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Modelling Tourism Demand in the Caribbean

An Approach Using Spatial Econometrics

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Abstract

Given the importance of tourism to the Jamaican economy, this study seeks to supplement the explanations for the resilience of Jamaica's tourism product in the context of the downturn in the US economy over the period 2008-09. We deviate from previous assessments of tourism demand by including spatial effects in an econometric model to determine whether or not Jamaica's relatively close distance to the US has been a factor responsible for her strong growth in arrivals, relative to other Caribbean countries. The study utilized a GMM framework on a panel data set of eight countries and found the spatial autoregressive parameter to be highly significant. This implies a preference, on the part of tourists, for destinations closer to their home.

JEL Classification: L83, C21

Keywords: tourism, spatial econometrics

[1] The views expressed in this paper do not necessarily reflect those of the Bank of Jamaica.

TABLE OF CONTENTS

1.0 Introduction

Tourism is one of the most important economic sectors in Jamaica. The Jamaican industry's major advantages include the government's prioritization of travel and tourism in its policy matrix. The sector, however, faces some disadvantages, including brain drain, crime, ineffective use of natural and cultural resources and insufficient human resources. While the history of tourism in Jamaica over the last 20 years has been one of steady growth, instances of decline also highlight the vulnerability of Jamaica's tourism product to external shocks. Since 2002, the tourism industry has been guided by the Master Plan for Sustainable Tourism Development (JTB, 2002).

This study is an attempt to contribute to the understanding of the relative position of the Jamaican tourism industry, vis-à-vis her Caribbean counterparts/competitors by introducing spatial effects as an argument in an econometric model. The idea is that Jamaica's relatively close distance to the US, compared with many of her competitor destinations in the Caribbean, may have given the country an edge over its neighbours. The inclusion of spatial effects follows from our *a priori* expectation that tourists have a preference for destinations which are closer to their home as opposed to destinations further away, since those which are further will usually involve greater monetary and non-monetary costs.

The study is timely in the context of the current negotiations between the UK Government and several Caribbean countries regarding the UK Government's revision to the Air Passenger Duty (APD) which it imposes on all passengers departing from UK airports. The concern arises because visitors to the Caribbean region will face a tax-level which is similar to destinations further away from the UK than the Caribbean due to the revised system of 'banding' regions based on distance. This revision, it is felt, will significantly impact the price competitiveness of Caribbean destinations which rely substantially on earnings from their tourism sectors.[2]

[2] There were originally two 'bands' for APD- one for European destinations and one for all non-European destinations, which included the Caribbean. Following consultation, the UK Government announced plans to revise APD so that the amount charged was based on a four-tier banding system. The Caribbean falls in band C which will cause the APD to move from £40 to at least £75 for an economy ticket (CTO, 2010).

The results from the study reinforce the significance of variables such as real incomes in the country's major source markets, particularly the USA, as well as wealth in determining visitor arrivals. Importantly, the study revealed a significant spatial effect implying that tourists have an inclination for closer destinations.

The remainder of the paper is structured as follows: Section two provides an overview of the tourism industry; section three provides a background to the field of spatial econometrics and well as specific considerations concerning the use of panel data; section four provides an overview of tourism demand models; section five shows the econometric specification; section six details the data used in the study as well as the results while section 7 provides some concluding remarks.

2.0 Overview of the Jamaican Industry

Tourism and remittances are the two most significant sources of foreign exchange for the Jamaican economy (see graph 1, appendix). The tourism industry, which is reflected in the *Hotels and Restaurants* sector in the country's National Accounts, contributed an average of 6.0 per cent to Jamaica's Gross Domestic Product (GDP) over the last five years. Other sectors, such as *Transportation*, *Agriculture*, *Electricity & Water Supply*, M*anufacturing* and *Construction* also benefit from linkages with the tourism industry. According to McCatty and Serju (2006), formal employment in the tourism industry accounted for approximately 30,531 persons per annum between 1999 and 2005 representing, on average, 3.2 per cent of the country's employed labour force.

The tourism sector in Jamaica faces major advantages as well as disadvantages. According to the Travel and Tourism Competitiveness Report (2009),[3] Jamaica's major advantages include the government's prioritization of travel and tourism in the form of development policies and share of the national budget, cultural affinity for travel and tourism, ease of visa requirements and bilateral air service agreements. The

[3] Like the Global Competitiveness Report, this study combines quantitative and qualitative information from both publicly available data and the Executive Opinion Survey, an annual poll which the World Economic Forum conducts among CEOs and top business industry leaders in all economies covered by the survey.

disadvantages include a very high rate of brain drain (especially among university educated people), crime, safety and security issues, insufficient human resources, ineffective use of natural and cultural resources for differentiating the tourism experience (including the relative lack of UNESCO world heritage sites) and high HIV/AIDS rate Travel and Tourism Competitiveness Report (2009).

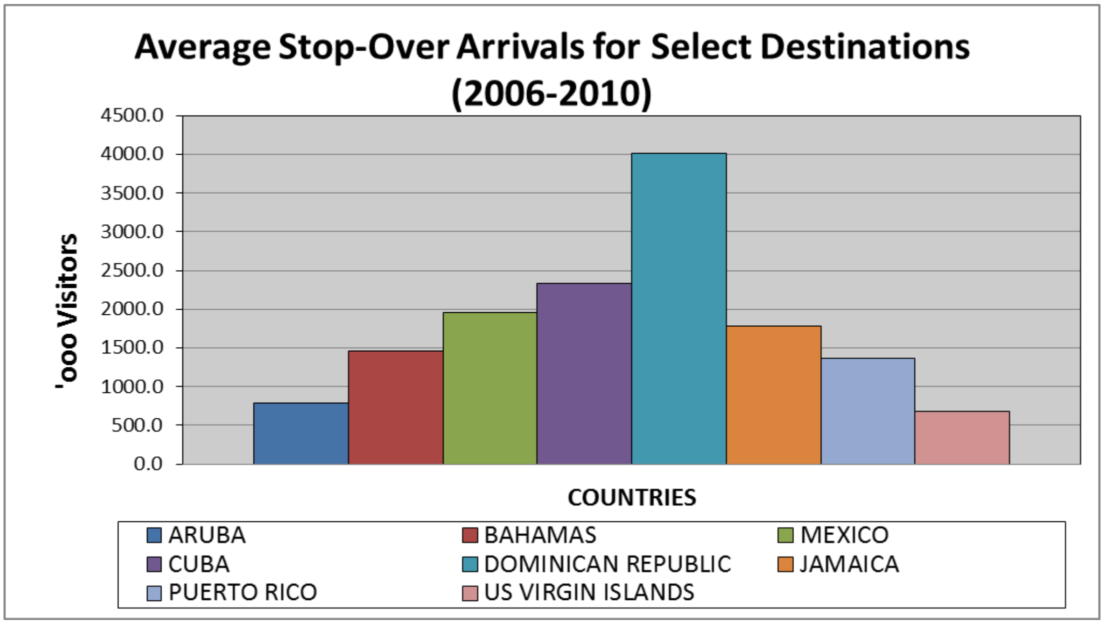
Since 2002, the tourism industry has been guided by the Master Plan for Sustainable Tourism Development (JTB, 2002). The objectives of the Plan are to guide the industry's development for the decade up to 2012 by creating a strategic vision for its growth and development and to establish an enabling environment to help it realize that vision. A major reason for the Plan was the realization that Jamaica's tourism product was in decline and would require clear and holistic initiatives to produce robust growth.

