegration; causality

JEL: C22, F41, O43

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Preliminary drafts copy prepared for the 11th Annual SALISES 2010 Conference in Port of Spain, Trinidad-Tobago, 24-26 March 2010.

1. Introduction

Tourism in Jamaica dates back to 1830 when there were nearly 1400 inns and houses for visitors to the country. The Hotels Act of 1890 encouraged more hotels accommodations to be built in principal towns like Kingston, Spanish Town, Port Antonio, Mandeville, to name a few. In the post independence era, the Jamaican Tourist Board was established to make tourism, one of the country's main foreign exchange earners, and a source of employment. Since the mid 2000 more than 2.5 million tourists have been visiting the country each year, with tourism and its related products employing nearly 25 percent of the national work force. This compares favourably with Taiwan's experience in 2000, and it surpasses the peak tourist arrivals in India in 1999 (Cf. Lee and Chien, 2008; Battacharya and Narayan, 2005).

Tourist expenditures as a share of the national income dropped from 16.6 percent in 1996 to 12.5 percent in 2002; it then rose gently to 14.2 percent in 2007. This far exceeds the tourist receipt per income of 4.2 per cent in 1996 for Taiwan, a well known export-oriented economy (see Kim et al., 2006; Ghartey, 1993), 5.9 per cent in 2000 for Spain according to World Tourism Organization (WTO) (Balaguer and Cantavella-Jorda, 2002), 4.6 percent in 2002 for Turkey (Gunduz and Hatemi-J, 2005) and 3.5 per cent in 2002 for South Korea according to Bank of Korea (Kim et al., 2006). The share of tourism in the gross earnings from exports of goods and services fell from 31 percent in 1999 to 27.8 percent in 2007. This is in spite of the fact that tourist arrivals in the country continue to trend upward over the years. See Figures 1 and 2. As a result, growth of foreign exchange earnings from tourism have not maintained an upward trajectory compared with what obtains in South Korea, Spain and Taiwan (Oh, 2005; Balaguer and

Figure 1: Shares of Tourist Expenditures in the GDP (%)

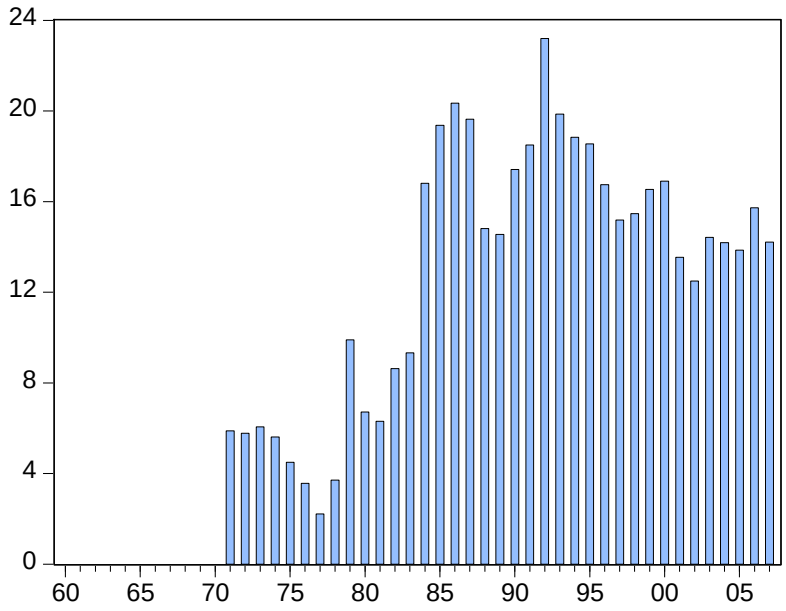
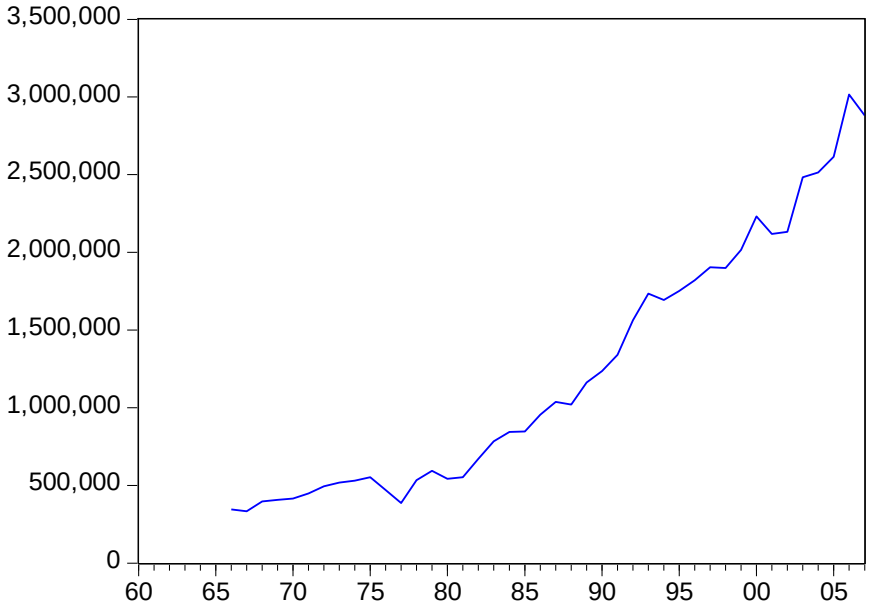


