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On the Relationship between Tourist Flows and Household Expenditure in Barbados: A Dynamic OLS Approach

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Abstract

Keynesians propose that increases in tourist arrivals are associated with an expansion in private spending through the multiplier effect. To test this hypothesis, this study augments a simple consumption function with tourist arrivals and employs the dynamic OLS method to compute the short and long run relationships of the variables. Results suggest that while tourist arrivals have a positive correlation with household expenditure in the short run, it does not Granger cause household expenditure consumption.

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1. Introduction

Does the number of tourist affect household consumption decisions? Keynesians argue that increases in tourist arrivals are associated with an expansion in private spending through the multiplier effect. As outlined by Tse (1998) pp. 233, "Tourism spending represents a net demand for domestic output. Such a net demand provides incomes in the economy…. recipients of this extra income in turn raise their consumption, creating further production and income gains in an endless but rapidly diminishing chain". Indeed, a number of studies have found evidence of causality running from tourism to economic output (see for instance Dubarry, 2004; Lee and Chang, 2008; and Brida et al, 2008). Given that income is often the primary determinant of consumption, it is reasonable to assume that tourist arrivals can also impact household consumption.

Tse (1998), to the best of the authors' knowledge, is the only study which empirically investigated the relationship between tourism and aggregate domestic consumption. Using the Engle-Granger approach to cointegration and bivariate vector autoregression, the author found that the tourism-driven consumption hypothesis is not held in Hong-Kong. Hence, the hypothesis that tourism growth boosts domestic consumption is not fully verified. Against this backdrop, this paper seeks to investigate the impact of tourism on the consumption behaviour of households in Barbados. Specifically, it attempts to determine if greater volumes of arrivals are capable of boosting household expenditure.

It is well documented that the impact of tourism on the Barbadian economy is profound and extensive (see Archer, 1984; Jackman and Greenidge, 2010). Tourism directly employs over 10% of the labour force, contributes over 10% to Gross Domestic Product and is the main earner of foreign exchange, accounting for over 60% of the country's total foreign receipts. More than this, the multiplier effects of tourism boosts other sectors of the economy, such as whole sale and retail, construction, entertainment and food and drinks sectors, which aid in servicing the industry. Therefore, by studying the case of Barbados, this paper provides some insight into how tourism affects private spending in countries specialising in tourism. Indeed several studies advocate that the impact of tourism tends to depend on the relative weight of tourism in the economy. It has also been documented that tourism tends to have a more favourable effect on small economies (see Sgro and Hazari, 1995; 1995; Candela and Cellini, 1997). Given that the economies, economic fortunes of Barbados are more closely tied to the tourism industry than in Hong Kong,[1] and the fact that Barbados has a relatively smaller economy,[2] it is possible that the tourism-led consumption hypothesis can hold true for Barbados but not for Hong Kong.

To effectively examine the long and short-run co-movements between tourism and domestic consumption, this study augments a model of household expenditure with tourism indicators. Tse's study, in our opinion, did not pay adequate attention to the possibility of omitted variables bias. There are a number of other factors that might impact on domestic consumption and the exclusion of these variables from the simple bivariate analysis may have masked the underlying

[1] According to the World Travel and Tourism Council, Barbados ranks eight with regards to the contribution of tourism to national economy, whereas Hong Kong ranks forty-one.

[2] According to the CIA World Fact Book, in 2008 Barbados had a GDP per capita of approximately US $19,100 while for Hong Kong, GDP per capita was roughly US $43,700.

relationship between the two variables under investigation. In addition, instead of using conventional system based or residual based methods to cointegration, this study utilises a dynamic OLS approach. The main advantage of this method is that it allows for the simultaneous modelling of stationary [I(0)] and non-stationary [I(1)] variables, which is an important gain. It is unreasonable to assume that because a variable is [I 0)], it does not have a long run effect on the dependent variable.

The remainder of this paper is organised as follows. The subsequent section describes the empirical methodology employed. This is followed by a discussion of the results and the final section provides some concluding remarks.

2. Empirical Methodology

2.1 Empirical Model

Both the empirical and theoretical literature have identified a number of key variables that may impact households' decision to consume. The standard variables to include in any consumption are income, prices and interest rates. Following Keynes (1936), higher income is expected to boost domestic consumption. On the other hand, a higher price often deters demand and is expected to be negatively related to household expenditure. Finally, in line with classical economic theory, one postulates that higher rates of interest encourage saving and discourages consumption, and hence should be inversely related to household expenditure.