Since the launch of the Master Plan, Jamaica has benefited from significant growth in visitor arrivals. Between 2000 and 2010, the annual growth in Jamaica's gross earnings from inbound travel averaged 5.9 per cent, while growth in stop-over arrivals averaged 4.0 per cent. The main factor contributing to this growth has been Jamaica's aggressive sales activities. There has been targeting of travel agents, tour operators and reservation agents through seminars, sales calls, training workshops and various industry shows in all of the country's major markets.

While the history of tourism in Jamaica has been one of steady growth, instances of decline highlight the vulnerability of the product to external shocks. The 0.1 per cent decline in arrivals in 1991 was attributed to the Persian Gulf War. Perception also plays a role and influenced a 2.5 per cent decline in arrivals in 1994 when Jamaica's image was tarnished as a result of highly publicized criminal activities against tourists. In 1988, stop-over arrivals fell by 12.5 per cent due to hurricane Gilbert. Declines in arrivals in 2001 and 2002 were due to heightened travel fears caused by the 11 September 2001 terrorist attacks on the United States as well as the impact of a mild recession in the US.

Relative to most popular destinations in the Caribbean, Jamaica was the fourth most favoured by stop-over visitors over the period 2006-2010 (see graph 1). The Dominican Republic welcomed 3.9 million visitors and was followed by Cuba with approximately 2.3 million. Mexico was third with about 2.0 million stop-over visitors with Jamaica trailing marginally behind.[4]

Graph 1

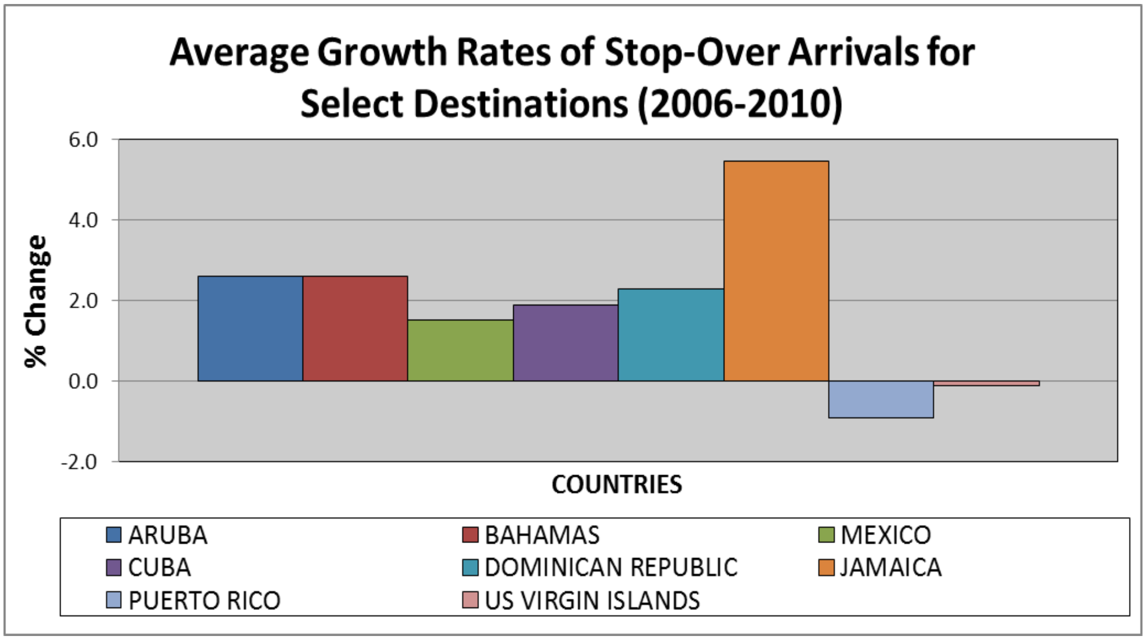


Source: JTB

Importantly, Jamaica's tourism growth record has been better than its Caribbean counterparts. Over the period 2006-2010, growth in stop-over arrivals to Jamaica averaged 5.5 per cent, relative to average growth of 0.8 per cent for the select group of Caribbean destinations (see graph 2). Jamaica also outperformed some well-developed tourism markets such as the Dominican Republic, Puerto Rico and Mexico over the recessionary period 2008-2009. Only Cuba, with average growth of 6.3 per cent, performed better than Jamaica over the period (see table 1, appendix).[5]

[4] The city of Cancun, which is Mexico's main tourism destination, was used as a proxy for the country.
[5] During this period, the US eased its restrictions on its citizens' travel to Cuba.

Graph 2



Source: JTB

Several explanations have been posited for the relatively strong performance of the Jamaican tourism industry. The increase in stop-over arrivals was largely influenced by an expansion in the number of visitors from the USA and Canada. Growth may have resulted from increased airlift and the impact of severe weather conditions in the main source countries. In addition, significant discounts in hotel rates within the industry and promotional activities by the country may have attracted tourists. Outside of the idiosyncratic jump in airlift, none of these factors provide satisfactory explanations for the differential growth in arrivals over the period. Moreover, for the country to be able to boost airlift in the context of shrinking demand means that its market share would have risen.

This study, therefore, is an attempt to contribute to understanding the relative position of the Jamaican tourism industry, vis-à-vis her Caribbean counterparts/competitors. The idea is that Jamaica’s relatively close distance to the US, compared with many of her competitor destinations in the Caribbean, may have given the country an edge over other destinations. Our *a priori* expectation is that tourists have a preference for destinations which are closer to their home as opposed to destinations further away, which will usually involve greater monetary and non-monetary costs.

2.1 Tourism Destination Evaluation

In order to underscore the distance-related differences between various destinations we highlight, in this section, some key travel-related statistics.[6] The spatial variation within the Caribbean region allows for a more informed assessment of the relationship between distance-related costs and arrivals. They include the total travel time to destination, the minimum number of stops, the likely lay-over time and, importantly, the airfare (see table 1).[7]

Table 1

SELECTED TRAVEL STATISTICS								
	Flight Miles (To destination)	Travel Time (To destination)	Travel Time (Back to origin)	Total Travel Time	Total Stops	Total Lay-over Time	Total Fare (US$)	Average Stop-Over Growth (2006-2010)
BAHAMAS	1104.0	5:32	5:30	11:02	1	1:35	452.7	-1.6
BARBADOS	2532.0	7:25	7:45	15:10	1	1:15	604.7	-0.5
DOMINICAN REPUBLIC	1769.0	5:45	7:40	13:25	1	0:45	475.8	2.3
JAMAICA	1507.0	5:35	6:10	11:45	1	1:20	396.5	5.5
MEXICO	2107.0	7:40	6:58	14:38	1	1:30	801.7	1.5
TRINIDAD AND TOBAGO	2543.0	7:35	8:40	16:15	1	1:15	582.4	-2.8
UK	3663.0	7:00	8:20	15:20	DIRECT	0:00	938.1	-4.0
US VIRGIN ISLANDS	1665.0	5:15	6:10	11:25	1	0:45	686.7	-0.1

Source: American Airlines, JTB

[6] These statistics are especially important for family heads vacationing with dependents that will require special attention.