Figure 2: Number of Tourists Visiting the Country



Cantavella-Jorda, 2002; Lee and Chien, 2008).[1]

Although tourism has always been an important focus of the government with a designated Minister of Tourism, in 2009 the government adopted a new tourist promotion strategy in what is currently dubbed as "Spruce up Jamaica National Tourism" logo which aims at raising the awareness of Jamaicans to tourism in the country and "Tourism Experience" which seeks to promote tourism among Jamaican residents. Additionally, plans are afoot to make the country a destination where merchants can import and sell 'high-end products' to tourists at a six percent tax rate to raise revenue for the government, in what is known as inventory enrichment strategy. A strategy which is remotely akin to "The Doubling of Tourist Arrivals Plan" initiated to stimulate the economy and promote jobs in Taiwan (Kim et al., 2006).

There are ample empirical studies that show economic growth and tourism to be interrelated. Some studies establish tourism as a driver of economic growth (Balaguer and Cantavella-Jorda, 2002; Dritsakis, 2004; Gunduz and Hatemi-J, 2005), while Oh (2005) finds economic growth driving tourism for Korea. Other studies show tourism and economic growth to be bi-directionally related for Taiwan (Kim et al., 2006; Lee and Chien, 2008).

Brau et al. (2003) indicate that small countries that specialize in tourism can hasten their economic growth. This means that the country can exploit the tourism sector as a source of dependable foreign exchange earnings to meet its balance of payment obligations, and finance its huge national debt. The tourism sector by being exposed to

[1] Tourism expenditures as a share of the GDP fell from 15.72% in 2006 to 14.81% in 2007, while remittances as a share of the GDP rose from 14.76% in 2006 to 15.23% in 2007. In 2007, tourism expenditures grew by 1.34% but fell by 0.47% in 2008; while remittances grew by 11.0% in 2007 but fell by 47.57% in 2008.

high competition in the world market, can also contribute to economic growth of the country by enhancing economic efficiency and facilitating economies of scale of production among firms in the country. Foreign exchange earnings from tourism, can also assist the country to fund importation of capital and raw materials necessary for production and economic growth of the country (see Kim et al., 2006; Brau, 2003; Balaguer and Cantavella-Jorda, 2002; Durbarry, 2002; Krugman and Helpman, 1985; Bhagwati and Srinivasan, 1979).

Empirical studies on the effect of tourism on economic growth define tourism either as tourist arrivals or expenditures (Kim et al., 2006); tourist arrivals are used for China by Shan and Wilson (2001), and for Aruba by Croes and Vanegas (2005). Lee and Chien (2008) and Gunduz and Hatemi-J (2005) began their studies with both tourism data, but finally ended up using tourist arrivals for Taiwan and Turkey, respectively, because the latter yielded better results than tourist expenditures which were dropped because of multicollinearity problem. Oh (2005), Dritsakis (2004), and Balaguer and Cantavella-Jorda (2002) used tourist expenditures in their studies.

The motivation of this study is to find the direction of causal relationship between tourism and economic growth in Jamaica to assist policymakers to find other sources of foreign exchange earnings for the country as it faces a dim current world market where its exports of bauxite, alumina and banana are no longer a reliable source of income. Both tourism data are used to examine the causal relationships between tourist arrivals (or real tourist expenditures) and economic growth for the first time in Jamaica. It also examines the effect of monetary policy, which is captured by the real exchange rates in the study to shed some light on the viability of relying on the inventory enrichment strategy recently

introduced by the government as vehicle to raise revenues. Note that other studies have also included the real exchange rates (Lee and Chien, 2008; Croes and Vanegas, 2005; Balaguer and Cantavella-Jorda, 2002; Shan and Wilson, 2001).

The study is formatted as follows: literature on the subject is reviewed in section 2 after the introduction. The model and data are presented in section 3, and the empirical results are reported and discussed in section 4. The paper is concluded with a summary of the findings and policy recommendations in section 5.

2. Literature Review

2.1 Nature of Tourism

Tourism which is often referred to as an industry does not, in a technical economic sense, employ factors of production nor operate variables traditionally employed in the production process. It is labor intensive, and regarded as a part of the non-traded sector of the economy, as it provides services to both domestic and foreign sectors of the economy. It constitutes the invisible part of the balance of payments account.

Tourism is listed as a demand for a bundle of goods and services on the questionnaire for the collection of primary data on tourism. It consists of both consumption component which is travelers who visit foreign countries on account of leisure, and production component which is travelers who visit countries on account of business. It is generally common for the same persons or tourists who visit a country for business to end up spending some period there for leisure. As a result, tourism cannot be explicitly regarded as a purely consumption or production good. Additionally, unlike most goods that are carried to the end user, tourism is a good which the end user is carried to the goods and services (O'Hagan and Harrison, 1984). It is therefore regarded

also as imports by Gray (1966), although in other studies it is considered as exports (Carey, 1991).