In this paper, a simple consumption function is augmented with tourist flows to explore the impact of tourism on household expenditure in Barbados. Formally,

$$C_t = f\underset{+}{(}T\underset{+}{,}Y\underset{-}{,}P\underset{-}{,}i) \qquad (1)$$

where *C, T, Y, P* and *i* represent household expenditure, tourist arrivals, income, prices and interest rates, respectively.

2.2 Data

The database employed consists of annual data for the period 1970 to 2007. Observations on income (proxied by real GDP per capita) and household expenditure (deflated by the GDP deflator) are taken from World Bank's World Development Indicators Database (2008); prices (approximated by the consumer price index) are obtained from the International Monetary Fund's International Financial Statistics Database (2008); and finally, observations on the minimum deposit rate[3] and tourist arrivals are obtained from the Central Bank of Barbados Annual Statistical Digest. All variables, except the minimum deposit rate, are expressed in logarithms.

2.3 Econometric Approach

Given the relatively small size of the sample, the authors opt for a single-estimation approach to cointegration. Hence, the dynamic OLS (DOLS) procedure developed by Saikkonen (1991) and generalised by Stock and Watson (1993) is employed. DOLS corrects for possible simultaneity

[3] The minimum deposit rate is set by the Central Bank of Barbados and serves as a benchmark for interest rates movements in Barbados.

bias amongst the regressors and is therefore preferable to other single equation cointegration techniques, namely the Engle and Granger (1987) two-step estimator. DOLS estimates are also asymptotically normally distributed; thus, direct statistical inference on the parameters of the cointegrating vector is possible. In addition, unlike most residual based and system based tests for cointegration, DOLS can accommodate varying orders of integration, i.e. it allows for direct estimation of a mixture of I(0) and I (1) variables. It should be noted that when all the variables of interest are I (1) and there is a single cointegrating vector, DOLS is asymptotically equivalent to the full information maximum likelihood approach developed by Johansen (1988).

The potential simultaneity bias and small sample bias among the regressors is dealt with by including lags and leads of the first differenced I (1) regressions. Hence, the estimation of the long run relationship of equation 1 is:

$$C_t = B' X_t + \sum_{j=-k}^{k} \partial_j' \Delta X_{t-j}^I + \varepsilon_t \quad (2)$$

where X = [T, Y, P, i], X^I is the subset of I (1) variables and B is the vector of long-run coefficients. The equation is estimated with k = 2, then a "general – to – specific" specification search technique (see Hendry and Richard, 1982; Campos et al., 2005;) is employed in order to obtain a parsimonious representation of the data generating process.

To investigate the short run dynamics of the model, one uses the estimates from equation 2 to generate an error correction model. Formally,

$$C_t = \sum_{j=1}^{k} \alpha_j \Delta C_{t-j} + \sum_{j=0}^{k} \lambda_j' \Delta X_{t-j}^I + \sum_{j=0}^{k} \theta_j' Y_{t-j} + \varphi(C_{t-1} - B' X_{t-1}) + \upsilon_t \quad (3)$$

which denotes the changes in household expenditure as a function of changes of the lagged first difference of the non-stationary variables (X^I), stationary variables (Y) and an error correction term. As in the case of equation of 2, equation 3 is reduced to a more parsimonious form using a "general – to – specific" procedure.

3. Results

As a preliminary step to the analysis, the order of integration of the variables is determined. A plot of each series shows that several series appear to undergo at least one structural break over the period under study. Since standard unit root tests can have reduced power if they are applied to a time series with a structural break, the unit root test by Saikkonen and Lutkepohl (2002) and Lanne et al. (2002) that takes structural breaks into account is adopted. The test considers models with general nonlinear deterministic shift functions. In the first step of the test, the deterministic component is estimated and subtracted from the series. In the second step, the standard ADF unit root test is applied to the transformed series. Critical values can be found in Lanne et al. (2002, p.678).

Table 1: Unit Root Tests

Variable	*Level*	*First Difference*	*Break Date*	*Decision*
Household Expenditure	-1.878	-3.106**	2001	I(1)
Tourist Arrivals	-1.936	-3.767***	1991	I(1)
Income	-1.313	-4.585***	1992	I(1)
Price	-2.341	-6.322***	1979	I(1)
Policy Rate	-4.011***	N.A.	1991	I(0)

Notes: ***, ** and* indicate significance at the 1%, 5% and 10% levels, respectively.