[7] The statistics were retrieved from the American Airlines website on October 11, 2010. They assume a visitor departing for their destination from Dulles International Airport in Washington D.C., USA on 01 January 2011, travelling to the capital of the respective destination country and returning home on January 15, 2011. The distances between capital cities are used throughout the paper to ensure consistency and, thereby, provide a normalizing function. The travel period was selected to lie during the peak tourist season and was queried three months in advance so as to give an indication of prices without the upward pressure caused by persons booking close to the travel time. From the myriad travel options in terms of departure times, routes, amenities etc., the selected travel arrangement was the one with the minimum travel time for economy class. The prices quoted related to round-trip, included all taxes and assumed no special discounts.

The analysis includes countries with varying distances from the US from the closest, the Bahamas, to the UK which is the furthest. The spatial variation within the Caribbean region and over longer distances will allow for a more informed assessment of the relationship between distance and arrivals. The countries within the sample are significant markets for American tourists and their inclusion provides the analysis with a considerable and useful degree of in-sample variation with respect to the vacation-related considerations which potential visitors make.

Jamaica ranks favourably in most categories. The airfare to Jamaica was the lowest of all the routes sampled (see graph 3, appendix). Also, of the eight countries in the sample, Jamaica had a total travel time to and from the source market which was the third lowest (see graph 4, appendix).[8] The shortest travel time between origin and destination was 5 hours and 15 minutes for the US Virgin Islands, but this was broadly in line with that for Jamaica, The Bahamas and the Dominican Republic. With the exception of Mexico, the travel distance for the countries in the sample was largely in line with the geographic distance. While Mexico is geographically the closest country to the US, of those in the sample, it ranks fifth in terms of the travel distance due to the absence of direct flights based on the chosen travel specifics.

It is not immediately clear from the table that geographical heterogeneity correlates with the regions' growth record. To clarify this idea, we introduce spatial effects as an argument in an econometric model.

3.0 Spatial Econometrics and Panel Data

Spatial econometrics relate to the collection of techniques that deal with the peculiarities caused by space in statistical analyses (Anselin, 1998). For example, it deals with methodological issues that follow from the consideration of spatial effects, such as spatial autocorrelation and spatial heterogeneity. When sample data have a locational component, spatial dependence and spatial heterogeneity exist between the observations as well as between the relationships being modelled. Spatial dependence refers to the fact

[8] St. Croix was used as the proxy for the U.S. Virgin Islands

that one observation associated with location i depends on other observations at locations $j \neq i$. Spatial heterogeneity is structural instability in the form of non-constant error processes (heteroskedasticity) or model coefficients (variable coefficients, spatial regimes). It is important to consider spatial heterogeneity explicitly when the location of the observations is crucial in determining the form of the instability. According to LeSage (1998), traditional econometrics ignores these two issues which clearly violate the Gauss-Markov assumption.

The term "spatial interaction models" has been used in the literature for models that focus on flows between origins and destinations (Sen and Smith (1995)). An objective of this type of modelling is to explain variation in the flows between n^2 Origin-Destination (OD) pairs. These models typically rely on a function of the distance between an origin and destination as well as explanatory variables pertaining to characteristics of both origin and destination regions. They typically assume that spatial dependence between the sample of n^2 OD pairs will be captured by the distance function. Conventional spatial autoregressive models rely on spatial weight structures constructed to reflect connectivity between n regions (LeSage and Pace, 2005).

To derive the structural Spatial Autoregressive (SAR) model, we first recall that spatial dependence in a collection of sample data observations refers to the fact that one observation associated with location i, depends on other observations at locations $j \neq i$. Formally

$$y_i = f(y_j), i = 1,...,n \quad j \neq i \tag{1}$$

To quantify this notion, we follow Anselin (1998) and interact the "standardization first-order" contiguity (or spatial) matrix (W) with the lag of the dependent variable to produce y^* as follows

$$y^* = Wy_t \tag{2}$$

The spatial matrix (*W*) reflects the contiguity relations for all the regions and will have zeroes along the main diagonal. In the context of this study, each element in the (*W*) matrix represents the Euclidean distance between the two countries which correspond to the respective row and column. The interaction of the transformed spatial variable (*W*) and the lag dependent variable can be interpreted as the mean of observations from contiguous regions. For example,

if $$W = \begin{pmatrix} 0 & 1 & 0 \\ .5 & 0 & .5 \\ .5 & .5 & 0 \end{pmatrix}, \tag{3}$$

$$y^* = Wy_t, \tag{4}$$

$$y^* = \begin{pmatrix} 0 & 1 & 0 \\ .5 & 0 & .5 \\ .5 & .5 & 0 \end{pmatrix} \begin{pmatrix} y_1 \\ y_2 \\ y_3 \end{pmatrix} \tag{5}$$

$$y^* = \begin{pmatrix} y_2 \\ .5y_1 + .5y_3 \\ .5y_1 + .5y_2 \end{pmatrix} \tag{6}$$

This is one way of quantifying the notion that $y_i = f(y_j), j \neq i$ expressed in equation (1) (LeSage, 1998).

A linear regression that uses y^* as an explanatory variable to explain variations in y across the spatial sample of observations would be reflected by the following expression

$$y = \rho y^* + \varepsilon \tag{7}$$

where ρ represents a regression parameter to be estimated and ε denotes the stochastic disturbance in the relationship. The parameter ρ would reflect the spatial dependence inherent in the sample data measuring the average influence of neighbouring or contiguous observations on observations in the vector *y*.

3.1 Panel Data Issues

Panel data require special treatment in the econometric framework. The standard specification of panel data models is as follows:

$$Y_{it} = \beta_1 + \sum_{j=2}^{k} \beta_j X_{jit} + \sum_{p=1}^{s} \gamma_p Z_{pi} + \sigma t + \varepsilon_{it} \qquad (8)$$

where Y is the dependent variable, the X_j are the observed explanatory variables and the Z_p are unobserved explanatory variables. The index i refers to the unit of observation, t refers to the time period and j and p are used to differentiate between observed and unobserved variables. ε_{it} is a disturbance term assumed to satisfy the usual regression model conditions. A trend term t is introduced to allow for a shift of the intercept over time (Dougherty, 2007).