Tourism is influenced by transportation cost, although tourism expenditure excludes transportation cost. It is noteworthy to know that foreign exchange is important in the decision of the tourists to consume in the host country. Therefore among the main determinants of tourism are income of the origin travelers, relative prices of the host country, cost of living of the host country which is measured by the relative exchange rate or exchange rate of the host country, international trade which is measured by the sum of exports and imports as a ratio of the GDP, and transportation cost or distance between the host and origin countries (Gray, 1966; Kwack, 1972; Lim, 1997; Shan and Wilson, 2001).[2]

Tourism often assists in economic development, as it involves the construction of infrastructure, like roads, airports, harbors, street light, pipe borne water system, sewer system, hotels, to name a few. It also improves the welfare of the citizenry by providing jobs, increasing revenues, and enhancing income distribution and the well being of nationals. It is also an important feature of international trade since inbound tourism demand tends to be dominated by business travel in some countries such as China where it features importantly in international trade (Shah and Wilson, 2001); whereas in Jamaica, inbound tourism is dominated by pleasure travel, nevertheless, it could drive economic growth.

Tourism carries in its trail the development of social linkages which could result in social infrastructure, cultural and environmental problems. Increase in demand for

[2] O'Hagan and Harrison (1984) list other factors such as sporting events, political stability, and other events as well which are non-economic as explanatory variables of tourism demand.

goods and services by tourists can also drive up inflation pressure in the country. In the light of the costs and benefits associated with tourism, we have provided an empirical study which for the first time in the annals of the country's history establishes whether tourism can be relied on by the government to promote economic growth and development of the country.

Note that if economic growth promotes tourism, then policymakers will not have to design policies to allocate huge fraction of the national income and resources to spending associated with the promotion of tourism. If on the other hand tourism is found to cause economic growth, then it is justifiable for the government to spend a huge fraction of the national income to boost the tourist industry. This will entail the government investing more money in the Jamaica tourist board and other related institutions, and foregoing taxes by extending tax incentives to foreigners to build and operate hotels, and set up other tourist infrastructure in the country to keep the tourist industry viable while providing enough land space for further expansion in the future.

2.2 Empirical Review

The early literature on tourism started in the 1960s when data on tourism was not readily available. During that period researchers compiled and calculated data on travelers from balance of payments accounts (see Gray, 1966; Kwack, 1972). In 1978 the United Nations (UN) conventionally defined a tourist as a traveler who spends at least a day in the country visited for either leisure or business. Since then data on tourism which comprises of the number of tourist visiting a country, the length of days stayed in the country and expenditures of the tourist per day which allows a country to compute the

receipts or expenditures of tourists have been made available. This has enhanced more research on tourism.

Early empirical studies on tourism demand employed single equation model to estimate multipliers and elasticities of income, exchange rate and price effects (Gray, 1966; Kwack, 1972). It became clearer to researchers that the use of tourist expenditures as a dependent variable in such studies yielded poor results because of multicollinearity and autocorrelation problems, so the best tourist data for such research was found to be tourist arrivals, which are readily available and often free of multicollinearity and autocorrelation problems. The draw back with using tourist arrivals is that they do not translate into commensurate spending in the host country, whereas tourist expenditures capture the effect of tourist spending in the host country.

The almost ideal demand system (AIDS) which was developed by Deaton and Muellbauer (1980) was first applied to study tourism demand because it was an improvement over the single equation (see O'Hagan and Harrison, 1984). In the 1990s, tourism studies were further extended to forecast tourist arrivals (see Carey, 1991; Dharmaratne, 1995; Vanegas and Croes, 2000; De Mello et al., 2002).

The development of cointegration using error correction models in the late 1980s was also applied to study tourism demand (Dritsakis, 2004; Narayan, 2004). Studies that investigate cointegration and causality between tourism growth, as measured by tourist arrivals and expenditures, and economic growth in a bivariate models are Oh (2005) for South Korea, while Lee and Chien (2008) considered a multivariate model to investigate causal relationship among tourist arrivals, real GDP and the real exchange rate by allowing for structural breaks for Taiwan over the period 1959 to 2003. They eliminated

tourist expenditures from the study because of limited available data. Kim et al. (2006) employed Granger causality to study the effect of tourist arrivals on economic growth for Taiwan with both quarterly and annual data over the periods 1971.1 to 2003.2 and 1956 to 2002, respectively.

Balaguer and Cantavella-Jorda (2002) in examining the role of tourism in the long-run economic growth of Spain employed real GDP, real tourist earnings, and real effective exchange rate which is used to capture external competitiveness using quarterly data from 1975.1 to 1997.1. Shan and Wilson (2001) examined the causal relationship between trade and tourism by employing the augmented vector autoregressive (VAR) model with vector of variables consisting of tourist arrivals, income, total trade defined as the sum of exports and imports, the exchange rate, and the real exchange rate which they used as a proxy for cost of living for China over the period 1981 to 1998.

This study employs the real GDP, the real exchange rates, and both tourist arrivals and real tourist expenditures to measure tourism. The variables are pre-whitened to establish the order of integration by using different unit root tests to lend rigor to the findings. Johansen cointegration tests and autoregressive distributed lag estimates (ADL) are used to establish the steady state relationship between the variables of interest. Hsiao's (1979) stepwise Granger causality tests, the ADL estimates and different goodness of fit tests on restrictions are then used to find out the direction of causation in both short-term and long-run. We also measured the responsiveness of tourist arrivals and/or real tourist expenditures to economic growth and the real exchange rates of the nation.