Table 1 presents the unit root test results, which imply that all variables excepting the minimum deposit rate, are I (1). Hence, equation 2 is estimated inclusive of the leads and lags of Y, T, and P in first differences. The parsimonious specification, obtained by sequentially deleting the insignificant variables, is presented in Table 2. The results suggests that only prices and income form the equilibrium subspace, i.e. only prices and income seem to impact household expenditure in the long run, and their coefficients conform to the 'a priori expectations outlined in Section 2.1. These findings are somewhat similar to those of Tse (1998), who also report the absence of a long-run relationship between tourist arrivals and domestic consumption.

Table 2: Long Run Estimates

Dependent Variable: *C*	
Constant	22.156 (16.00) [0.000]
P	-0.283 (-5.70) [0.000]
Y	2.356 (11.1) [0.000]
R^2	0.914

Long Run Diagnostic Test Statistics

Autoregressive conditional heteroscedasticity F (2, 22) = 0.613 [0.551]
Serial Correlation (LM) F (1, 22) = 0.462 [0.504]
Normality $\chi^2(2)$ = 0.218 [0.897]
Ramsey Reset Test F (1, 27) = 0.182 [0.674]
Heteroscedasticity F (10, 17) = 0.308 [0.976]

Note: T-statistics are in parentheses ( ) and the associated p values in square brackets [ ].

The results of the short-run dynamic coefficients are shown in Table 3. As required, the coefficient on the error correction term is negative and significant, therefore confirming the existence of a cointegrating relationship. In fact, the value of the coefficient implies that about

29% of the discrepancy between the actual and equilibrium household expenditure is corrected in each year.

It should be noted that there is some difference between the variables entering the short run model and those in the long-run. Though the income variable retains its positive and significant coefficient, the findings indicate that in the short run, prices have no effect on the consumption decisions of households. In addition, the minimum deposit rate reduces household consumption in the short-run but has not effect in the long-run. Furthermore, this impact is lagged one year. This is in line with the findings of Mamingi et al (2009) who report that on average, it takes about four to six quarters for the full effect of changes in the minimum deposit rate to be transmitted to the economy via adjustments. Of particular interest, tourist arrivals seem to be positively related to household consumption.

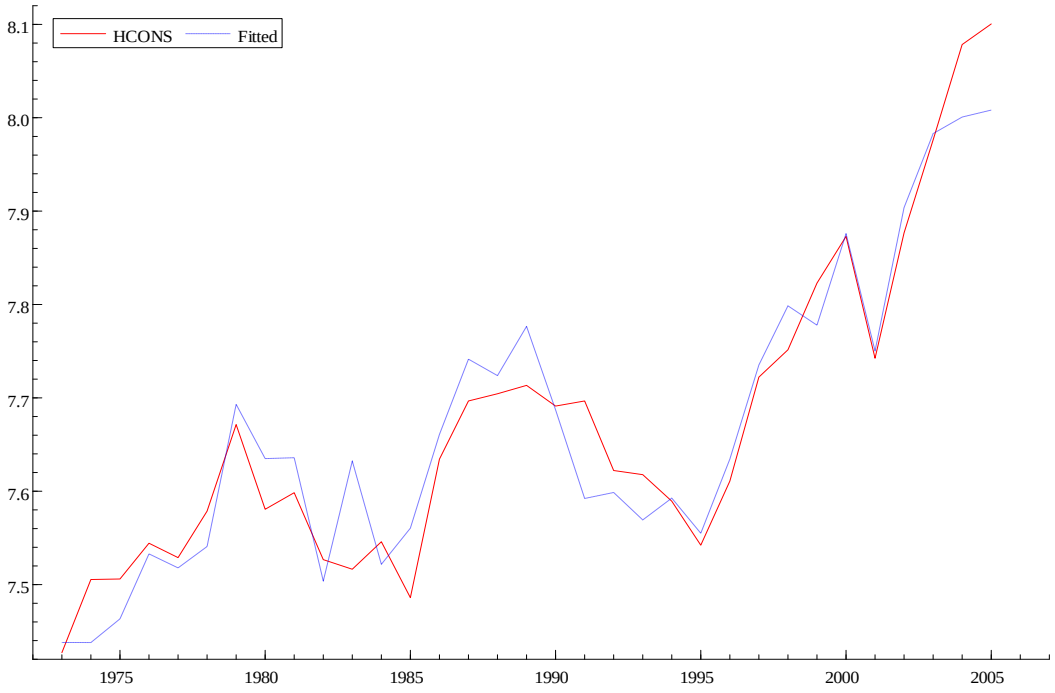
Table 3: Parsimonious Error-Correction Model