The Xj variables are usually the variables of interest, while the Z_p variables are responsible for unobserved heterogeneity and, as such, constitute a nuisance component of the model. Since the Z_p variables are unobserved, there is no means of obtaining information about the $\sum_{p=1}^{s} \gamma_p Z_{pi}$ component of the model and it is convenient to rewrite equation (8) as

$$Y_{it} = \beta_1 + \sum_{j=2}^{k} \beta_j X_{jit} + \alpha_i + \delta t + \varepsilon_{it} \qquad (9)$$

where $$\alpha_i = \sum_{p=1}^{s} \gamma_p Z_{pi} \qquad (10)$$

The unobserved effect α_t represents the joint impact of the Z_{pi} on Y_i. If α_t is correlated with any of the Xj variables, the estimates from a regression of Y on the Xj variables will be subject to unobserved heterogeneity bias. Even if the unobserved effect is not correlated with any of the explanatory variables, its presence will cause OLS regressions to yield inefficient estimates and invalid standard errors. First difference fixed effects can be used to overcome the problem. For each i in time period t, the model may be written as:

$$Y_{it} = \beta_1 + \sum_{j=2}^{k} \beta_j X_{jit} + \delta t + \alpha_i + \varepsilon_{it} \qquad (11)$$

For the previous time period, the model is

$$Y_{it-1} = \beta_1 + \sum_{j=2}^{k} \beta_j X_{jit-1} + \delta(t-1) + \alpha_i + \varepsilon_{it-1} \qquad (12)$$

Subtracting (12) from (11) produces the model without the unobserved heterogeneity

$$\Delta Y_{it} = \sum_{j=2}^{k} \beta_j \Delta X_{jit} + \delta + \varepsilon_{it} - \varepsilon_{it-1} \qquad (13)$$

4.0 Tourism Demand Models

Generally, empirical studies of tourism demand employ log linear models in which demand is a function of income growth in the source countries, the real exchange rate and the cost to travel to and from competing destinations. According to Crouch and Ritchie (1999), demand for a particular tourism product is, however, determined by four components: core resources and attractors such as physiography, culture and history; market ties; mix of activities; special event and superstructure. The latter includes supporting factors and resources such as infrastructure, accessibility, facilitating resources and enterprise, destination management such as resource stewardship, marketing, organisation, information and service and qualifying determinants such as location, dependencies, safety and cost (Crouch and Richie, 1999).

Morley (1992) also argued that most studies give little consideration to underlying microeconomic factors and viewed tourism demand as complementary to the demand for food and other types of entertainment. That paper, in addressing this issue, derived a model from the following constrained optimization problem:

$$\text{Max} \quad U_{tot}(u_t, u_{oth}) \tag{14}$$

$$\text{Subject to:} \quad t_{dest} + t_{tran} \le T_t$$

$$P.q_{oth} + c_t t_t + f \le Y$$

Where U_{tot} = total utility, u_t = utility from tourism, u_{oth} = utility from other activities, t_{dest} = time spent at destination, t_{tran} = time spent in transit, T = total time available for tourism services, P = vector of prices of other goods, q_{oth} = quantities of other goods, c_t = cost per unit of time on tour, t_t = time spent on tour, f = airfare and Y = income. The resulting optimum demand for tourism services (q) is given as follows:

$$q_t^* = q_t(P, c_t, t_{tran}, f, T_t) \tag{15}$$

This specification implicitly noted that spatial heterogeneity is likely to be related to the desire of the tourist to minimize expenditure as well as the non-monetary costs associated with foreign travel. The geographic characteristic of a particular destination is important because of the link between distance to destination and the cost of the vacation.

Very few studies have explicitly incorporated spatial effects. Deng and Athanasopoulos (2009) modelled Australia's domestic and international inbound travel from the multitude of locations from which tourists originate, using an anisotropic dynamic spatial lag panel Origin-Destination (OD) travel model as follows:[9]

[9] Anisotropic means that the model assumes that spatial effects are asymmetric and, therefore, differentiates between capital city neighbours and non-capital city neighbours.

$$Y_t = \phi_1 Y_{t-1} + \phi_4 Y_{t-4} + \beta_{trend} t + \beta_{q1} Q_{1,t} + \beta_{q2} Q_{2,t} + \beta_{q3} Q_{3,t} +$$
$$\sum_{j=1}^{4} q_{j,t} \left\{ \left[\left(\rho_{o,j} D_{o1} + \rho_{oc,j} D_{oc} \right) \bullet W_o \right] y_t \right\} +$$
$$\sum_{j=1}^{4} q_{j,t} \left\{ \left[\left(\rho_{d,j} D_{d1} + \rho_{dc,j} D_{dc} \right) \bullet W_d \right] Y_t \right\} + \tag{16}$$
$$X_{o,t} \beta_o + X_{d,t} \beta_d + \mu + \varepsilon_t$$

Y_t is an $(N \times 1)$ vector of observed travel flows between regions at time t, which is assumed to be correlated with its first lag (Y_{t-1}) and its seasonal fourth lag (Y_{t-4}). A linear trend, t, is also included. $Q_{j,t}$ represents seasonal dummies. $X_{o,t}$ and $X_{d,t}$ are $(N \times K_o)$ and $(N \times K_d)$ matrices of socioeconomic characteristics observed at the origin and destination, respectively, at time t. $D_{o1}, D_{d1} + D_{oc}, D_{dc}, W_o$, and W_d are $(N \times N)$ matrices that specify spatial structures.[10] $q_{j,t}$ is a seasonal dummy that is equal to one if time 't' corresponds to the j^{th} quarter, and zero otherwise. The spatial parameters $\rho_{o,j}, \rho_{d,j}, \rho_{oc,j}$ and $\rho_{dc,j}$ are indexed by the j^{th} quarter. The combination of $q_{j,t}$ and seasonally indexed spatial parameters allows for potential seasonal variations in the spatial parameters. For instance, in Q1, the spatial effects will be captured by the following two spatial terms:

$$\left\{ \left[\left(\rho_{o,1} D_{o1} + \rho_{oc,1} D_{oc} \right) \bullet W_o \right] Y_t \right\} \tag{17}$$

and

$$\left\{ \left[\left(\rho_{d,1} D_{d1} + \rho_{dc,1} D_{dc} \right) \bullet W_d \right] Y_t \right\} \tag{18}$$

while all other spatial terms will be equal to zero. Finally, μ is an $(N \times 1)$ vector of unobserved individual effects. ε_t is an $(N \times 1)$ vector of i.i.d. normal errors with $E(e_t) = 0 \forall t, E(\varepsilon_t \varepsilon_t^T) = 0 \forall t \neq s.$

[10] Spatial contiguity is defined as binary contiguity, where two statistical regions/countries sharing the same border are considered as spatial neighbours.

Deng and Athanasopoulos (2009) found significant spatial autocorrelation both at the origin and the destination for domestic as well as international inbound travellers.

5.0 Modelling Tourism Flows in the Caribbean: Econometric Specification

Following Deng and Athanasopoulos (2009), this paper uses a dynamic spatial error model which is specified as follows:

$$Y_t = \oplus Y_{t-1} + X_t \beta + \mu + \varepsilon_t$$
$$\varepsilon_t = \rho W \varepsilon_t + \mu_t \qquad (19)$$

where Y_t is an (N x 1) cross-sectional vector of tourist arrivals, $\oplus$ is the first-order autoregressive parameter, ρ is the spatial autoregressive parameter, W is an (N x N) spatial weights matrix whose ij^{th} element specifies the spatial relationship between the i^{th} and j^{th} spatial units, X_t is an (N x K) matrix of exogenous explanatory variables observed at time t, u is an (N x 1) vector of time-invariant individual effects and ε_t is an (N x 1) vector of i.i.d. normal errors with $E(\varepsilon_t)$=0.