3. The Model and Data

The basic form of the vector autoregressive (VAR) model is expressed as

$$\Phi(B)\mathbf{X}_t = \mathbf{e_t}, \ \forall \ t \in 1, \ldots, T \qquad (1)$$

where $\mathbf{e_t}$ is Gaussian errors with i.i.d. and $\mathbf{e_t} \sim N(0, \Sigma)$, $\mathbf{X}_t = [y_t \ ta_t \text{ or } tg_t \ q_t]'$ is 3x1 column vector of variables: y_t is the real GDP, ta_t is tourist arrivals, tg_t is real tourist expenditures, q_t is the real exchange rate which is a proxy for cost of living and measures competitiveness. The optimum lag-length of $\Phi(B)$ is k, and there is no deterministic components, and $\Phi(B) = \begin{pmatrix} \Phi_{11} & \Phi_{12} \\ \Phi_{21} & \Phi_{22} \end{pmatrix}$. Small case letters denote logarithmic form of respective variables.

The error-correction specification of equation (1) is specified as

$$\Delta\mathbf{X}_t = \Gamma_1\Delta\mathbf{X}_{t-1} + \ldots + \Gamma_{k-1}\Delta\mathbf{X}_{t-k+1} + \Pi\mathbf{X}_{t-1} + \mathbf{e_t} \qquad (2)$$

where $\Gamma_j = -(I - \Phi_1 - \ldots - \Phi_j), \ \forall \ j \in 1, \ldots, k-1$, and $\Pi = -(I - \Phi_1 - \ldots - \Phi_k) = \alpha\beta'$.

Thus, the compact form of equation (2) is

$$\mathbf{X}_{ot} = \Pi\mathbf{X}_{1t} + \Gamma\mathbf{X}_{2t} + \mathbf{e_t} \qquad (3)$$

where, $\mathbf{X}_{ot} = \Delta\mathbf{X}_t$, $\mathbf{X}_{1t} = \mathbf{X}_{t-1}$ and $\mathbf{X}_{2t} = (\Delta\mathbf{X}_{t-1}' \ldots \Delta\mathbf{X}_{t-k+1}')$. $\mathbf{X}_{ot}$ is a 3xT matrix of first differences of $\mathbf{X}_t$, $\mathbf{X}_{1t}$ is the lagged $\mathbf{X}_t$, Γ is a (3x(k-1).3) matrix of stacked Γ_js and $\mathbf{e}$ is a 3xT matrix of Gaussian errors for the 3 equations in the system, α and β are 3xr matrices. Given that the rank (Π) = r, if r < 3 and the number of cointegrated equations of $\beta'\mathbf{X}_{1t}$ is r, then there is long-run causality with the exogenous variables causing the endogenous variable.

Estimated parameters of equation (1) in a bivariate model indicate that in the short-run ta or tg (or q) uni-directionally Granger-causes y if and only if $H_0: \Phi_{21,j} = 0, \ \forall \ j \in 1, 2, \ldots, k$ (where $\Phi_{21,j}$'s are the coefficients of the manipulated variables), is rejected

as judged by either Wald (W) test or modified W test or log-likelihood ratio (LR) test or Lagrange multiplier (LM) test (Granger, 1991; Mosconi and Giannini, 1992; Zapata and Rambaldi, 1997; Harvey, 1999; Juselius, 2006).[3] We have used both W and LM tests to supplement the LR test. The LR test is calculated from both restricted and unrestricted equations by using the maximum likelihood functions calculated under H_0 and H_1, respectively. W test is calculated from the unrestricted equation only, so it is not affected when the estimation of restricted equations is problematic, and the LM test is calculated from only the estimation of the restricted equation (Harvey, 1999).

The ADL estimates of the parameters of Π in equation (2) indicate that in the long-run ta or tg (and/or q) does not Granger-cause y if they are insignificant (Engle and Granger, 1991; Peseran and Shin, 1999; Harvey, 1999). The variables are interchanged to test reverse Granger-causation between (and among) all the variables; note that ta and tg are considered to be alternate tourism data in the study.[4] We have employed the ADL estimates because they are not sensitive to the order of integration and perform very well in undersized samples. See Pesaran and Shin (1999).

3.1 Data

Consumer price index (P^{JM}, 1995 base year), 1962-2008; tourist arrivals (TA), 1966-2008; real tourist expenditures (TG), 1971-2008; GDP, 1962-2007; exchange rate (XR), end of the period average, and P^{US} (1996 base year), 1960-2008. Tourism data are TA and TG; they are used alternatively because they have different policy implications in the study, and are sourced from **Statistical Digest**, Bank of Jamaica, various issues. The rest

[3] F-test is our default joint test of zero restrictions.
[4] See also Ghartey (2008) for application of the ADL methodology.

of the variables are sourced from **International Financial Statistics**, International Monetary Fund, various issues. $Q = (XR*P^{US})/P^{JM}$ where super scripts US and JM denote United States and Jamaica, respectively. Small case letters denote logarithmic form of respective variables.