Dependent Variable: ΔC	
Constant	0.101 (16.00) [0.000]
ε_{t-1}	-0.288 (-3.35) [0.002]
ΔT_t	0.266 (1.85) [0.076]
ΔY_t	0.830 (3.10) [0.004]
i_{t-1}	-0.018 (-2.93) [0.007]
R^2	0.682
Short Run Diagnostic Test Statistics	
Autoregressive conditional heteroscedasticity F (1, 26) = 0.910 [0.349]	
Serial Correlation (LM) F (2, 26) = 0.311 [0.736]	
Normality $\chi^2(2)$ = 1.535 [0.464]	
Ramsey Reset Test F (1, 27) = 0.154 [0.698]	
Heteroscedasticity F (10, 17) = 1.853 [0.126]	

Note: T-statistics are in parentheses ( ) and the associated p values in square brackets [ ].

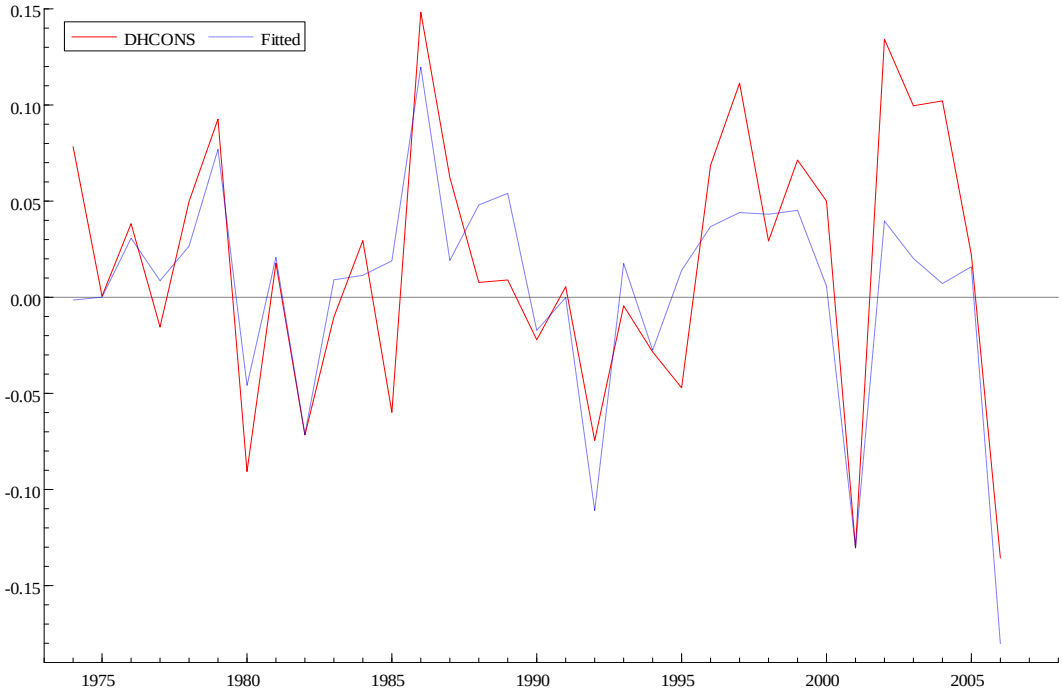
To test the adequacy of the results, both the long run and short run models are subjected to a battery of diagnostic tests (see the bottom panel of Tables 2 and 3). These tests imply that the models are well specified[4]. Moreover, the models appear to effectively explain household consumption patterns in Barbados evidenced by Figures 1 and 2.

Figure 1: Fitted Long Run Model



[4] It should be noted that the general error correction model had a non-normality problem. A look at the residual series revealed very large values for observations in the early 1980s, early 1990s and 2001, which corresponds to periods of recessions in the Barbadian economy. To correct this issue, the model was re-estimated with observation specific dummy variables.

Figure 2: Fitted Error-Correction Model



A small set back in the findings is that results only indicate that there is positive co-movement between tourist arrivals and domestic consumption in the short-run. However, correlation does not imply causation. Hence, we now seek to determine whether there is a causal relationship between tourism and household expenditure.