The model chosen for this study is represented as follows:

$$\Delta \mathrm{LARR}_t = \alpha + \sum_{i=1}^{n} \beta_i \Delta LARR_{t-i} + \sum_{j=0}^{n} \delta_i \Delta LUSGDP_{t-j} + \sum_{k=0}^{n} \lambda_i \Delta LPRICE_{t-k} + \sum_{m=0}^{n} \mu_i \Delta LDJIA_{t-m} + \sum_{n=0}^{n} \omega_i \Delta LUSUNEMP_{t-n} + \sum_{p=0}^{n} \rho_i \Delta LDIST_{t-p} \times \xi + \eta_t \qquad (20)$$

where LARR is the log of visitor arrivals, LUSGDP is the log of US Gross Domestic Product, LTOURPRICE is the log of the tourism price, LUSUNEMP is the log of the unemployment rate in the US, LDJIA is the log of the Dow Jones Industrial Average stock market index, LDISTUSAIR is the log of the actual travel distance between origin and destination and ζ is the error term collected from the regression absent the spatial parameter. To see if spatial effects are present, we compare the model without spatial effects with equation (19). Specifically, the test for spatial autocorrelation uses the Wald test for which the null hypothesis is that the spatial parameter ρ is statistically significant. The spatial parameter was found to be highly significant (see table 5, appendix

The Jarque-Bera test for normality of the residuals was used to determine the appropriate estimation methodology. The maximum likelihood estimation framework assumes that the errors are normally distributed while the generalized method of moments does not. The Jarque-Bera test indicated that the residuals were not normally distributed and so the equation was estimated using the generalized method of moments technique (see graph 5, appendix).

Robustness checks on the GMM model represented in table (4) revealed the presence of serial correlation. The test for serial correlation involved regressing η_t from equation (20) on η_{t-1}. Under the null hypothesis that the original idiosyncratic errors are uncorrelated, the residuals from the equation should have an autocorrelation coefficient of -0.5 (Wooldridge, 2001). The autocorrelation coefficient of 0.07 was revealed by the Wald test to be significantly different from -0.5 (see table 6, appendix). Once serial correlation is detected, Wooldridge (2002) recommends the computation of White-type robust standard errors which are robust to serial correlation and time-varying variances in the disturbances. In addition, Wooldridge (2002) points out that the robust variance matrix estimator is valid in the presence of any heteroskedasticity or serial correlation.

6.0 Data & Estimation Results

The data span the period March 1997 to December 2009 at a quarterly frequency. Tourist arrivals data from the JTB for Jamaica, Bahamas, Barbados, the Dominican Republic, Mexico, Trinidad & Tobago and the US Virgin Islands were used. Arrivals' data for the UK was taken from the International Financial Statistics (IFS) database of the

International Monetary Fund (IMF). Data for macroeconomic indicators including the Dow Jones Industrial Average and US GDP were taken from Bloomberg Data Services. Data related to country earnings from tourism were taken from the World Travel and Tourism Council (WTTC). These annual data were then interpolated to a quarterly frequency.

Tourism Price Indices where calculated using the total visitor expenditure and the number of visitor arrivals for each country in the sample. This implicit index was used due to the unavailability of data related to the average daily expenditure of visitors for most countries in the sample. In order to validate the choice of this proxy, estimates for the average daily expenditure of visitors were compared to the implicit tourism price index for the case of Jamaica. These two series were found to move together with a 60.0 per cent correlation and the implicit version was, therefore, deemed a suitable proxy.

Using geographical coordinates, the distances to the various tourism destinations were calculated using the Geographic Distance Matrix Generator Version 1.2.3 (see table 3, appendix). However, to reflect the actual distances faced by a traveller, the distances used in the analysis were the flight distances between origin and destinations. These were taken from the American Airlines website and normalized so that each country's value represented its share of the sum of the distances between the source market (U.S.) and each of the destinations (see table 3, appendix).

The panel data were loaded in the stacked format. Panel data analysis endows regression analysis with both a spatial and temporal dimension. The spatial dimension pertains to a set of cross-sectional units of observation. The temporal dimension pertains to periodic observations of a set of variables characterizing these cross-sectional units over a particular time span. Unit root tests were carried out on all variables and since the model requires variables to be differenced, all were stationary.

6.1 Results

The paper gives precedence to the GMM model which utilized robust standard errors. The spatial parameter on the GMM model was negative 0.39 and implies that a 1.0 per cent increase in the distance between source market and a particular destination will lead to a 0.39 per cent decline in the growth in tourist arrivals (see table 4, appendix). The low probability value on the null hypothesis that the coefficient on the spatial parameter is zero is strongly rejected. The parameter is, therefore, considered to be highly significant (see table 4, appendix).

USGDP has a significant effect on visitor arrivals. This points to a strong income effect in general. A 1.0 per cent increase in GDP would produce a 6.2 per cent and 7.4 per cent increase in visitor arrivals at two and three lags, respectively. At a two period lag, the tourism price variable was negative, as expected. The result indicated that a 1.0 per cent increase in the tourism price would reduce visitor arrivals by 2.7 per cent. The variable, however, was positive for the third lag. The positive relationship at the third lag when most trips are being booked may be related to the degree of destination loyalty and tourists' willingness to vacation even in spite of higher prices. The negative coefficient at the second lag suggests that tourists that make bookings closer to the intended vacation time are more price-sensitive.

The Dow Jones variable with a one-period lag indicated that a 1.0 per cent increase in the index would lead to a 0.23 per cent increase in tourist arrivals. The variable, however, was negative for the second and fourth lags. The unemployment rate in the US had a negative impact on arrivals contemporaneously so that a 1.0 per cent increase in unemployment would lead to a 0.43 per cent decline in arrivals. The coefficient on the first lag of unemployment was, however, positive (see table 4, appendix).

The results from both GMM estimations were juxtaposed against the OLS results which deviated only marginally from each other (see table 4, appendix). The residuals from both the original as well as the GMM estimation with robust standard errors were both stationary (see graphs 6 and 7, appendix). Graph 8 shows the line graph of the residuals from the GMM estimation with robust standard errors. Generally, the model which used robust standard errors produced coefficients which were slightly less significant than the original GMM model. One variable, the fourth lag of USGDP, lost its significance when estimated by the model with robust standard errors.

In contrast to some of the findings in this study, ECLAC (2009) found no strong evidence of an increase in real income in the US playing a major role in tourism competitiveness in the Caribbean. That study found competitiveness to be linked to depreciations of the real exchange rate, low transport costs as proxied by oil prices, population density, domestic credit to the private sector, trade openness, government consumption, exposure to natural disasters as well as the AIDS prevalence rate. The study also suggests that competitiveness for the Caribbean is slowing down and that there is need to support local private sector development to reduce import leakages and build linkages between the tourism sector and the rest of the economy.