4. Discussion of the Empirical Results

Results of Table 1 from both Dickey-Fuller (DF) and augmented DF (ADF) tests indicate that all the variables are stationary in first difference form at 0.01 significant levels, with the exception of tg which is significant at 0.05 levels for the case with intercept and trend. The LM statistic of the KPSS test of the level form of tg for the H_0 of stationarity is rejected for the case with intercept at 0.10 significant levels. Level form of ta and q is stationary for the case with intercept and trend as the LM statistic of the H_0 of stationarity cannot be rejected at 0.10 significant levels. The first difference form of the variables is stationary at 0.01 significant levels as the LM statistic of the H_0 of stationarity cannot be rejected at 0.01 significant levels for all the variables for both cases with intercept, and intercept with trend. Thus, all variables are not integrated at the same degree so the ADL estimator which does not discriminate on the basis of the order of integration is used for the study.

The optimum lag-lengths of the variables are selected by Akaike information criterion (AIC) and Schwarz-Bayesian information criterion (SBIC). Results in Table 2 show that both criteria select optimum lag-lengths of both Δtg and Δy to be four, while the SBIC selects optimum lag-lengths of four for both Δta and Δq. The AIC selects the optimum lag-length of Δta to be two, and Δq to be three.

The Johansen cointegration tests reported in Table 3 show that (ta and y) and (ta

Table 1: Unit Roots Tests

	Level Form					
	With Intercept		Without Intercept and Trend		With Intercept and Trend	
Variables	k	ADF[p-values]	k	ADF[p-values]	k	ADF[p-values]
ta	2	-0.063[0.946]	2	4.476[1.000]	0	-2.583[0.289]
tg	0	-1.235[0.649]	0	0.757[0.873]	1	-1.885[0.642]
q	1	-2.063[0.260]	0	0.085[0.705]	1	-2.368[0.390]
y	0	0.216[0.971]	0	2.542[0.997]	0	-1.050[0.926]
		KPSS Unit Roots Tests				
	With Intercept		With Intercept and Trend			
	BW	LM-Stat	BW	LM-Stat		
ta	5	0.817	4	0.105		
tg	5	0.611	4	0.143		
q	5	0.492	5	0.101		
y	5	0.718	5	0.167		
	Difference Form					
	With Intercept		Without Intercept and Trend		With Intercept and Trend	
	k	ADF[p-values]	k	ADF[p-values]	k	ADF[p-values]
Δta	1	-7.339[0.000]*	1	-5.128[0.000]*	1	-7.246[0.000]*
Δtg	1	-5.494[0.000]*	1	-5.352[0.000]*	1	-5.421[0.000]*
Δq	0	-4.914[0.000]*	0	-4.970[0.000]*	0	-4.874[0.001]*
Δy	0	-5.209[0.000]*	0	-4.748[0.000]*	0	-5.229[0.000]*
		KPSS Unit Roots Tests				
	With Intercept		With Intercept and Trend			
	BW	LM-Stat	BW	LM-Stat		
Δta	8	0.110	8	0.110		
Δtq	5	0.129	5	0.101		
Δq	1	0.085	1	0.073		
Δy	2	0.158	2	0.081		

Note: p-values are reported in the square brackets; * and ** denote significance at 0.01 and 0.05 levels, respectively. Asymptotic critically values of the LM statistics from the KPSS test are 0.739, 0.463 and 0.347 at 0.01, 0.05 and 0.10, respectively for the case with intercept; 0.216, 0.146 and 0.119 at 0.01, 0.05 and 0.10, respectively for the case with intercept and trend. Logarithmic form of tourist arrivals, tourist expenditures, real exchange rates and economic growth are denoted by ta, tg, q and y, respectively.

Table 2: Selection of Optimum Lag-lengths

Variables	Criteria	1	2	3	4
Δta	AIC	33.7910	**33.6861**	36.4233	34.7999
	SBIC	32.9342	31.9973	33.9280	**31.5248**
Δtg	AIC	-3.7537	-3.3400	-4.3889	**-4.7600**
	SBIC	-4.5454	-4.8953	-6.6785	**-7.7529**
Δq	AIC	36.3697	35.2444	**33.0061**	33.8253
	SBIC	35.4663	33.4602	30.3643	**30.3500**
Δy	AIC	61.6173	60.8886	58.0205	**55.4179**
	SBIC	60.7252	59.1274	55.4140	**51.9907**

Note: Boldfaced figures denote minimum values of respective information criteria. AIC denotes Akaike information criterion and SBIC denotes Schwarz-Bayesian information criterion.

Table 3: Johansen Cointegration Tests of Tourist Arrivals (ta) or Real Tourist Expenditures (tg), Economic Growth (y) and Real Exchange Rates (q)