To test the existence of causality in the short run, the Granger causality test developed from the seminal paper of Granger (1969) is employed. 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 (in this case tourism in first differences) constitutes the Granger causality test. The results are provided in Table 4.

Table 4: Granger Causality Test

Causality	χ^2 *-Statistic*	*P-Value*
$\Delta T \not\rightarrow \Delta C$	1.486	0.476
$\Delta C \not\rightarrow \Delta T$	0.614	0.736

Note: The notation $\Delta T \not\rightarrow \Delta C$ represents the null: Growth in Tourism does not Granger-cause growth in household expenditure. A similar interpretation follows for the reverse test.

From the test statistics, it is clear that the null hypothesis "Growth in Tourism does not Granger-cause growth in household expenditure" cannot be rejected. In addition, there is no evidence to suggest that higher consumption boosts tourism. Overall, our results are in line with those of Tse (1998).

4. Concluding Remarks

The primary purpose of this study is to empirically examine the impact of tourist flows on household expenditure in Barbados. Hence, a simple model of consumption is augmented with tourism indicators and DOLS applied to investigate the long run and short run relationships between the variables of interest. Despite the importance of tourism to the Barbadian economy, we are unable to find any evidence of a long-run relationship between tourist arrivals and household expenditure. Furthermore, while tourist arrivals have a positive correlation with expenditure in the short run, it does not Granger cause it. Taken together, our results suggest that, like Hong Kong, the hypothesis that tourism boosts domestic consumption is not verified for Barbados.

References

Archer, E (1984) "Estimating the relationship between tourism and economic growth in Barbados" *Journal of Travel Research* **22**, 8-12.

Brida, J., E. Carrera and W. Risso (2008) "Tourism's Impact on Long-Run Mexican Economic Growth" *Economics Bulletin* **3(21)** pp1-8

Dritsakis, N (2004) "Tourism as a long-run growth factor: An empirical investigation for Greece using causality analysis" *Tourism Economics* **10**, 305-316

Dubarry, R (2004) "Tourism and economic growth: The case of Mauritius" *Tourism Economics* **10** 389-401

Campos, J., N.R. Ericsson and D.F. Hendry (2005) "General – to – specific modelling: an overview and selected bibliography" *International Finance Discussion Paper No. 838*, Board of Governors of the Federal Reserve System: USA.

Candela, G and R. Cellini. (1997) "Countries' size, consumer's preferences and specialization in tourism: A note" *Rivista Inernazionale di Scienze Economiche e Commerciali* **44**, 451-457

Engle, R and C.W.J. Granger (1987) "Cointegration and error-correction: representation, estimation and testing" *Econometrica* **55**, 251-276

Hendry, D.F. and J.F. Richard (1982) "On the formulation of empirical models in dynamic econometrics" *Journal of Econometrics* **20**, 3-33

Jackman, M., and K Greenidge (2010) "Modelling and forecasting tourist flows to Barbados using structural time series models" *Tourism and Hospitality Research* **10**, 1-13

Johansen, S. (1988) "Statistical analysis of cointegrating vectors" *Journal of Economic Dynamics and Control* **12**, No 2/3, 231-254.

Keynes, J.M. (1936), *The General Theory of Employment, Interest and Mone*y, Macmillan Cambridge University Press, London, UK.

Lanne, M., H. Lutkepohl and P. Saikkonen (2002) "Comparison of unit root tests for time series with level shifts" *Journal of Time Series Analysis* **23**, 667–685

Lee, C and C. Chang (2008) "Tourism development and economic growth: A closer look at panels" *Tourism Management* **29**, 180-192.

Mamingi, N., D. Boamah and M. Jackman (2009) "Interest rate pass-through: evidence for The Bahamas and Barbados" *Central Bank of Barbados Mimeo.*

Saikkinen, P (1991) "Asymptotically efficient estimation of cointegration regressions" *Economic Theory* **7**, 1-21

Saikkonen, P and H. Lutkepohl (2002) "Testing for a unit root in a time series with a level shift at unknown time" *Econometric Theory* **18**, 313–348

Sgro, P and B. Hazari (1995) "Tourism and growth in a dynamic model of trade" *The Journal of International Trade and Economic Development* **4**, 243-252

Stock, J.H and M.W. Watson (1993) "A simple estimator of cointegrating vectors in higher order integrated systems" *Econometrica* **61**, 783-820

Tse, R (1998) "Do more tourists lead to higher levels of consumption?" *Tourism Economics* **4**, 233-240