7.0 Conclusion

The study explains the resilience of Jamaica's tourism product over the period 2008-2009 in the context of the country's relatively close distance to the US and, more importantly, the price elasticity of the country's tourism product. Since the study has pointed to the distance between source market and destination as significant to the decisions which tourists make, the implication is that Jamaica should focus considerable attention and marketing resources to the source markets which are relatively close. While the US is the country's main market in terms of visitors, given the importance of distance, the rest of the region holds great potential in terms of valuable source markets. Airlift, which will provide the means by which visitors are brought to Jamaica, should also feature heavily in the planning process.

8.0 References

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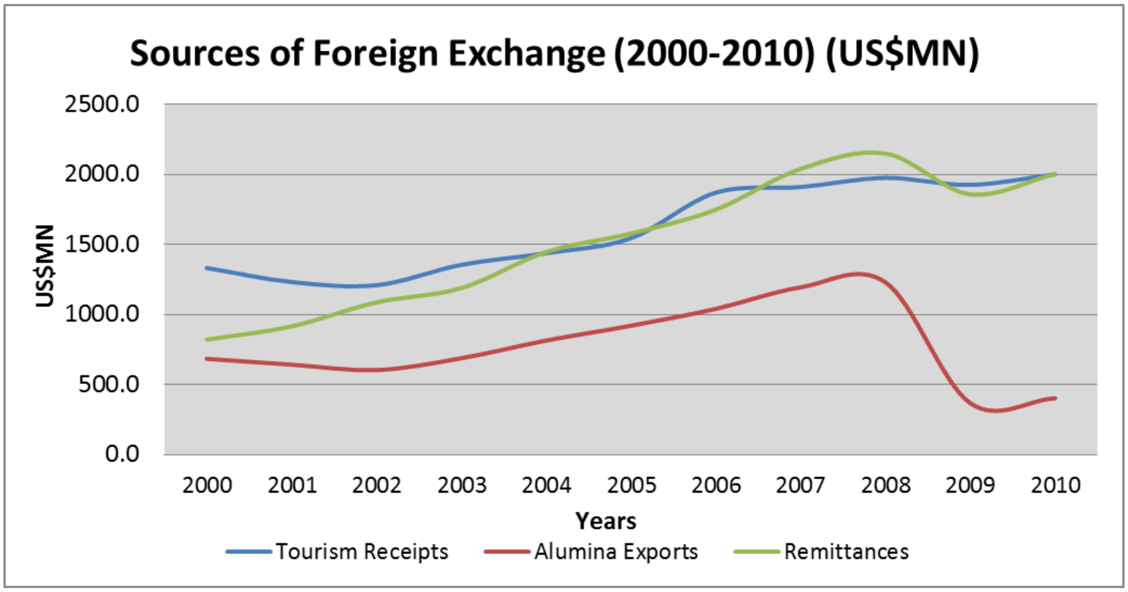
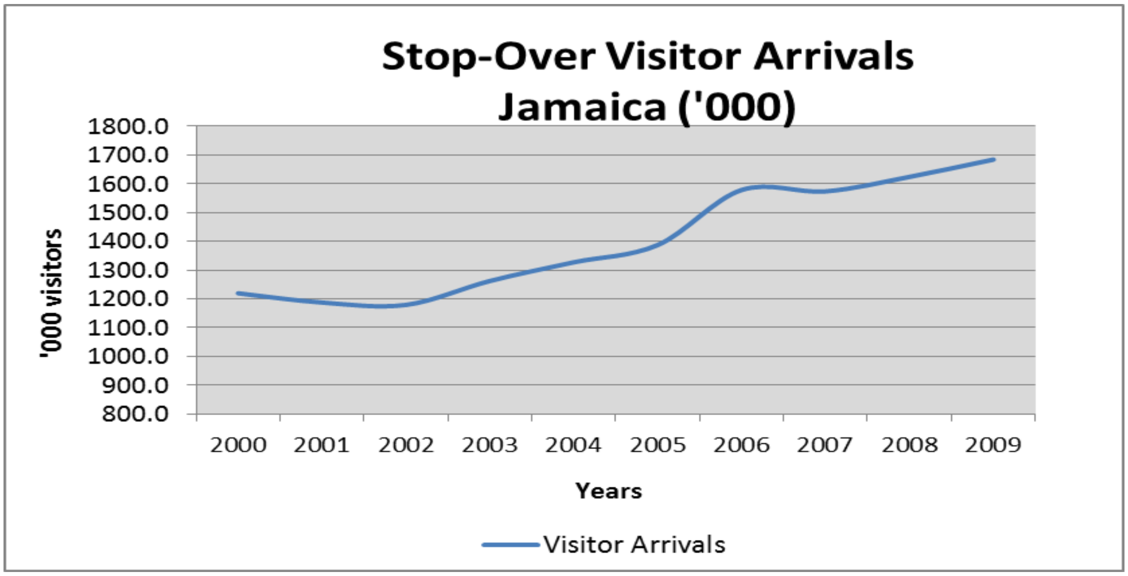
9.0 Appendix

Graph 1



Source: JTB, Statistical Institute of Jamaica (Statin)