H_0	H_1	λ_{Max}	H_1	λ_{Trace}
Cointegration of ta and y				
r=0	r=1	9.497[9.280]***	r≥1	14.984[12.360]**
r≤1	r=2	5.487[3.040]***	r =2	5.487[4.160]**
Cointegration of tg and y				
r=0	r=0	5.519[11.030]	r≥1	7.433[12.360]
r≤1	r=1	1.914[3.040]	r=2	1.914[3.040]
Cointegration of ta and q				
r=0	r=1	25.562[11.030]**	r≥1	29.512[12.360]**
r≤1	r=2	3.950[3.040]***	r=2	3.950[3.040]**
Cointegration of tg and q				
r=0	r=1	3.102[11.030]	r≥1	3.366[12.360]
r≤1	r=2	0.264[3.040]	r=2	0.264[3.040]
Cointegation of ta, y and q				
r=0	r=1	23.849[17.680]**	r≥1	36.724[24.050]**
r≤1	r=2	8.497[9.280]	r≥2	12.874[12.360]**
r≤2	r=3	4.377[4.160]**	r=3	4.377[4.160]**
Cointegration of tg, y and q				
r=0	r=1	19.239[17.680]**	r≥1	24.795[24.050]**
r≤1	r=2	3.913[9.280]	r≥2	5.556[10.250]
r≤2	r=3	1.643[3.040]	r=3	1.643[3.040]
Restricted normalized cointegrated vectors:				
(ta y)		(ta q)	(ta y q)	
(-1.000 1.765), (-1.000 1.899)		(-1.000 5.098), (-1.000 4.191)	(-1.000 0.948 2.247), (-1.000 1.536 0.691), (-1.000 7.916 -13.274)	
Restricted normalized cointegrated vectors:				
(tg y)		(tg q)	(tg y q)	
(-1.000 0.683)		(-1.000 1.839)	(-1.000 0.524 1.529)	

Notes: Critical values are reported in square brackets. ** and *** denote critical values at 95% and 90%, respectively.

Table 4: Short-term Granger Causality Tests of Tourist Arrivals (ta) or Real Tourist Expenditures (tg), Economic Growth (y) and Real Exchange Rates (q)

Cont. Variable	Man. Variable	Criteria	$\chi^2_{LM}(k)$	$\chi^2_{LR}(k)$	F(k, n-k)/ **Wald**	Causal Direction
Bivariate case						
Δta[2]	Δy[2]	AIC: 31.121	1.53[0.47]	1.56[0.44]	0.71[0.50]	$\Delta y \nRightarrow \Delta ta$
		SBIC:27.794				
Δy[4]	Δta[4]	AIC: 50.099	8.86[0.06]***	10.13[0.04]**	2.28[0.08]***/ **9.13[0.05]****	$\Delta ta \Rightarrow \Delta y$
		SBIC: 43.656				
Δta[2]	Δq[2]	AIC: 32.301	1.21[0.55]	1.23[0.54]	0.56[0.57]	$\Delta q \nRightarrow \Delta ta$
		SBIC: 28.923				
Δq[4]	Δta[4]	AIC: 26.438	5.42[0.25]	5.84[0.21]	1.25[0.31]	$\Delta ta \nRightarrow \Delta q$
		SBIC: 19.888				
Δtg[4]	Δy[4]	AIC: -8.201	1.92[0.75]	1.98[0.74]	0.38[0.82]	$\Delta y \nRightarrow \Delta tg$
		SBIC: -14.064				
Δy[4]	Δtg[4]	AIC: 42.772	8.64[0.07]***	10.08[0.04]**	2.22[0.09]**/ **8.88[0.06]****	$\Delta tg \Rightarrow \Delta y$
		SBIC:36.909				
Δtg[4]	Δq[4]	AIC: -6.682	4.65[0.32]	5.02[0.28]	1.02[0.42]	$\Delta q \nRightarrow \Delta tg$
		SBIC: -12.545				
Δq[3]	Δtg[3]	AIC: 21.107	2.19[0.53]	2.27[0.52]	0.64[0.598]	$\Delta tg \nRightarrow \Delta q$
		SBIC: 16.617				
Trivariate Case						
Δta(2)	Δy(2)	AIC: 29.968	3.12[0.54]	3.25[0.52]	0.72[0.59]	Δy and $\Delta q \nRightarrow \Delta ta$
	Δq(2)	SBIC: 24.977				
Δy(4)	Δta(4)	AIC: 49.738	13.88[0.08]***	17.41[0.03]**	1.88[0.11]/ **15.02[0.05]****	Δta and $\Delta q \Rightarrow \Delta y$
	Δq(2)	SBIC: 40.073				
Δtg[4]	Δy[4]	AIC:-9.434	6.70[0.57]	7.52[0.48]	0.66[0.72]	Δy and $\Delta q \nRightarrow \Delta tg$
	Δq[4]	SBIC:-18.229				
Δy[4]	Δtg[4], Δq[4]	AIC: 43.967	15.12[0.05]**	20.47[0.01]*	2.24[0.07]***/ **17.91[0.02]****	Δtg and $\Delta q \Rightarrow \Delta y$
		SBIC: 35.172				

Note: Wald tests are boldfaced, and all small case variables are expressed in logarithmic form. See also the note in Table 3.

Table 5: Long-run Granger Causality Tests and ADL Estimates

ADL Model's Order	Dependent Variables	Regressors	Long-run Coefs.	Coefs. of EC_{t-1} Term	Causal Direction	
Bivariate Case						
(3, 0)	ta	y	1.667[0.00]*	0.054[0.26]		$y \not\Rightarrow ta$
(3, 0)	y	ta	0.534[0.00]*	-0.133[0.01]*		$ta \Rightarrow y$
(3, 0)	ta	q	4.935[0.00]*	-0.040[0.01]*		$q \Rightarrow ta$
(2, 1)	q	ta	0.227[0.00]*	-0.240[0.01]*		$ta \Rightarrow q$
(1, 0)	tg	y	0.780[[0.00]*	-0.09[0.26]		$y \not\Rightarrow tg$
(1, 0)	y	tg	1.497[0.00]*	-0.032[0.01]*		$tg \Rightarrow y$
(1, 1)	tg	q	1.688[0.00]*	-0.120[0.21]		$q \not\Rightarrow tg$
(1, 1)	q	tg	-0.249[0.99]	-0.005[0.99]		$tg \not\Rightarrow q$
Trivariate Case						
(3, 0, 0)	ta	y	-1.020[0.85]	-0.025[0.63]		y and $q \not\Rightarrow ta$
		q	7.666[0.60]			
(3, 0, 0)	**y**	**ta**	**0.633[0.00]***	**-0.0169[0.00]***		**ta and $q \Rightarrow y$**
		q	**-0.435[0.19]**			
(2, 2, 0)	q	y	-0.512[0.04]**	-0.405[0.00]*		y and $ta \Rightarrow q$
		ta	0.502[0.00]*			
(3, 0,1)	tg	y	-1.298[0.19]	-0.130[0.14]		y and $q \not\Rightarrow tg$
		q	4.648[0.05]**			
(1, 0, 0)	**y**	**tg**	**0.883[0.27]**	**-0.041[0.04]****		**q and $tg \Rightarrow y$**
		q	**0.953[0.45]**			
(1, 2, 3)	q	y	0.452[0.00]*	-0.251[0.02]**		y and $tg \Rightarrow q$
		tg	-0.039[0.82]			

Note: Granger-causality is denoted by $\Rightarrow$, thus ta $\Rightarrow$ y means ta Granger-causes y; and no Granger-causality is denoted by $\not\Rightarrow$, thus y $\not\Rightarrow$ ta means that y does not Granger-cause ta; p- values are reported in square brackets. *, ** and *** denote significance at 0.01, 0.05 and 0.10 levels, respectively. See also the note in Table 1.

and q) are all cointegrated as judged by both λ_{Max} and λ_{Trace} at either 0.05 or 0.10 significant levels. Thus there are two cointegrated equations between the respective paired variables. There are no cointegrated relationship between (tg and y) and (tg and q). Additionally, judged by both λ_{Max} and λ_{Trace} at either 0.05 or 0.10 significant levels, there are about three cointegrated relations among (ta, y and q), and one cointegrated relation among (tg, y and q). Their respective restricted normalized cointegrated vectors are reported in the table.

The short-term Granger-causality tests conducted by following the Hsiao's (1979) stepwise Granger-causality method reported in Table 4 show that in the bivariate process, Δta uni-directionally Granger-causes Δy, while Δtg uni-directionally Granger-causes Δy. This evidence is supported by Gunduz and Hatemi-J (2005) for Turkey, and Balaguer and Cantavella-Jorda (2002) for Spain. There are no other Granger-causal relationships between any other pairs in the short-term. In the trivariate process, Δta and Δq uni-directionally Granger-cause Δy, Δtg and Δq uni-directionally Granger-cause Δy; again there are no other Granger-causal relationships in the short-term.

In the long-run, Table 5 shows that the coefficients of the estimated error-correction terms show that tourist arrivals (or real tourist expenditures) uni-directionally Granger-cause economic growth. There is a bi-directional Granger-causal relationship between the real exchange rates and tourist arrivals; while real tourist expenditures and the real exchange rates are independent (Cf. Lee and Chien, 2008). Additionally, tourist arrivals (or real tourist expenditures) and the real exchange rates Granger-cause economic growth, tourist arrivals (or real tourist expenditures) and economic growth Granger-cause

the real exchange rate, but economic growth and the real exchange rates do not Granger-cause either tourist arrivals or real tourist expenditures.

It is clear from the results that economic growth is endogenous in the model. We decided to find out whether tourist arrivals or real tourist expenditures are relevant for the study by conducting a long-run ADL estimation of a quadrivariate model which yields the following results:

ADL (3, 0, 0, 0): y = -0.267[0.28]q + 0.632[0.00]*ta – 1.091[0.27]tg (4)

$\overline{R}^2$ = 0.97, F(5, 27) = 201.71[0.00]*, DW = 2.039, $\chi^2_{SC}(1)$ = 1.244[0.26],

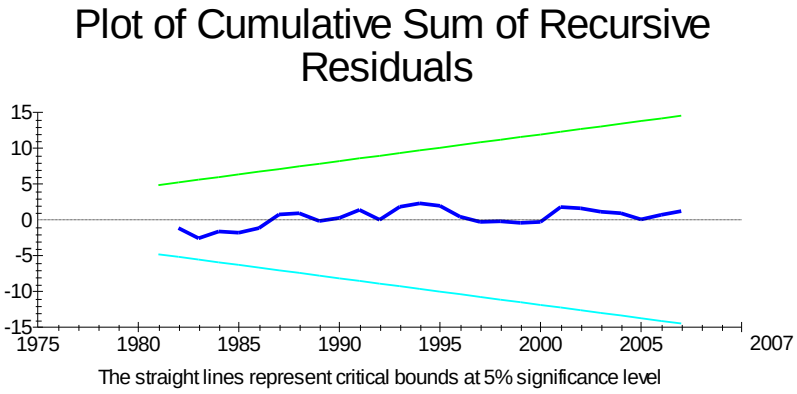
$\chi^2_{FF}(1)$ = 0.252[0.62], $\chi^2_{H}(1)$ = 0.13[0.72] and $\chi^2_{N}(2)$ = 1.57[0.46]