Graph 2



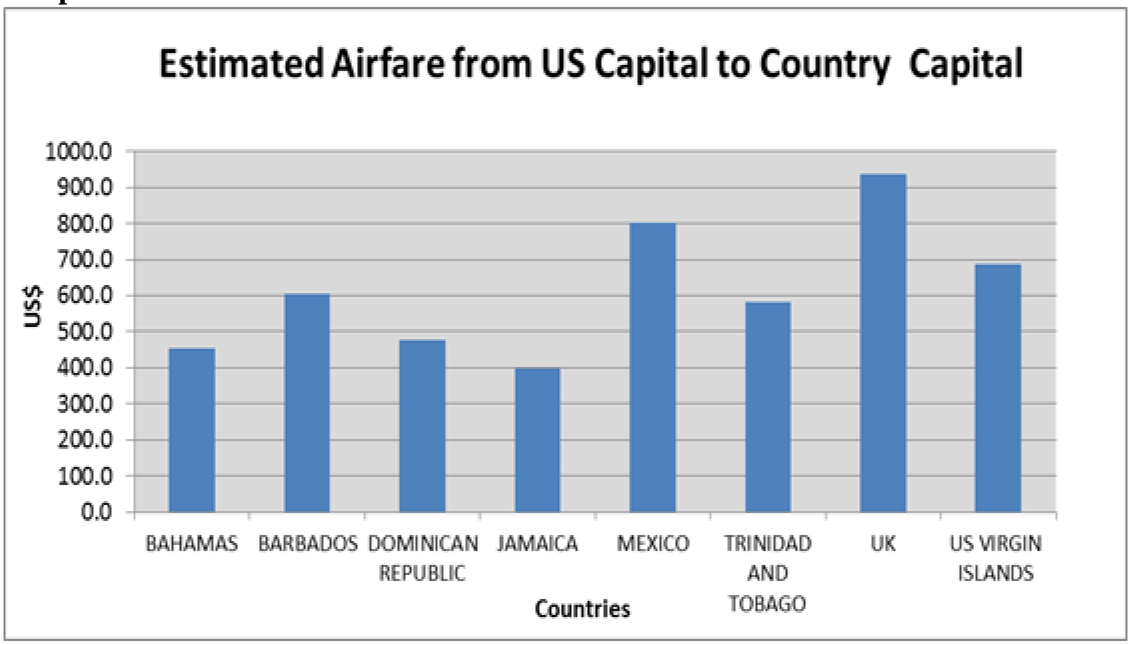
Source: JTB

Table 1

Growth in Stop-Over Arrivals for Major Caribbean Destinations (%)							
COUNTRY	**2006**	**2007**	**2008**	**2009**	**2010**	**Average (2006-2010)**	**Average (2008-2009)**
ARUBA	-5.2	11.5	6.8	-1.7	1.6	2.6	2.5
BAHAMAS	5.7	-5.0	-3.8	-9.3	4.4	-1.6	-6.5
CUBA	-4.3	-3.1	9.1	3.5	4.2	1.9	6.3
DOMINICAN REPUBLIC	7.4	0.4	0.0	0.3	3.3	2.3	0.2
JAMAICA	13.5	1.3	3.9	3.6	4.9	5.5	3.8
MEXICO	-25.6	27.4	7.1	-12.6	11.4	1.5	-2.8
PUERTO RICO	1.3	-6.8	-3.3	-1.9	6.1	-0.9	-2.6
US VIRGIN ISLANDS	-3.7	3.3	-2.1	-1.9	3.8	-0.1	-2.0

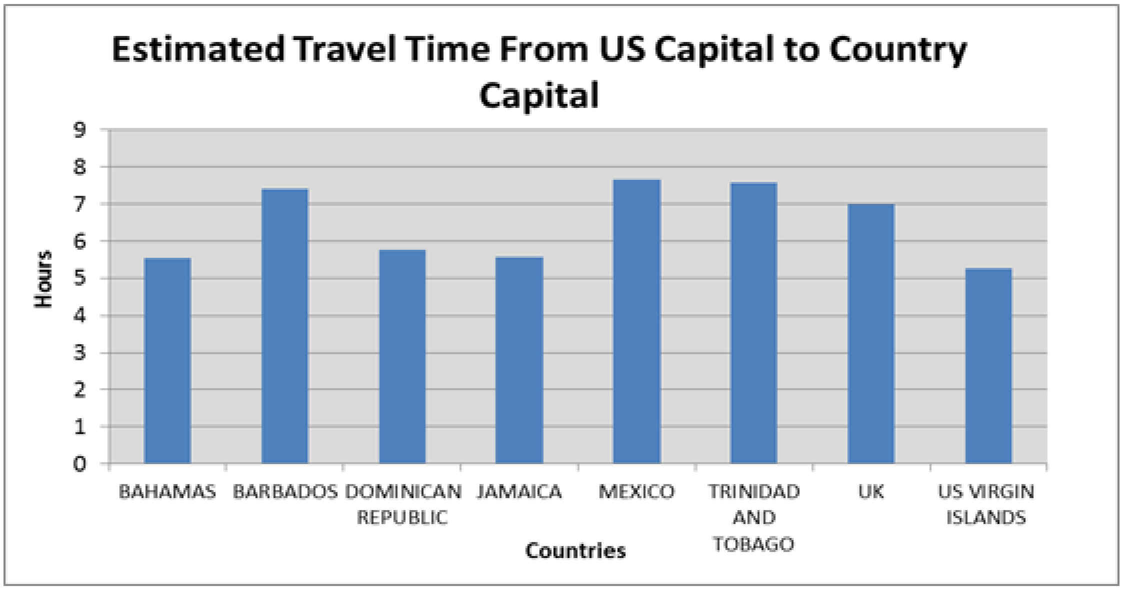
Source: JTB

Graph 3



Source: American Airlines

Graph 4



Source: American Airlines

Table 3

Distance Matrix (Kilometre)									
	BAH	BAR	DO	JAM	MEX	TRI	UK	US	USVI
BAH	0.0	2143.4	815.1	681.4	2652.1	2158.9	6834.0	2516.5	1364.3
BAR	2143.4	0.0	1354.4	2006.6	4632.2	296.8	6734.4	4638.8	794.0
DO	815.1	1354.4	0.0	734.2	3307.7	1346.3	6912.6	3331.5	628.8
JAM	681.4	2006.6	734.2	0.0	2626.7	1926.5	7437.5	2923.8	1353.5
MEX	2652.1	4632.2	3307.7	2626.7	0.0	4546.6	8589.9	1736.5	3933.4
TRI	2158.9	296.8	1346.3	1926.5	4546.6	0.0	7030.7	4674.2	885.6
UK	6834.0	6734.4	6912.6	7437.5	8589.9	7030.7	0.0	6986.5	6601.5
US	2516.5	4638.8	3331.5	2923.8	1736.5	4674.2	6986.5	0.0	3845.9
USVI	1364.3	794.0	628.8	1353.5	3933.4	885.6	6601.5	3845.9	0.0
Row Normalized									
	BAH	BAR	DO	JAM	MEX	TRI	UK	US	USVI
US	0.07	0.15	0.10	0.09	0.12	0.15	0.22	0.00	0.10

Table 4

	OLS		GMM		GMM (Robust Standard Errors)	
	ln Arrivals		ln Arrivals		ln Arrivals	
Variables						
Constant	-0.009 0.006		-0.080 (0.020)		-0.082 (0.022)	
ln Arrivals (-1)	-0.194 0.012	***	-0.222 (0.023)	***	-0.213 (0.033)	***
ln Arrivals (-2)	-0.063 0.015	***	-0.246 (0.057)	***	-0.259 (0.112)	**
ln USGDP (-2)	0.109 0.593		5.313 (1.777)	***	6.203 (1.810)	***
ln USGDP (-3)	0.855 0.514	*	4.722 (1.289)	***	7.463 (2.265)	***
ln USGDP (-4)	0.855 0.514	*	2.929 (1.595)	***		
ln Tourism Price (-2)	-0.541 0.154	***	-2.578 (0.508)	***	-2.702 (1.088)	**
ln Tourism Price (-3)	0.542 0.154	***	2.772 (0.559)	***	2.886 (1.15)	**
ln US Unemployment	-0.172 0.056	***	-0.456 (0.122)	***	-0.433 (0.144)	***
ln US Unemployment (-2)	0.076 0.080		1.027 (0.296)	***	1.055 (0.258)	***
ln DJIA (-1)	0.322 0.032	***	0.259 (0.061)	***	0.231 (0.043)	***
ln DJIA (-2)	-0.051 0.034		-0.188 (0.098)	*	-0.280 (0.117)	**
ln DJIA (-4)	-0.138 0.035	***	-0.613 (0.122)	***	-0.609 (0.208)	***
$\rho W \varepsilon_t$	-0.461 0.008	***	-0.397 (0.020)	***	-0.387 (0.052)	***
R^2	0.95		0.88		0.87	

Notes:

1. Standard errors are in parentheses

2. *** indicates significance at the 1 % level, ** indicates significance at the 5 % level and * indicates significance at the 10 % level