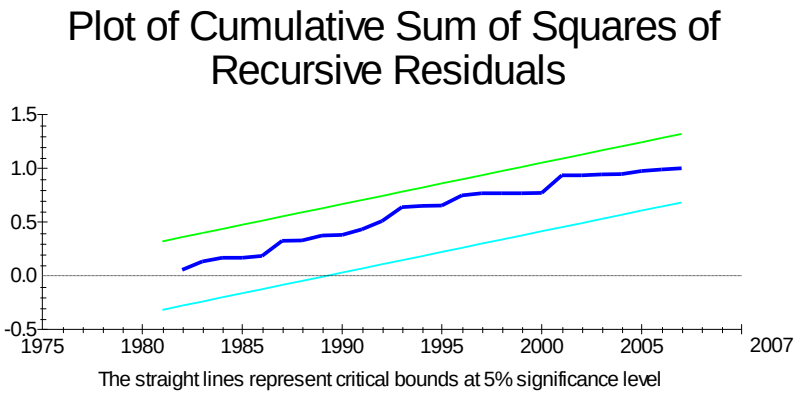
where p-values are reported in square brackets, degrees of freedom are reported in parentheses, $\overline{R}^2$ is adjusted coefficient of determination, χ^2_{SC} is LM test for residual serial correlation, χ^2_{FF} is the functional form test which uses the reset test of Ramsey which is based on the square of residual values, and χ^2_{H} is heteroscedasticity test and it is based on regressing the squared residuals on the squared fitted values. χ^2_{N} is the normality test and is based on the skewness and kurtosis of residuals under the assumption of homoscedasticity against the alternative assumption of heteroscedasticity (Jarque and Bera, 1980). See the boldface in Table 5.

The stability tests from the plot of cumulative sum and cumulative sum of squares of recursive residuals in Figures 3 show that equation (4) is stable, as both graphs lie within their respective 5 percent significance level bands. Additionally, the diagnostic tests indicate that equation (4) has a good functional form, no heteroscedasticity and serial correlation problems, and passes the normality test.

The long-run result of equation (4) shows that tourist arrivals are the only

Figure 3: Stability test of equations 4 with economic growth as the dependent variable





explanatory variables of economic growth in Jamaica and it is significant at 0.01 levels. This explains further as to why studies that examine the role of tourism in economic growth tend to define tourism as tourist arrivals only (Lee and Chien, 2008; Croes and Vanegas, 2005; Gunduz and Hatemi-J, 2005; Shan and Wilson, 2001). The error-correction term is -0.268 and is significant at 0.05 levels. Additionally, *all other things being equal,* in the long-run a unit increase in tourist arrivals result in less than proportionate change in economic growth. Income elasticity with respect to tourist arrivals is 0.632 and is significant at 0.01 levels. Thus a 5 percent increase in tourist arrivals will result in economic growth of 3.1 percent.

5. Conclusion

In the short-term only an increase in tourist arrivals (or real tourist expenditures) leads to an increase in economic growth. Changes in tourist arrivals (or real tourist expenditures) and the real exchange rates lead to changes in economic growth. In both short-term and long-run, changes in economic growth and the real exchange rates do not lead to either changes in tourist arrivals or real tourist expenditures. Additionally, changes in tourist arrivals or real tourist expenditures and economic growth lead to changes in the real exchange rates.

Tourist arrivals (or real tourist expenditures), real exchange rates and economic growth are cointegrated. Among the variables in the model, economic growth is endogenous and is explained by tourist arrivals; real tourist expenditures and the real exchange rates are insignificant in explaining the country's economic growth. Tourism in the study is therefore defined as tourist arrivals.

The tourism-led economic growth finding in both short-term and long-run implies that extending incentives to suppliers of tourism and related products to promote the country as a tourist destination is important in increasing the number of tourist arrivals in the country. However, depreciation and increase in real tourist expenditures retard economic growth, *all other things being equal*, although both variables are not statistically significant.

Considering that the promotion of tourist arrivals or real tourist expenditures boosts economic growth, policymakers must continue with policies that promote the country as the preferred tourist destination. The inventory enrichment strategy which aims at taxing inbound tourists six percent appears to be consistent with increasing foreign exchange receipts in the sector; but if majority of our tourists are from developed countries[5], then the effectiveness of relying on such a strategy to attract inbound tourists to buy high end product in Jamaica appears to be a daunting task. Rather, promoting goods and artifacts that are uniquely Jamaican and Caribbean may be the best means to induce additional spending from such group of tourists.

It is important that the government continues to provide incentives to encourage players in the sector to re-invest or plough-back profit into the tourism sector, and reduce the leakage of foreign exchange earnings by extending incentives for hoteliers to reduce their imports of identical agricultural and other goods produced locally, and rather use more local substitutes. Finally, the implementation of a joint venture policy of foreign hotel owners with Jamaican residents can further reduce foreign exchange leakages in the sector.

[5] In 2008 among landed visitors in the country, 65, 13 and 16 percent were from the US, Canada and Europe, respectively; only less than six percent were from other countries including non-resident Jamaicans.

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