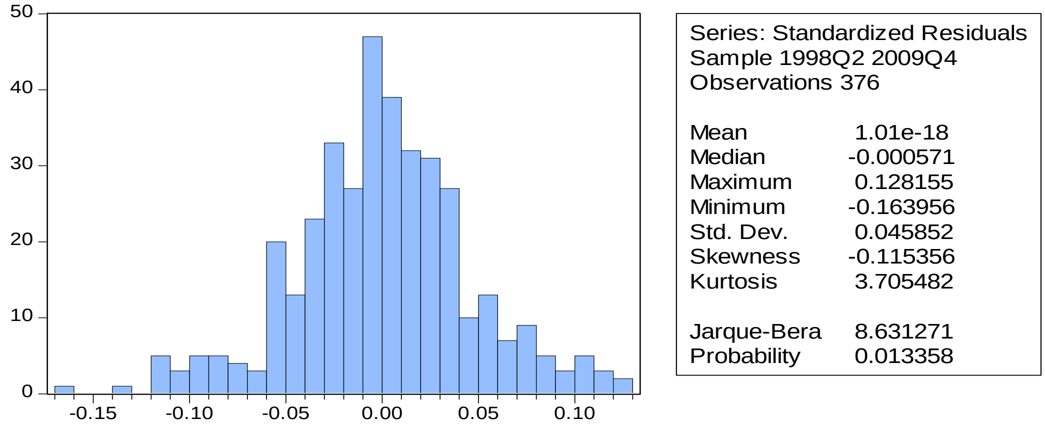
Table 5

Wald Test:			
Equation: CORE_ROBUSTSE2			
Test Statistic	Value	df	Probability
F-statistic	55.79430	(1, 356)	0.0000
Chi-square	55.79430	1	0.0000
Null Hypothesis Summary:			
Normalized Restriction (= 0)		Value	Std. Err.
C(13)		-0.387024	0.051814
Restrictions are linear in coefficients.			

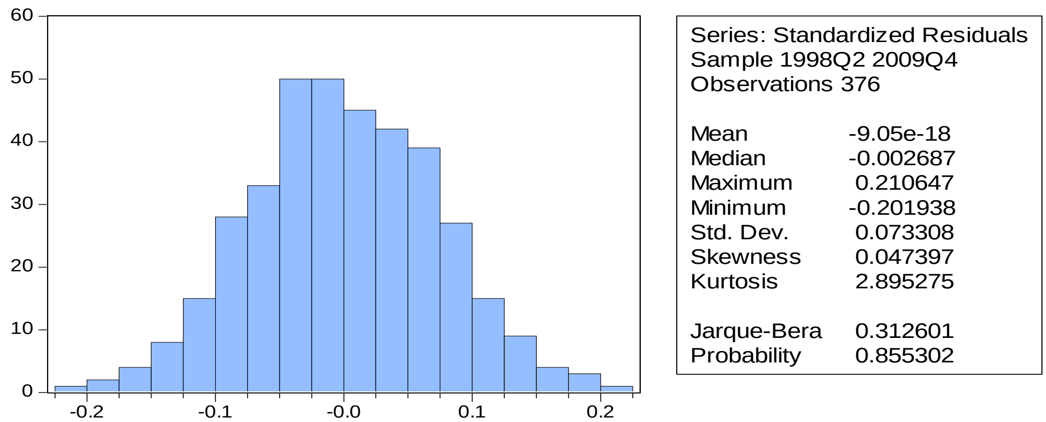
Table 6

Wald Test:			
Equation: CORE			
Test Statistic	Value	df	Probability
F-statistic	397.8885	(1, 355)	0.0000
Chi-square	397.8885	1	0.0000
Null Hypothesis Summary:			
Normalized Restriction (= 0)		Value	Std. Err.
C(14)		-0.396825	0.019894
Restrictions are linear in coefficients.			

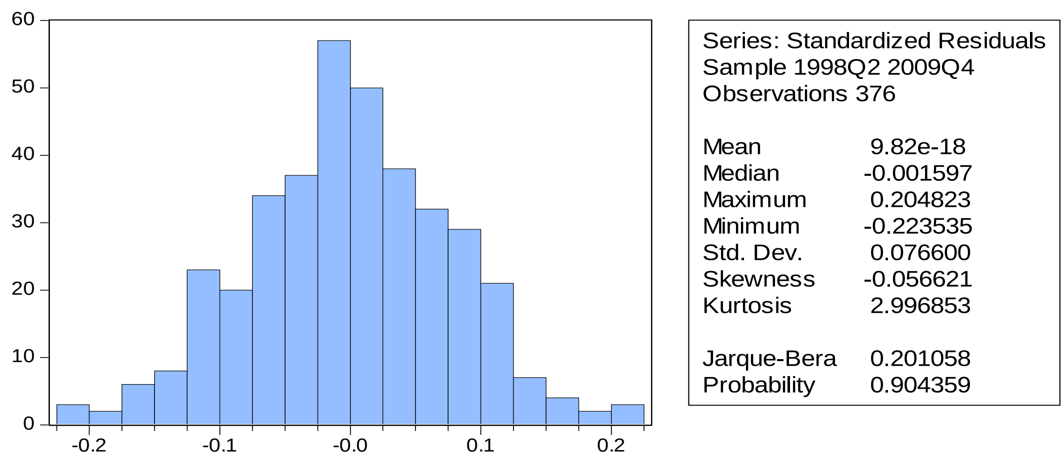
Graph 5



Graph 6



Graph 7



Graph 8

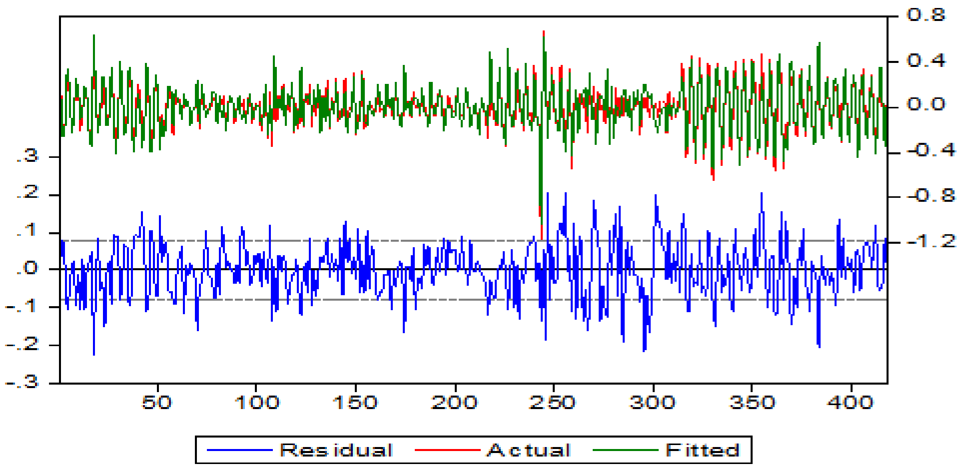


Table 7

Wald Test:
Equation: Untitled

Test Statistic	Value	df	Probability
F-statistic	119.6924	(1, 367)	0.0000
Chi-square	119.6924	1	0.0000

Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
0.5 + C(1)	0.568319	0.051947

Restrictions are linear in coefficients.